Lappeenranta
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Harri Ryynänen

FROM NETWORK PICTURES TO NETWORK INSIGHT IN SOLUTION BUSINESS – THE ROLE OF INTERNAL COMMUNICATION

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ABSTRACT

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Operating in business-to-business markets requires an in-depth understanding on business networks. Actions and reactions made to compete in markets are fundamentally based on managers' subjective perceptions of the network. However, an amalgamation of these individual perceptions, termed a network picture, to a common company level shared understanding on that network, known as network insight, is found to be a substantial challenge for companies. A company's capability to enhance common network insight is even argued to lead competitive advantage. Especially companies with value creating logics that require wide comprehension of and collaborating in networks, such as solution business, are necessitated to develop advanced network insight. According to the extant literature, dispersed pieces of atomized network pictures can be unified to a common network insight through a process of amalgamation that comprises barriers/drivers of multilateral exchange, manifold rationality, and recursive time. However, the extant body of literature appears to lack an understanding on the role of internal communication in the development of network insight. Nonetheless, the extant understanding on the amalgamation process indicates that internal communication plays a substantial role in the development of company level network insight.

The purpose of the present thesis is to enhance understanding on internal communication in the amalgamation of network pictures to develop network insight in the solution business setting, which was chosen to represent business-to-business value creating logic that emphasizes the capability to understand and utilize networks. Thus, in solution business the role of succeeding in the amalgamation process is expected to emphasize. The study combines qualitative and quantitative research by means of various analytical methods including multiple case analysis, simulation, and social network analysis. Approaching the nascent research topic with differing perspectives and means provides a broader insight on the phenomenon. The study provides empirical evidence from Finnish business-to-business companies which operate globally. The empirical data comprise interviews (n=28) with managers of three case companies. In addition the data includes a questionnaire (n=23) collected mainly for the purpose of social network analysis. In addition, the thesis includes a simulation study more specifically achieved by means of agent based modeling.

The findings of the thesis shed light on the role of internal communication in the amalgamation process, contributing to the emergent discussion of network insights and thus to the industrial marketing research. In addition, the thesis increases understanding on internal communication in the change process to solution business, a supplier's internal communication in its matrix organization structure during a project sales process, key barriers and drivers that influence internal communication in project sales networks, perceived power within industrial project sales, and the revisioning of network pictures. According to the findings, internal communication is found to play a substantial role in the amalgamation process. First, it is suggested that internal communication is a base of multilateral exchange. Second, it is suggested that internal communication intensifies and maintains manifold rationality. Third, internal communication is needed to explicate the usually differing time perspectives of others and thus it is suggested that internal communication has role as the explicator of recursive time. Furthermore, the role of an efficient amalgamation process is found to be emphasized in solutions business as it requires a more advanced network insight for cross-functional collaboration. Finally, the thesis offers several managerial implications for industrial suppliers to enhance the amalgamation process when operating in solution business.

Keywords: network insight, network pictures, internal communication, solution business, industrial networks, B-to-B marketing, industrial marketing

UDC: 65.01:65.012.45:658.8

ACKNOWLEDGEMENTS

Pursuing a doctoral degree is not a lonely or simple project. Nonetheless, I had that naïve notion at the back of my mind approximately four years ago when I stepped into my supervisor's office to ask if he would guide me in this project. These four years of toil, blood, sweat and tears have changed my mind. The task is not lonely or simple at all; it is however delightful, educative at various levels, and worth all the effort required. At this moment, I'm proud to admit that it's not about the goal but the journey. And for me this journey has most definitely been enjoyable. However, its successful completion and reaching my goal would not have been possible without the great number of tremendous people who have supported me. My deepest appreciation goes to the following individuals.

First, I would like to thank my supervisors. Professor Risto Salminen for introducing me to the scientific world of industrial marketing, and guiding me along my path to a doctoral degree by hinting at the right doors to enter. It gives me the utmost pride to say that Professor Salminen was my supervisor. And my deep gratitude goes to my other supervisor, Professor Anne Jalkala, whose incredible energy and intelligence has given me a great example to emulate. I will never forget her words of encouragement and pushing me to extend myself.

I would also like to express my deep gratitude to the pre-examiners Professor Virpi Havila and Professor Kimmo Alajoutsijärvi, whose comments have helped me improve the quality of the thesis. Throughout, I have endeavored to take their most relevant comments and suggestions onboard. In addition, my gratitude goes to my opponent for the thesis, Professor Rami Olkkonen.

My gratitude also goes out to my co-authors who have offered their insight and promoted interesting discussions concerning the individual papers that make up the thesis; they have taught me that not all knowledge comes from books. I have in addition been surrounded in the workplace by many close colleagues, or may I say friends. Without them my journey to a doctoral degree would not have been such fun and so enjoyable. So thank you Jaakko, Joona, Juha, Lauri, Markus, Minna, Olli, Pekka, Samuli K, Samuli P and many others for the thousands of laughs, insightful discussions, and moments of enlightenment. In addition, my gratitude goes to Alex Frost for his invaluable help in revising the language of my work. His professional skills and flexibility are beyond compare.

Alongside members of the academia, my gratitude goes also to the managers of the case companies for investing their time, and for sharing their thoughts and insights. These persons welcomed me into their companies with warmth, although the issues to discuss were possibly onerous. Thus, they all deserve my warm thanks.

During four years of work on the thesis I have been privileged to receive financial support from a variety of sources. I would therefore like to express my gratitude to the Lappeenranta University of Technology Support Foundation (Lappeenrannan teknillisen yliopiston tukisäätiö), Finnish Foundation for Technology Promotion (Tekniikan edistämissäätiö), Marcus Wallenberg Foundation (Vuorineuvos Tekn. ja Kauppat. tri h.c. Marcus Wallenbergin Liiketaloudellinen Tutkimussäätiö), Jenny and Antti Wihuri Foundation (Jenny and Antti Wihuri rahasto), Finnish Cultural Foundation (Suomen Kulttuurirahasto, Etelä-Karjalan rahasto), and the Foundation for Economic Education (Liikesivistysrahasto). In addition, the Finnish Graduate School of Marketing (FINNMARK) merits my gratitude for supporting me financially during my work on the thesis.

To succeed in achieving a doctoral degree is not just about working with colleagues and other scholars, but also having family and friends who provide support on the journey, and tolerate gibberish concerning network structures, ontological perspectives, theoretical frameworks, and so on. In addition, spending several weeks in the wilderness of Lapland, eating only dried food, being eaten by mosquitoes in a tent, and doing nothing but fly-fish with a good friend, for example provides a new type of perspective on industrial marketing and internal communication. Thank you, Pasi and all. Special thanks go to my mother, Kaija, and to my late father Pauli who have taught me, what a person with a whole heart, a willingness to work hard and an ambition can do – anything. Finally and most importantly, my deepest and greatest gratitude goes to my love, my muse, my friend, my fiancée, Sari. After a long day at work, nothing refreshes me more than coming home to her smiling face and laughing eyes. Thank you from the bottom of my heart.

Lappeenranta, February 2013

Harri Ryynänen

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LIST OF PUBLICATIONS

The thesis comprises two main parts, the overview (Part 1) and the publications (Part 2). The publications comprising the second part are listed below, summarizing the contribution of the present author and the acceptance procedure for each paper.

PUBLICATION 1

Ryynänen, H., Pekkarinen, O., and Salminen, R.T. (2012), Supplier's Internal Communication in Change Process to Solution Business - Challenges and Tentative Research Agenda. *Journal of Business Market Management*, Vol. 5, No. 3, pp. 154-172.

The present author created the research plan, conducted the literature review, and drew the conclusions of the paper. Research interviews and data analysis were conducted in collaboration with the co-authors. The paper was published in the journal based on a double-blind review on the full paper.

PUBLICATION 2

Ryynänen, H. (2012), A social network analysis of internal communication in a matrix organization – the context of project business. *International Journal of Business Information Systems*, Vol. 11, No. 3, pp. 324–342.

Sole author.

PUBLICATION 3

Ryynänen, H., Jalkala, A., and Salminen, R.T. (2008) Supplier's Internal Communication Network during the Project Sales Process. Earlier version presented at the EBRF 2008, Research Forum to Understand Business in Knowledge Society, 22–24 September 2008, Helsinki - Stockholm, Finland - Sweden. *A revised version of the paper, attached to the present thesis, is currently at the 3rd review round in the review process of the Project Management Journal.*

The present author was responsible for the creation of the research design, and the collection and analysis of the data. The paper was written with the assistance of the co-authors.

PUBLICATION 4

Ryynänen, H., Salminen, R.T., and Pekkarinen, O. (forthcoming), A Paucity of Person's Perceived Power within Industrial Project Sales. *International Journal of Industrial Systems and Engineering, (In Press)*

The present author developed the research plan with the co-authors. The data were collected and analyzed by the present author. The paper was written in collaboration with the co-authors. The paper was published in the journal based on a double-blind review on the full paper.

PUBLICATION 5

Ryynänen, H., Kortelainen, S., Lättilä, L., Jalkala, A. (2012), Understanding the Revisioning of Network Pictures – Insights from an Agent Based Modeling Approach, Proceedings of the IMP 2012, 28th Industrial Marketing and Purchasing Group Conference, 12 – 15 September 2012, Rome, Italy.

The present author was responsible for the literature review, concluding the findings, and organizing the research process. The research plan and simulation model were developed in collaboration with the co-authors. The paper was accepted by the conference through a double-blind review on an extended outline of the paper.

PART 1: OVERVIEW OF THE DISSERTATION

1 INTRODUCTION

Present day companies operate within global business networks that cross national and industrial boundaries. To succeed in ever fiercer competition, companies are required to understand their business environment more thoroughly. These companies, among other capabilities, must attempt to understand their customers' needs, their competitors' strengths and weaknesses, and the resources and capabilities offered by their partners. Perhaps, most importantly, these companies need to understand the relationships between these actors. In other words, companies are required to understand their business networks if they are to operate efficiently in global business networks. Ultimately, this is a task for an individual manager. However, to operate as an efficient company, these individual perceptions of business networks should be amalgamated into a common network insight (Mouzas, Henneberg, and Naudé, 2008).

Ever fiercer competition and the globalization of markets is, among other factors, compelling companies to refocus their value creating logics (Fang, Paltimatier, and Steenkamp, 2008; Jacob and Ulaga, 2008). It is paradoxical that business-to-business (B-to-B) supplier companies are pushed to focus on their core competencies while, simultaneously, customers demand more extensive offerings with higher problem-solving capabilities (Möller, 2006). The relational process of co-creating value with a customer and partners is employed in an attempt to satisfy customers' needs (Holm, Eriksson, and Johanson, 1999; Tuli, Kohli, and Bharadwaj, 2007). Thus, from offering something to the markets, companies have been evolving to offering with the markets (Vargo and Lusch, 2004). Offering, building, and delivering these solutions require new types of resources and capabilities from a supplier (Galbraith, 2002; Ulaga and Reinartz, 2011). The role of understanding networks is emphasized especially in this type of value creating logic. However, these business networks of actors are in the midst of constant change with new actors appearing and others disappearing, and, in addition, relationships between actors are constantly evolving. This type of constant change is a challenge for a manager to cope with.

All parties in a network have their own differing subjective understanding on that network (Ford et al., 2003). These mental structures are based on the actors' perceptions, experiences, and presumptions, thus being retrospective in nature. However, these mental structures form the basis of managers' understanding on relationships, interaction, and interdependencies, and thus they are also fundamental to each actor's decision making process (Henneberg, Mouzas, and Naudé, 2006). According to Gary and Wood (2011), more accurate mental models of causal relationships in a business environment are linked to higher performance outcomes. Therefore, these subjective mental structures are a central concept to managing within networks, and this perspective has established a growing interest in the academic literature (e.g., Markus and Zajonc, 1985; Fiol and Huff, 1992; Hodgkinson and Johnson, 1994; Huff and Eden, 2009; Gary and Wood, 2011).

Based on an understanding on business relationships and networks, the network picture concept is developed to describe participating managers' mental models (e.g., Ford et al., 2003; Henneberg, Mouzas, and Naudé, 2006; Henneberg, Mouzas, and Naudé, 2009; Geiger and Finch 2010; Leek and Mason, 2010; Corsaro et al., 2011). Unifying these individual network pictures to a common company level network insight is a challenge for companies. Thus, companies which have value creating logic where the role of understanding networks is substantial are especially influenced by their capability to unify network pictures. According to Mouzas, Henneberg, and Naudé (2008), these dispersed pieces of atomized network pictures can be unified to a network insight through an amalgamation process comprising

multiple negotiations and heedful interactions at numerous differing levels within organizations. Multilateral exchange, manifold rationality, and recursive time have been found to be the enablers and/or barriers of the amalgamation process (Mouzas, Henneberg, and Naudé, 2008).

1.1 Research gap

Scholars have studied personal level cognitive structures (e.g., Hodgkinson and Johnson, 1994; Osborne, Stubbart, and Ramaprasad, 2001; Henneberg, Mouzas, and Naudé, 2006) and organization level social cognition (e.g., Dougherty, 1992; Fiol, 1993; Bettis and Prahalad, 1995; Mouzas, Henneberg, and Naudé, 2008) in various disciplines, around which a variety of literature streams and concepts have been created that are based on their own ontological and epistemological assumptions. Thus, at a broad level, it can be concluded that research on an individual's cognitive mental structures or an organization's social cognition is not a novel research area. However, research on network pictures and network insights is an emerging research field. The focus on business relationships and networks (Ford, 1980; Ford, Håkansson, and Johanson, 1986; Håkansson and Johanson, 1992; Ford and Håkansson, 2006), and the relativistic ontology (Anderson, Håkansson, and Johansson, 1994; Easton and Håkansson, 1996; Ford et al., 2003) differs from previous streams. Although the number of studies that discuss network pictures and network insights is increasing, various research gaps remain to be studied (Henneberg, Naudé, and Mouzas, 2010).

The extant literature on network pictures focuses on defining the dimensions of network pictures (e.g., Henneberg, Mouzas, and Naudé, 2006; Leek and Mason, 2010), discussing their nature (e.g., Colville and Pye, 2010; Geiger and Finch, 2010), and creating a model to study network pictures academically and managerially (Leek and Mason, 2009; Leek and Mason, 2010; Ramos and Ford, 2011). In addition, the network picture discussion has thus far addressed the development of the concept at the theoretical level, offering only some empirical evidence (Ford and Redwood, 2005; Henneberg, Mouzas, and Naudé, 2006; Öberg, Henneberg, and Mouzas, 2007; Kragh and Andersen, 2009; Leek and Mason, 2009; Leek and Mason, 2010). As the research focus has been on personal level network pictures, the research on intraorganization level network insight appears to have been overlooked. However, it is found that the ability to achieve desired changes in a network is dependent on the degree of overlap between managers' network pictures (Kragh and Andersen, 2009). Furthermore, the capability to enhance a common network insight is argued to create competitive advantage (Mouzas, Henneberg, and Naudé 2008). However, the extant understanding on network insights is limited to the identification of the phenomenon and recognition of the enablers/barriers of amalgamating network insight. Thus, there is a call for studies on these network insights (Henneberg, Naudé, and Mouzas, 2010).

Justification for the present thesis is based on the following reasons. *First*, the transition of companies operating in B-to-B markets to solution business emphasizes the need to understand management practices in a more networked business environment. For example, intensified internal cooperation and changing the mindsets of employees are found to be crucial for success in solution business (Sawhney, 2006; Tuli, Kohli, and Baharadwaj, 2007). Thus, further attention to group level collective cognitions is necessary. *Second*, in addition to external communication between the solution or project firm and its stakeholders, internal communication within the supplier organization also has a great impact on the success of a project (Ritter and Gemünden, 2003; Peters and Fletcher, 2004; Lecoeuvre-Soudain. and Deshayes, 2006). Studies on solutions and projects have mainly focused on the interaction

between buyers, sellers, and actors in the project 'milieu' network, largely neglecting the role of internal communication (Cova, Ghauri, and Salle, 2002). Thus, a greater understanding on the characteristics of personal level internal communication networks during the project sales process is required. *Third*, the core process of amalgamating individual network pictures to a common network insight is recognized to include multilateral exchange, manifold rationality, and recursive time (Mouzas, Henneberg, and Naudé 2008). These enablers/barriers of the amalgamation process indicate that an understanding on communication between these internal actors plays a substantial role in enhancing organization level network insight. However, the extant body of literature appears to lack understanding on the role of internal communication in the formation of network insight (Henneberg, Naudé, and Mouzas, 2010).

The present study contributes to the research gaps by increasing understanding on a supplier's internal communication challenges in the change process to solution business, and enhancing the understanding on customer related internal communication between the matrix organization's structures during the project sales process. In addition, the thesis contributes to the research gaps by determining the key barriers and drivers that influence internal communication in project sales networks, and by increasing understanding on the dynamic nature of network pictures. Furthermore, the thesis sheds light on an actor's network picture in the project sales process. At the broader level, the study enhances understanding on the role of internal communication[1] in the amalgamation of network pictures to network insight, focusing on the solution business setting. As such, the study contributes to the literature on network insights' adoption of the business networks perspective (e.g., Mouzas, Henneberg, and Naudé, 2008; Henneberg, Naudé, and Mouzas, 2010; Möller, 2010; Corsaro et al., 2011) by proposing that internal communication plays a substantial role in the amalgamation process of network insight. In addition, by discussing internal communication, network pictures, and network insights in the solution business setting, the study continues the line of argument advanced by Olivia and Kallenberg (2003), Davies, Brady, and Hobday (2006), Cova and Salle (2007), and Matthyssens and Vandenbempt (2008).

1.2 The purpose of the study and the research questions

Following from the research gap discussed above, *the purpose of the study is to enhance understanding on internal communication in the amalgamation of network pictures to network insight in the solution business setting.* To fulfill this purpose the present study is divided into five sub-objectives, which are addressed in the individual publications. As there is a relatively small body of prior research that relates to network insight in the solution business setting, the imposed research questions are descriptive and exploratory in nature, and are answered by leaning on triangulation, as having a broader perspective with distinct approaches might offer wider understanding on the studied phenomenon. *The studied phenomenon can be described as a ongoing process in which a company's individuals interact with each other by various means and with differing purposes, and usually implicitly create more overlapping understanding on the surrounding business network in which their company operates.* The focus of the thesis is especially on internal communication in the solution business setting in the studied phenomenon. The study combines qualitative and quantitative research by means of various analytical methods comprising multiple case

[1] The majority of the extant literature on the concept of role is focused on the discussion on the personal- and organization-level, describing functions or activities performed by a party in the context of other actors (Levinson, 1959; Williams, 1969). In addition, business research leaning on the role theory usually refers to the individual within an organization as a role bearer (Pettigrew, 1968). That research describes roles either by whom an actor is (Anderson et al., 1998; Chreim, Williams ,and Hinings, 2007) or what the actor does (Levinson, 1959). However, as the role bearer of the thesis is not an individual nor an organization but a process in an organization, the role is understood as functions performed by internal communication in the context of an amalgamation process in solution business.

analysis, content analysis, agent based modeling, and social network analysis. Table 1 introduces the imposed research questions, objectives, methods, and publications more specifically.

Table 1. Research questions

	Research questions	Objectives	Method	Publication
1	What is the role of internal communication in the amalgamation of network pictures to network insights in solution business?	To understand the role of internal communication in the amalgamation process.		1-5
1.1	What are the supplier's internal communication challenges in the change process to solution business?	To determine the supplier's internal communication challenges in the change process to solution business.	Multiple case study; inductive content analysis.	1
1.2	What type of internal communication interface is formed between the functional and divisional matrix structure during the early phases of the project sales process?	To understand customer related internal communication between the functional and divisional structures of the matrix organization during the early phases of the project sales process.	Single case study; social network analysis; inductive content analysis.	2
1.3.1 **1.3.2**	What type of communication network is formed during the early phases of the project sales process? What are the barriers to, and drivers of, efficient internal communication during the early phases of project sales process?	To determine key factors influencing internal communication in project sales networks.	Single case study; social network analysis; inductive content analysis.	3
1.4	How do actors involved in project sales perceive their power in the early phase of the project sales process?	To demonstrate a person's perceived power in the early phase of the project sales process.	Single case study; inductive content analysis.	4
1.5	How does a manager's ability to revise the network picture affect the quality of decisions in a dynamic business environment?	To understand the change of network pictures in dynamics business network conditions.	Agent based modeling.	5

The main research question aims to enhance understanding on the amalgamation process to objectify individual network pictures to network insight, and focus the role of internal communication within it. The aim is addressed in all publications (1-5). *The first sub-research question* aims to determine the supplier's internal communication related challenges during the change process to solution business. The aim was approached through a multiple case

study comprising two industrial companies which are changing to solution business. *The second sub-research question* increases understanding on internal communication in an organization structure often utilized in project and solution business companies. The matrix organization structure was studied in an industrial supplier organization through social network analysis, supported with in-depth interview data. *The third sub-research question* focuses on internal communication in a project sales network and employs social network analysis in the study on an intraorganizational communication network. The method was utilized to study a large-scale project in a supplier's organization during a sales process. In addition, the social network analysis is supported with in-depth interview data. *The fourth sub-research question* concerns an individual's network picture in the project sales process by focusing on the power dimension of network pictures. This question was approached through a single case study on a project sales process in an industrial supplier company. *The fifth sub-research question* aims to shed light on the dynamic nature of network pictures by employing a longitudinal approach to the phenomenon. The longitudinal approach was attained by utilizing simulation as the research method.

1.3 Theoretical positioning of the research

The focus of the thesis is on a cross-section of multiple theoretical traditions and concepts on its own context. Figure 1 depicts the theoretical positioning of the study and illustrates (with bold ellipse) that internal communication is the central concept, the role of which is studied in the amalgamation process from network pictures to network insight. Various literature streams offer several concepts to describe a company's internal and external communication, such as employee communication (Frank and Brownell, 1989), corporate communication (Argenti, 1996; Cornelissen, 2004), internal marketing (Ballantyne, Christopher, and Payne, 1995), business communication (Reinsch, 1996), management communication (Smeltzer, 1996), organizational communication (Mumby and Stol, 1996), and internal communication (Smythe, 1996; Scholes, 1997; Mounter, 2003; Mazzei, 2010). The present thesis builds its theoretical understanding on the concept of internal communication (e.g., Smythe, 1996; Scholes, 1997; Mounter, 2003; Mazzei, 2010) as a part of corporate communication (e.g., Argenti, 1996; Cornelissen, 2004). The concept of internal communication has been selected as it has a clear focus on internal activities coordinated by managers and takes into account all levels of the organization, including formal and informal communication.

Theoretically, the present study is grounded on the Industrial Network Approach (INA)[2] that views business relationships not as separate entities but as interconnected and interdependent systems of relationships, which are built on actors' bonds, activity links, and resource ties (e.g., Håkansson and Johanson, 1992; Ritter, Wilkinson, and Johnston, 2004). Today, INA represents a major stream of research on industrial marketing and interorganizational strategy (Håkansson et al., 2009). Thus, this approach offers a theoretical ground with a broad and commonly accepted perspective on business relationships. In addition, as communication

[2] The origins of the Industrial Network Approach (INA) can be traced to the 1960s, when a group of scholars carried out research on distribution channels (e.g., Boulding, 1962; Balderston, 1964; Breyer, 1964; Bucklin, 1965; Bartels, 1988), on the relationships between specific companies over time, and on the long-term processes through which companies developed internationally (e.g., Johanson and Vahlne, 1977; Johanson and Wiedersheim, 1975), and, finally, moving the research focus to the nature of business relationships in industrial markets (e.g., Ford, 1980; Ford, Håkansson, and Johanson, 1986). The interaction model of business relationships was developed as a result of this research (Håkansson and Wootz, 1979; Håkansson, 1982). This model emphasizes the role of relationships and networks that exist between buyers and sellers in industrial markets, thus adopting relationships as a unit of analysis (Håkansson, 1982). The theoretical ground of the INA is based on the resource-based perspective (e.g., Penrose, 1959; Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991; Peteraf, 1993; Lavie, 2006; Sanchez, 2008) and social exchange theory (e.g., Thibaut and Kelly, 1959; Blau, 1964; Bagozzi, 1975; Donaldson and O'Toole, 2000).

among a group of individuals can be seen to form a network structure, a theory that emphasizes the understanding on networks is required. This type of network approach is also proposed in the fields of economic sociology and strategic research (Amit and Zott, 2001; Eisenhardt and Martin, 2000; Gulati, Nohria, and Zaheer, 2000; Gulati and Gargiulo, 1999; Gulati, 1998).

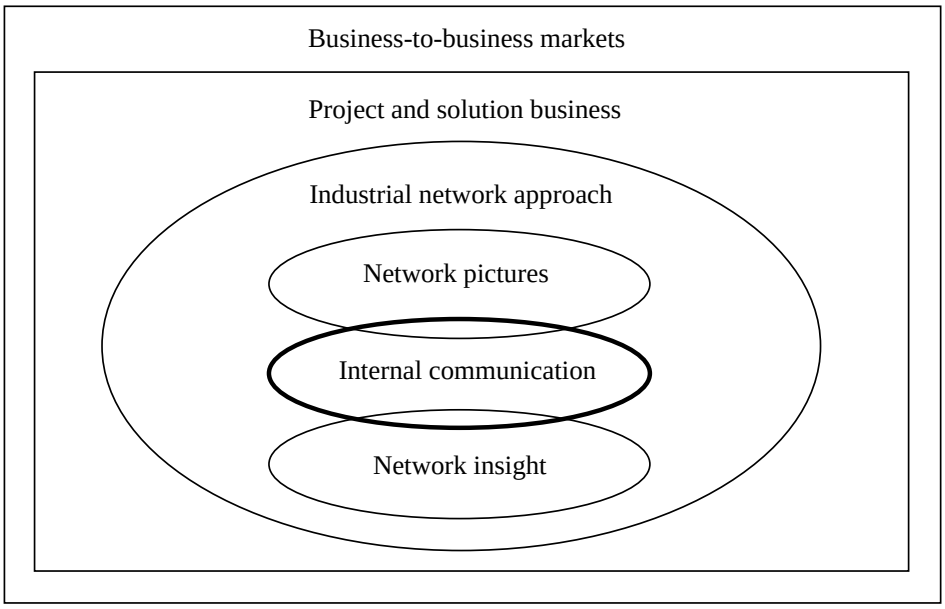

Figure 1. Theoretical positioning of the research

Recent studies have increasingly highlighted the role of managerial cognition[3] in the management of a company and generally agree that cognition is a factor in decision making (e.g., Walsh, 1995; Hodgkinson et al., 1999) and impact the performance of a company (Thomas, Clark, and Gioia, 1993; Osborne, Stubbart, and Ramaprasad, 2001; Goodhew, Cammock, and Hamilton, 2005; Gary and Wood, 2011). Based on INA, some scholars have adopted the highly relevant research avenue of managerial cognition. The thesis is grounded on the extant literature and thus leans on the understanding on the concepts of network pictures (e.g., Ford et al., 2003; Henneberg, Mouzas, and Naudé, 2006; Colville and Pye, 2010; Geiger and Finch, 2010; Corsaro et al., 2011) and network insight (Mouzas, Henneberg, and Naudé, 2008).

The broad context of the present thesis is B-to-B markets. At a more specific level the focus is on value creation logics, in which the role of understanding the surrounding network is emphasized. The academic discussion has generated various concepts that adopt slightly differing perspectives on these types of value creation logics. Probably the most common concepts are solution business (Sawhney, 2006; Davies, Brady, and Hobday, 2007; Tuli, Kohli, and Bharadwaj, 2007), service business (Olivia and Kallenberg, 2003; Vargo and

[3] A person's cognition is approached in several disciplines and literature streams, such as managerial and organizational cognition (Huff, 1992; Huff and Eden, 2009), the sense-making literature (Weick, 1995), psychology including social psychology (Markus and Zajonc, 1985; Markus, 2005), and cognitive psychology (Eysenck and Keane, 2010; Manktelow, 2008).

Lusch, 2004; Fang, Paltimatier, and Steenkamp, 2008; Gummesson and Mele, 2010), system selling (Mattson, 1973; Hanan, Cribbin, and Donis, 1978; Günter and Bonaccorsi, 1996), and project marketing (Cova, Ghauri, and Salle, 2002; Skaates and Tikkanen, 2003). With its general acceptance of the academic debate and suitability to the studied phenomenon, The thesis draws from the extensive body of literature on marketing industrial projects and solutions (e.g., Cova, Ghauri, and Salle, 2002; Skaates and Tikkanen, 2003; Sawhney, 2006; Davies, Brady, and Hobday, 2007; Tuli, Kohli, and Bharadwaj, 2007). Publications 1-4 are contextually based on this type of value creation logic.

1.4 Overview and organization of the thesis

The thesis is divided into two main parts. Part 1 is an introduction and overview of the study and Part 2 comprises the five publications that address the research questions introduced above. The first part begins with an introduction to the identified research gap, the research questions, and theoretical positioning of the study. Thus, the purpose of Chapter 1 is to provide an overview on the thesis and its purpose, orienting the reader to subsequent chapters. Chapter 2 discusses the theoretical background of the thesis and introduces its meaning for practice. The chapter includes a brief introduction to INA, and the concepts of network pictures and network insight based on the extant academic literature. In addition, the chapter briefly discusses the concepts of solution business and internal communication to the extent necessary for the study. Thus, the chapter offers the required theoretical understanding to the reader.

Chapter 3 discusses the justification of the methodological choices, and the data collection and analysis processes. More precisely, the chapter introduces the methods of case study, social network analysis, and agent based modeling employed in the thesis. Thus, the chapter provides the reader with the basis for methodological choices and their brief introduction. Chapter 4 summarizes the content of the included publications. The role of the publications is to shed light on the research gap by approaching the phenomenon with research on solution business (Publication 1), internal communication (Publications 2 and 3), and network pictures (Publications 4 and 5). The purpose of the chapter is to provide a summary of the included publications and their implication for the thesis. Finally, Chapter 5 provides answers to the research questions and, derived from the results, a summary of theoretical and managerial implications of the thesis. In addition, the chapter includes the critical assessment of the reliability and validity of the thesis. Furthermore, the chapter suggests some well selected avenues for future research. Thus, the purpose of the chapter is to condense the contribution of the thesis for the reader. Figure 2 summarizes the structure of the Part 1 and illustrates the contributions of each section to the design of the thesis.

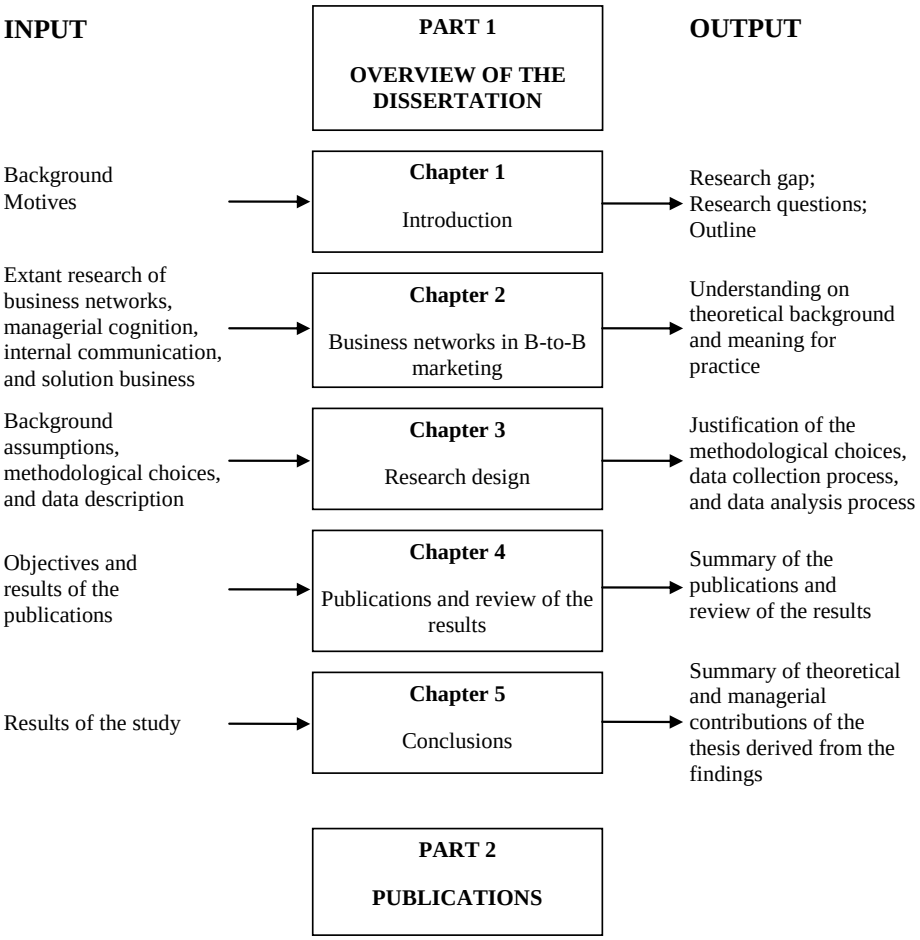

Figure 2. Outline of the first part of the thesis

2 BUSINESS NETWORKS IN BUSINESS-TO-BUSINESS MARKETING

This chapter presents business networks in business-to-business (B-to-B) marketing, which sets the theoretical ground for the thesis. The chapter begins with a description of the Industrial Network Approach (INA), its aims and underlying philosophy. The chapter continues with a review on personal level and company level cognition, employing the concepts of network pictures and network insight. It continues with a review of previous research that relates to marketing industrial projects and solutions. Finally, the chapter provides a brief picture of the current academic knowledge on intraorganizational communication, focusing on the concept of internal communication.

2.1 Industrial network approach

Network research has long traditions. At the abstract level, network is a structure in which a number of nodes relate to each other by specific ties (Ford et al., 2003). In business networks these nodes are business actors; for example, business units, buyers, sellers, finance companies, service companies, or individuals. These business actors are interconnected directly or indirectly with each other in a theoretically unlimited network, affecting each other and being affected simultaneously by others. The ties between these business actors are relationships.

Networks have been the object of interest in several disciplines (e.g., sociology; social psychology; computer sciences; business studies) and researched by employing various approaches. Various network perspectives have become popular in business research; for example, the strategic research tradition on strategic groups has found that they can be defined by objective characteristics (Porter, 1985; McNamara, Deephouse, and Luce, 2003) or established by a shared understanding on diverse companies (Reger and Palmer, 1996; Osborne, Stubbart, and Ramaprasad, 2001). The channel management literature embodies individual business relationships as unique entities, claiming that companies have to respond appropriately to changes in their business environment (Guiltinan, 1974; Stern and Reve, 1980; Achrol, Reve, and Stern, 1983). It is also argued in the strategic marketing discourse that business networks are value-creating systems, in which companies cooperatively create value for customers (Normann and Ramirez, 1993; Möller and Svahn, 2006). Additionally, in the strategic marketing discourse, a business network has been characterized as marketing alliances in which companies' cooperation is based on formalized and collaborative agreements (Das, Sen, and Sengupta, 1998; Gulati, Nohria, and Zaheer, 2000).

Business networks are also referred to as ecosystems, based on the ecological metaphor that companies participate in a larger ecosystem (Moore, 1993; Iansiti and Levien, 2004; Basole and Karla, 2011). According to this perspective, each company plays a contributing role and forms symbiotic relationships with customers, suppliers, competitors, and complementors. Thus, an ecosystem is not limited to a specific industry and can comprise participants from several industries (Basole and Karla, 2011). In addition, one commonly known and utilized framework that has offered understanding on the relationship between social and technological artifacts is the actor network theory (Latour, 1987). These actors can be either human (one or many) or non-human (factors, machines, or patents). However, subsequent to Bruno Latour, Michel Callon, and John Law introducing this universal theory to understand networks, it has become quite substantially fragmented. INA is based on understanding business relationships and interaction within them (Ford, 1980; Ford, Håkansson, and

Johanson, 1986; Håkansson and Johanson, 1992)[4]. Due to its established position in marketing research and its suitability for the purposes of the study, INA is adopted by the thesis. Furthermore, the theoretical tradition offers suitable conceptual ground for the study.

The industrial network perspective is based on the ontological perspective that markets are interconnected webs of dependent exchange relationships that are built on actors' bonds, activity links, and resource ties (Håkansson and Johanson, 1992; Anderson, Håkansson, and Johanson, 1994; Easton and Håkansson, 1996). Furthermore, according to this perspective, a core requirement to understand a network is an understanding on the interactions of participants within the network (Ford and Håkansson, 2006). These networks are perceived as relativistic in nature and there is no single, objective network. The network is not owned by any particular company, nor can it be centrally managed in its entirety, although all companies try to manage within it. Also, although many companies might believe that they are at the "center", no company is the hub of the network as there is no center (Ford et al., 2003).

There has been substantial academic debate on the nature and possibilities of management in networks. For example, according to Jarillo (1988), companies are in control of themselves and even the surrounding companies. These controlling companies are referred to as hub companies involved in strategic networks with clear boundaries. However, according to authors who adhere to INA, companies do not have total control of their resources as their actions are influenced and restricted by other network members (Wilkinson and Young, 1994; Håkansson and Ford, 2002; Welch and Wilkinson, 2002; Ford et al., 2003). Thus, paradoxically, while a company is attempting to affect a network, actors in the network are simultaneously affecting the company (Håkansson and Ford, 2002). From this perspective, networks are found to be complex adaptive systems that are not centrally directed (Ritter, Wilkinson, and Johnston, 2004).

Based on INA, management of a network is not possible as the "manager" is itself a part of the network. Thus, as management occurs in the network, the proper term should be *management in a network* instead of *management of a network*. Ford et al. (2003) have suggested a model that demonstrates the composition of networks and offer a model of managing in networks (Figure 3). The model comprises the interconnected elements of network pictures, networking, and network outcomes. The networking element comprises all the interactions of a company or an individual. Networking is an ongoing process in which all actors in the network are networking simultaneously. Thus, the network is in a constant incremental or radical change with multiple drivers such as, for example, mergers and acquisitions (Havila and Salmi, 2001). The essential feature is that networking is affected by individuals' perceptions of the network (Ford et al., 2003; Corsaro et al., 2011). These perceptions are termed network pictures, which are an individual's subjective interpretation of the surrounding network, and thus the foundation for decision making (Ford et al., 2003; Henneberg, Mouzas, and Naudé, 2006; Colville and Pye, 2010). This linkage of managerial cognition and managerial behavior is found also in other research streams (Thomas, Clark, and Gioia, 1993; Gioia and Chittipeddi, 1991). Ultimately, network pictures impact network outcomes (Ford et al., 2003). However, network outcomes affect the actors' network pictures and thus also networking. If network outcomes are in accordance with the present network picture, the outcomes validate the picture. Conversely, if outcomes are not in accordance with the network picture, it will probably be revised (Ford et al., 2003). Thus, these three elements

[4] For more comprehensive reviews on the network literature see Araujo and Easton (1996), and Iacobucci (1996), Nohria and Eccles (1992), and Borgatti and Foster (2003).

are at the heart of an ongoing process, in which an actor's network picture is revised by network outcomes as well as by networking itself.

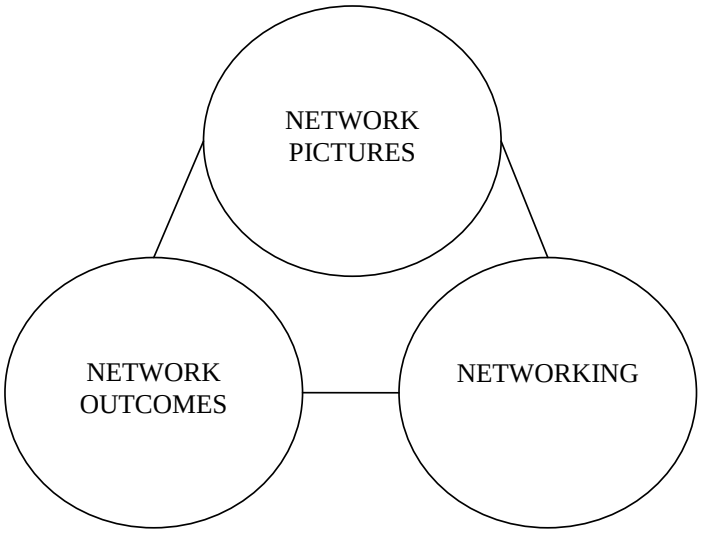

Figure 3. Model of managing in networks (Ford et al., 2003)

Interactions in the network take many forms and one of the main challenges for a manager in B-to-B markets is to understand these multiform interactions. In recent years, academic interest in business studies has emphasized a manager's ability to operate in a network environment. In addressing one aspect of this issue, research that examines the role of managerial cognition has shown that understanding managers' cognitive mental structures is focal in studying successful network operations (e.g., Simon, 1991; Henneberg, Naudé, and Mouzas, 2010; Gary and Wood, 2011). In addition, network pictures are argued to be a central concept to INA (Mouzas, Henneberg, and Naudé, 2008). The concept of network pictures is discussed more thoroughly in the following chapter.

2.2 Network pictures – individuals' perceptions of the surrounding business network

Generally, mental structures can be understood as a person's simplified knowledge structures or cognitive representation of how the world works. Building on INA, a notion has developed that all parties in a network have their own differing, subjective "picture" of the network (Johanson and Mattson, 1992; Ford et al., 2003). These pictures are based on the parties' perceptions, experiences, and presumptions. Nevertheless, these mental structures are the foundation for managers' understanding on relationships, interactions, and interdependencies, and thus are also fundamental to the decision making process of the actors (Henneberg, Mouzas, and Naudé, 2006). Therefore, these subjective mental representations of the surrounding network are a central concept to managing in networks.

The network picture concept proposes a description of "the different understanding that players have of the business network in which their focal company is operating" (Henneberg, Mouzas, and Naudé, 2009, p. 95). These network pictures are argued to be the result of the

"subjective, idiosyncratic sense-making with regard to the main constituting characteristics of the network in which their company is operating" (Henneberg, Mouzas, and Naudé, 2006, p. 409). Thus, network pictures are retrospective in nature, constructed of past events. However, the pictures form a basis for prospective decisions and thus shape organizations' future options and identities (Weick, 1979; Mouzas and Naudé, 2007).

Within the industrial network research tradition, the network picture concept has a wide variety of overlapping concepts that aim to define how managers perceive and enact reality; for example, network theories (Johanson and Mattsson, 1992), network position (Easton, 1992; Johansson and Mattsson, 1992; Turnbull, Ford, and Cunningham, 1996; Haimala, 2008), network horizon (Anderson, Håkansson, and Johanson, 1994; Holmen and Pederson, 2003), network context (Anderson, Håkansson, and Johanson, 1994; Holmen and Pederson, 2003), network maps (Borders, Johnston, and Rigdon, 2001), enacted network (Halinen, Salmi, and Havila, 1999), network boundaries (Cova, Mazet, and Salle, 1998), ideas and schemas (Welch and Wilkinson, 2002), network surrounding (Ford et al., 2002), network identity (Anderson, Håkansson, and Johanson, 1994; Gadde and Håkansson, 2001), and network insight (Mouzas, Henneberg, and Naudé, 2008).

2.2.1 Definitions of network pictures and related prior research

The extant literature on network pictures offers two levels of analysis: narrow and broad (Abrahamsen, Naudé, and Henneberg, 2009; Henneberg, Naudé, and Mouzas, 2010). The narrow perspective suggests that network pictures collected from a manager can provide an insight on the individual's frame of mind (Ford et al., 2003; Henneberg, Mouzas, and Naudé, 2006; Öberg, Henneberg, and Mouzas, 2007). The broad perspective advocates that network pictures can be integrated and abstracted from specific managerial network pictures to broad network pictures as part of a research tool (Ramos, Ford, and Naudé, 2005; Ramos and Ford, 2011). The narrow perspective offers a suitable level of analysis for the present study, the purpose of which is to enhance understanding on internal communication in the amalgamation of individuals' network pictures to network insight in the solution business setting. Table 2 provides an insight on the definitions which are provided in the extant literature. The table contains the definitions of network pictures at both broad and narrow levels.

Table 2. Descriptions of network pictures

Author(s)	Description
Ford et al., 2003, p. 176	The views of the network held by participants in that network.
Ramos, Ford, and Naudé, 2005	A representational technique that aims to capture or illustrate views that specific actors have of the networked environment.
Henneberg, Mouzas, and Naudé, 2006, p. 408	Subjective mental representations of their [managers'] relevant business environment. They are posited to work as "sense-making" devices, and consequently shape managerial decisions, actions, and evaluations.
Ford and Ramos, 2006, p. 2	A conceptualization by the observer of the network views of the participants, (...) a representational technique that aims to capture or illustrate views that specific actors have of the networked environment within which they operate.
Henneberg, Mouzas, and Naudé, 2009, p. 95	The different understanding that players have of the business network in which their focal company is operating.
Kragh and Andersen, 2009, p. 642	The mental representations held by managers of the roster of routines that can be evoked in any given network setting, which in turn is linked to the manager's understanding of other actors in the network.
Colville and Pye, 2010, p. 376	An output of an enacted sense-making process.
Geiger and Finch, 2010, p. 382	*Representationalist network pictures:* Snapshot drawings of industrial contexts developed from a bird's eye perspective and informed by network understandings. *Mentalist network pictures:* Drawings of industrial contexts that seek to capture actors' understandings of their environments with a view to improving action upon these environments. *Situated network pictures:* Drawings of industrial contexts in which the focus is on the social process of interaction.
Munksgaard, 2010, p. 938	Network pictures capture the ways actors make sense of the wider network setting in which they are integrated, and, as such, constitute subjective mental representations of the context of managers, which shape the underlying subjective logic for managerial action accordingly.
Mandjak, Simon, and Szalkai, 2011, p. 823	The interpretation of the network in the actor's mind.

One of the early definitions of the concept of network picture was provided by Ford et al. (2002 and 2003) who define network pictures as "the views of the network held by participants in that network". Ford et al. (2003) note that these network pictures are dependent on actors' own experiences, relationships, and positions in the network, and that these are affected by their problems, uncertainties, abilities, and by the limits of their knowledge and understanding. In addition, Mouzas and Naudé (2007) note that network pictures build on multiple snippets of information. According to Henneberg, Mouzas, and Naudé (2006) network pictures are the product of "a subjective, idiosyncratic sense-making with regard to the main constituting characteristics of the network in which their company is operating". Accordingly, network pictures are in the middle of an ongoing process, and thus they argue that network pictures have two roles, meaning-creation devices and devices for managerial

action. Thus, network pictures closely relate to managerial decision making. Later, Henneberg, Mouzas, and Naudé (2009, p. 95) redefined the concept as "the different understanding that players have of the business network in which their focal company is operating". For the purposes of the thesis Henneberg, Mouzas, and Naudé's (2009) definition plays a suitable role as its focus is on individual players and their understanding on the business network in which they operate.

Henneberg, Mouzas, and Naudé (2006) also made the first attempt to define the building blocks of a network picture. According to Henneberg, Mouzas, and Naudé (2006) there are eight interconnected building blocks:

- *Boundaries*. The network picture is defined by both depth (the number of relationships that a focal company has that involve the direct supply of goods/services) and width (the nature of the relationships that a focal company has with other companies outside the formal product/service delivery) (Henneberg, Mouzas, and Naudé, 2006).
- *Directionality*. Refers to the direction of a relationship and the modes of interconnectedness: being neutral, assisting, hindering, synergizing, lacking, or competing (Henneberg, Mouzas, and Naudé, 2006; Ritter, 2000).
- *Power*. Relationships are tempered by the relative power of the involved parties (Håkansson and Gadde, 1992), thus the network picture involves the power building block, which indicates the extent of independence or dependence.
- *Time/Task*. Indicates the time horizon involved in a network picture.
- *Environment*. Refers to an entity which lays outside the boundary, but the role of which can influence the outcome of the network picture (Henneberg, Mouzas, and Naudé; 2006). The
- *Focus*. Refers to the main ontological property of the actors and provides two alternatives: an entity related perspective (sets of connected actors) and a connectivity related perspective (sets of connected relationships between companies).
- *Actors/Activities/Resources*. The basic blocks through which the network picture implicitly is incorporated (Håkansson and Johanson, 1992).
- *Center/Periphery*. Refers to the focal actor, which can be, for example, an individual, company, relationship, or central network of highly integrated companies (Ford et al., 2003; Henneber, Mouzas, and Naudé, 2006).

To study network pictures in an analytic and systematic manner, employment of some or all of the above dimensions might be considered (Henneberg, Mouzas, and Naudé, 2006). Ramos and Ford (2011) extend the dimensions of the network pictures identified by Henneberg, Mouzas, and Naudé (2006) by arguing that an individual's network picture can be described through 21 dimensions that divide to 46 sub-dimensions. These dimensions are combined in four main groups: focus, weight, specificity/coherence, and overall perspective of surroundings.

Öberg, Henneberg, and Mouzas (2007) lean on some of the building blocks of network pictures defined by Henneberg, Mouzas, and Naudé (2006) while studying the change of network pictures in merger and acquisition activities. They found that, on occasions of merging and acquisition, unification of network pictures requires careful guidance and management between the involved actors. A challenge faced by managers is network picture inertia, or opposition to changing cognitive representation. Inertia to replacing pre-existing network pictures with new ones has considerable effect on networking activities. While Öberg, Henneberg, and Mouzas (2007) research the change of a network picture, the role of network pictures in a change at the network has received a substantial amount of attention.

Kragh and Andersen (2009) have studied change management in the business network setting and found that the degree of overlap in the network pictures of involved actors has a decisive effect on the possibility of successful implementation of network change. Abrahamsen, Henneberg, and Naudé (2012) verify this finding and add the notion that too much overlapping network pictures can make the network static. To prevent this occurrence, Abrahamsen, Henneberg, and Naudé (2012) suggest a dottogram based analytic method to facilitate a more detailed understanding on change within a network.

A large body of literature scrutinizes network pictures at the network level, depicting interconnections of companies' (e.g., Ramos, Ford, and Naudé, 2005; Henneberg, Mouzas, and Naudé, 2006), Leek and Mason (2009) study network pictures at the dyadic relationship level. They build on the framework of the four levels of network management (Möller and Halinen, 1999) and focus their research on the exchange relationship level (Level 4). At the first level, known as the industry level, network pictures can be applied to represent the configurations of all actors which perform value adding activities within a given industry. At the second level, known as the firm level, network pictures represent the configuration of a firm's strategic positioning within its focal net. At the third level, the relationship portfolio level, network pictures represent the configuration of activities performed internally and externally, and identify the various types of exchange relationship with the focal company. At the fourth level, the exchange relationship level, network pictures represent individual customer-supplier relationships. Following Ramos, Ford, and Naudé's (2005) definition of the network picture and Henneberg, Mouzas, and Naudé's (2006) work, Leek and Mason (2010) create a model to view network pictures at the dyadic relationships level. According to Leek and Mason (2010), when examining network pictures at a relationship level some adjustments in the dimensions need to be considered. However, according to Corsaro and Snehota (2012), evolution of a relationship cannot be explained by individual interpretations of the parties involved in the relationship. They found that actors' intentions appear more to shape the interpretations rather than the contrary. Nonetheless, there is evidence that the extent of overlap in actors' network pictures relates to perceived interdependencies and strategic options in specific relationships (Munksgaard, 2010).

Scholars have been interested in the relationship between network pictures and networking, as they relate to network outcomes (Ford et al., 2003). Ford and Redwood (2005) longitudinally approach network dynamics through the concept of network pictures. They found that efficient networking requires the network pictures of various actors in a network to be understood and deduced. Corsaro et al. (2011) study also the relation of network pictures and networking activities in a business network and found that there is a clear link between them. Perceived power especially appeared to be associated with networking decisions. Mandjak, Simon, and Szalkai (2011) emphasize the strategic importance of the interpretation of network pictures and develop a framework termed Spatial Networking Matrix for the analysis of various types of business network. This framework offers a tool to deepen the understanding on the real business world for practitioners. During recent research, the discussion on network pictures also has extended from the theoretical level to a more practical level. For example, Henneberg, Mouzas, and Naudé (2009) suggest that a business network is segmented based on the dimensions of network pictures. In addition, Ritvala and Salmi (2011) propose the notion that wider network pictures might lead to new business opportunities.

The extant research on network pictures has also faced some critique (Colville and Pye, 2010). Henneberg, Mouzas, and Naudé (2006) frame the network picture to concern "the network in which their company is operating", which does not appear to be in accord with

Ford et al.'s (2003) notion concerning the ontological nature of a network. However, Ford et al. (2003) note that it is easy to slip between referring to *the* network and *a* network. The reason is that the idea of the network varies, and is dependent on the purpose of the analysis and the adopted perspective (ibid). In addition, Henneberg, Mouzas, and Naudé (2006) are accused of ontological oscillation[5] by Colville and Pye (2010), who argue that the problem with Henneberg, Mouzas, and Naudé's (2006) position is the change from a subjective, idiosyncratic network picture to the implicit presumption of an objective network, and the change in direction of the causation link between a network/organization and its environment. However, according to Weick (1995) the ontological oscillation among researchers who study sense-making can also be perceived in a positive way, as it helps to understand the actions of people in everyday life.

The divergent discussion regarding network pictures has led to attempts for the concept to be structured and analyzed. Geiger and Finch (2010) dissect network pictures as a metaphor and argue that network pictures are employed in one of three approaches: as representationalist, as mentalist, and as situated. According to Geiger and Finch (2010) the representationalist network pictures refers to "snapshot drawings of industrial context developed from a bird's eye perspective and informed by network understandings". Representationalist network pictures are based on the realism of their ontological and epistemological nature. These network pictures have diverted attention from dynamics and multiple perspectives to a more static and individual perspective (Geiger and Finch, 2010). However this perspective is accused of being naïve (Henneberg, Naudé, and Mouzas, 2010).

The second method of employing network pictures according to Geiger and Finch (2010, p. 382) is the mentalist approach, defined as "drawings of industrial context that seeks to capture actors' understandings of their environments with a view to improve action upon these environments." Referring to Geiger and Finch (2010), the mentalist approach has a more cognitive conception. However, Henneberg, Naudé, and Mouzas (2010) note that Geiger and Finch's (2010) mentalist approach to employing network pictures contradicts the thinking of scholars who adopt INA.

Geiger and Finch's (2010) third method of employing network pictures is termed the situated approach, which is defined as "drawings of industrial context in which the focus is on the social process of interaction." Geiger and Finch (2010) provide a relatively new perspective to the discussion on network pictures, arguing that network pictures should be considered as actants[6]. These actants (network pictures) are a "part of an organization's – or any actor's – tools and practices, not external to but embedded in and mediating actors' distributed cognitions and emerging practices" (Geiger and Finch, 2010, p.386). Thus, the situated approach to employing network pictures perceives the researcher's position differently. The researcher is no longer a neutral actor observing a person's subjective understanding on the network and its dynamics; rather, the researcher is perceived as a participating person who is involved in the actor's network picture development. Thus, the tools and techniques employed to study network pictures intervene in the practitioner's situation. Geiger and Finch (2010) therefore argue that developing network pictures is no longer regarded as a representational activity, but as a tool enabling practitioners to engage in radical reflexivity. According to Henneberg, Naudé, and Mouzas (2010) the situated approach to employing network pictures can be perceived as a fruitful potential alternative.

[5] Burrell and Morgan (1979) describe ontological oscillations as moving from realist ontology to a more relativist ontology and vice versa.

[6] An actant is "that which accomplishes or undergoes an act" (Greimas and Courtés, 1982, p.5).

The concept of network pictures appears to have attained a strong position in the discussion of scholars who lean on INA. However, as the diversity of the definitions of network pictures in Table 2 indicates, a consensus on the nature of the network picture is missing. For example, this is referred to by the two identified levels of discussions of network pictures, the broad and narrow level introduced at the very beginning of this chapter (Abrahamsen, Naudé, and Henneberg, 2009; Henneberg, Naudé, and Mouzas, 2010). The debate concerns the stability of network pictures; for example, Purchase, Lowe, and Ellis (2010) suggest that the network picture should be understood more like an ongoing process. They even suggest, due to its stability, the concept of network movies to replace the concept of the network picture. However, Möller (2010) connects the concept of the network picture to the concept of sense-making by suggesting that sense-making is the process that revises network pictures. In addition, Vanharanta and Easton (2010) also lean on INA and go even further by developing an understanding on cognitive processes from cognitive psychology. As the above description and recent research indicates, the concept of network pictures has strong connections to the broader research on an individual's subjective understanding on the world in various disciplines. Thus, to understand the phenomenon, coincident research that relates to the concept of network pictures should be discussed.

2.2.2 Coincident research on network pictures

The research on a person's subjective understanding on the surrounding world is disassembled among the various disciplines and literature streams, such as managerial and organizational cognition (Huff, 1992; Huff and Eden, 2009), the sense-making literature (Weick, 1995), psychology including social psychology (Markus and Zajonc, 1985; Markus, 2005), and cognitive psychology (Eysenck and Keane, 2010; Manktelow, 2008). Although discussion concerning the concept of the network picture is relatively new and scarce, the wider discussion on human cognition in an organization has longer traditions. Thus, when a new theory on network pictures is proposed, the extant discussion related to it should not be forgotten. The extant discussion in a large number of disciplines offers various concepts to understand a person's cognitive mental models, such as cognitive maps (Fiol and Huff, 1992), schemas (Markus and Zajonc, 1985; Harris, 1994), mental models (Hodgkinson and Johnson, 1994; Osborne, Stubbart, and Ramaprasad, 2001), heuristics (Eysenck and Keane, 2010), dominant logic (Prahalad and Bettis, 1986; Bettis and Prahalad, 1995), and belief systems (Grube, Mayton, and Ball-Rokeach, 1994). As the network picture has a strong overlap with other literature streams and concepts, its relation to these should be discussed. Thus far, the discussion on the connection of the network picture to similar concepts in other literature streams remains predominantly as solitary references (Henneberg, Mouzas, and Naudé, 2006; Leek and Mason, 2009 and 2010) and a few articles adopting a well framed perspective (Colville and Pye, 2010).

Cognition science has long traditions and has generated a vast body of literature. The history of cognitive science extends back to the time and work of Platon, Descardes, Hume, and Kant. However, the modern culture of cognitive science is seen to have evolved in the 20th century. The focus of cognitive science is on the mind and intelligence, and cognitive science researchers are interested in concepts such as learning, memory, language, thinking, reasoning, and intelligence. This discipline embraces several fields of science such as philosophy, psychology, artificial intelligence, neuroscience, linguistics, and anthropology (Thagard, 2005). Thus, it can be opined that cognition science overlaps with several disciplines. The wide range of disciplines has generated audiences from numerous disciplines

(Schunn, Crowley, and Okada, 1998). As there are several disciplines involved in the academic discussion, there are various understandings of the basic assumptions. For example Simon and Kaplan (1989) argue that there are three threads to study intelligence and the processes of intelligence: in the abstract, in computers, and in humans. A considerable amount of academic deliberation revolves around the distinction between these domains (Eden and Spender, 1998). Thus, inside cognitive science, there can be found several areas of study with a variety of ontological and epistemological assumptions, such as managerial and organizational cognition and sense-making (ibid).

The cognitive approach to managerial and organizational studies has constituted a field of its own in social science. In particular, business studies are interested in the managerial and organizational aspects (Hellgren and Löwstedt, 1998). However, the discussion concerning managerial and organizational cognition has always been divided between interest in individual cognition and attention to organizational cognition (Huff and Eden, 2009). Thought, which is often the central subject of cognitive research, is clearly the product of individual minds. However, there is a continuing debate on organizations also being regarded as cognitive (Heijden and Eden, 1998). The field of managerial and organizational cognition remains characterized by heterogeneity in theoretical assumptions and levels of analysis (Sims and Gioia, 1986; Huff, 1992). Discrepancies are created by issues such as whether cognitive structures are stable or continuously changing, and the relationship between thinking and acting. Therefore it is considered that contradictions dominate the field (Hellgren and Löwstedt, 1998).

Sense-making is a theory that is referred to several times when network pictures are studied (Henneberg, Mouzas, and Naudé, 2006; Henneberg, Naudé, and Mouzas, 2010; Colville and Pye, 2010). Sense-making literally means the making of sense, and is the process by which individuals structure the unknown (Waterman, 1990). However there is no single commonly approved definition of sense-making; on the contrary, sense-making is defined in a variety of ways (Weick, 1995). Louis (1980) regards sense-making as a thinking process that employs retrospective accounts to explain surprises, whereas many researchers imply that sense-making involves placing stimuli into a particular type of framework (Starbuck and Milliken, 1988). These frameworks enable researchers "to comprehend, understand, explain, attribute, extrapolate, and predict" (Starbuck and Milliken, 1988, p. 51). Some researchers include more activities in their description of sense-making by noting that it is a reciprocal interaction of information seeking, or ascription, and action (Thomas, Clark, and Gioia, 1993). Thus, they include environmental scanning, interpretation, and associated responses as components of sense-making. However, Ring and Rands (1989) perceive sense-making as a more singular activity, defining it as "a process in which individuals develop cognitive maps of their environment" (p. 342).

Whereas Thomas, Clark, and Gioia (1993) mention "action" is conjunction with sense-making, Feldman (1989) introduces a notion that sense-making often does not result in action, although it might result in an understanding that action should not be taken. While studying network pictures, Corsaro and Snehota (2012) argue that actors' intentions more shape the interpretations than vice versa. When looking closely at the relation between thinking and action, it can be found that, according to the sense-making concept, the relation more resembles an ongoing and simultaneous process. Weick (1995) identifies seven dimensions that distinguish sense-making from other explanatory processes such as understanding, interpretation, and attribution. One of these dimensions (ongoing) proposes that sense-making is an ongoing process. According to this dimension, sense-making cannot be turned on and off, and people are continuously involved in sense-making. Winograd and Flores (1986) make

a similar point and note that people cannot avoid acting, as they are involved in ongoing situations and thus have to act and react if they want to make sense of what is happening. Therefore, thinking and acting are simultaneous and interrelated processes (Weick, 1983; Bartunek, 1984; Hellgren and Löwstedt, 1998). This concept is dissimilar to Feldman's (1989) notion that sense-making often does not result in action.

In addition to sense-making being described as ongoing, it is proposed that it is grounded in identity construction, and is retrospective, enactive of sensible environments, social, focused on and by extracted cues, and driven by plausibility rather than accuracy (Weick, 1995). Commonly, it can be opined that the concept of sense-making offers a dynamic perspective on a human observing and trying to understand his/her surroundings. For the discussion on the network picture this might mean that observation of the mental model being tied to a particular time and space is irrelevant. According to the sense-making perspective, a person's mental model (or network picture) should be perceived as an ongoing process. Thus, when Colville and Pye (2010, p. 377) adopt a sense-making perspective to study the network picture, they found that "a key way in which the sense-making perspective can shed light on network pictures is by emphasizing the dynamic of network picturing rather than the static snapshot implied by network pictures." This notion is in accord with the suggestion that the concept of network pictures should be replaced with the more dynamic concept of network movies (Purchase, Lowe, and Ellis, 2010).

Although sense-making is an ongoing process, this does not mean that "the static snapshots" or a person's mental models are irrelevant or do not exist. Weick (2001) employs a cognitive map concept to describe a person's personal knowledge patterns. These cognitive maps comprise the concepts and all possible types of relation that a person employs to understand organizational situations[7]. Ring and Rands (1989, p. 342) even perceive cognitive maps as a central concept in the sense-making process when defining sense-making as "a process in which individuals develop cognitive maps of their environment." However, there also appears to be a diverse understanding on cognitive maps that are defined by Fiol and Huff (1992, p. 267) as "graphic representations that locate people in relation to their information environments." As sense-making is an ongoing process, the change of a mental model is an interesting aspect. According to Weick (1995) and Ring and Rands (1989), cognitive maps are a result of an ongoing process and thus are in a state of continual change. However, there appears to be a discrepancy in opinions on the frequency and totality of change. For example, changes in the belief systems are found to be incremental and seem to influence only a small part of the whole mental structure. In addition, Hellgren and Melin (1993) found that the mental structures seem to be stable. Thus, when discussing cognitive maps, it appears that there is difference of opinion.

As indicated by the above introductive discussion on a person's cognitive mental models, the approaches to the phenomenon are wide, and the focus on enacting business is only a part of this discussion. In the field of business studies, the focus on these alternative concepts is typically on the entire business environment including, for example, human resource policies, earning logics, and existing business relationships. However, the focus based on INA remains on the interaction of the parties in a network. In addition, dissimilar ontological assumptions[8],

[7] More specific types of cognitive map, concerning only causal relations are termed causal maps (Weick, 2001).

[8] The INA perspective is based on the ontological perspective that markets are an interconnected web of dependent exchange relationships (Anderson, Håkansson, and Johansson, 1994; Easton and Håkansson, 1996). A core requirement to understand networks is to understand the interactions of the parties within that network (Ford and Håkansson, 2006). These networks are perceived as relativistic in nature and it is opined that there is no single, objective network. The network is not owned by any company, nor can it be centrally managed, although all companies try to manage in it. Also, no company is the hub of the network as there is no "center", although many companies might believe that they are at the center. (Ford et al., 2003).

or alternative perspectives on sense-making, differentiates the INA perspective from the extant literature (Henneberg, Naudé, and Mouzas, 2010). As in business studies, in which the focus is more on the organizational level and network level rather than the personal level, the extant literature on INA has additionally focused on the broader level in a form of collective and organization level cognitions. By leaning on the INA perspective and understanding on network pictures, the concept of network insight has been developed to refer to an organization's collective perspective on the network objectified from individual network pictures (Mouzas, Henneberg, and Naudé, 2008). These network insights are discussed more thoroughly in the next chapter.

2.3 Network insights – amalgamated perception of the business network

The value of having a common understanding on the surrounding business environment in an organization has been emphasized in various studies (e.g., Douglas, 1986; Meindl, Stubbart, and Porac, 1994; Mouzas and Naudé, 2007; Mouzas, Henneberg, and Naudé, 2008; Kragh and Andersen, 2009). However, previous research has had a controversial approach to the idea of the collective mind. Allport (1924), for example, does not believe that the collective mind exists. Douglas (1986, p. 4) describes the nature of collective mind by stating "institutional thinking (…) is (…) in the minds of individuals as they try to decide." In addition, Douglas (1986, p. 91) further states that "our social interaction consists very much in telling one another what right thinking is and passing blame on wrong thinking. This is indeed how we build the institutions, squeezing each other's ideas into a common shape." Thus, some people might find consideration of group level cognition problematic. Regardless of this, it is important to face the controversy and utilize ideas that urge us to develop a theory of "sociocognition" (Levine et al., 1993). Levine et al. (1993, p. 533) also found that "outside the laboratory and the school, cognition is almost always collaborative." This finding has motivated researchers to examine individual knowledge structures and to find that within a group of individuals, although they have their individual knowledge structure concerning the surrounding environment, some type of collective knowledge structure is likely to emerge. Also, sociocognition is likely to function as a mental model when imposed on an information environment. It provides form and meaning and thereby serves as a cognitive foundation for action, corresponding to an individual collective template. The study of cognition at this level of analysis is thus a study of social cognition.

Hypothesized group level knowledge structures, or frames of social cognition, have been named as, for example, a collective cognitive map (Axelrod, 1976), collective cognition (Klimoski and Mohammed, 1994), dominant logic (Prahalad and Bettis, 1986), common knowledge (Grant, 1996; Grant and Baden-Fuller, 2004) and a collective mind (Wiley, 1988; Weick and Roberts, 1993). Recent studies that ground research on INA also aim to understand social cognition in the business context. These studies have introduced the concepts of network insights (Mouzas, Henneberg, and Naudé, 2008) and organizational inscriptions (Öberg, Henneberg, Mouzas, 2012) to refer to organization level social cognitive structures. The extant studies build on the extant understanding on networks (Anderson, Håkansson, and Johanson, 1994; Dyer and Singh, 1998; Halinen, Salmi, and Havila, 1999; Håkansson, Havila, and Pedersen, 1999; Ritter, 1999; Gnyawali and Madhavan, 2001; Kranton and Minehart, 2001; Håkansson and Ford, 2002; Wilkinson and Young, 2002; Henneberg, Mouzas, and Naudé, 2006), knowledge (Hayek, 1945; Tsoukas, 1996; Hargadon and Fanelli, 2002), and collective mind (Wiley, 1988; Weick and Roberts, 1992; Weick, 1995). According to Mouzas, Henneberg, and Naudé (2008, p. 168) these social cognition structures, termed network insights, are regarded as "the outcome of continuous and iterative

interplay between the factual physical and social artifacts that surround actors in networks of exchange relationships as well as the cognitive schemata constructed and shaped from actors' past experience and precedents." Thus, it can be opined that the network insight is the unified outcome of network pictures held by participants in the focal network. Further, the organization's network insight is found to be the amalgamated outcome of multiple negotiations and heedful interactions at numerous differing levels within and between organization structures (Mouzas, Henneberg, and Naudé, 2008). However, Ford and Mouzas (2010) note that it is not possible to create one network picture for an entire company by simply combining the distinct network pictures held by each of its key individuals.

The number of academic studies on these concepts that are grounded on INA remains very limited, although the extant research emphasizes the importance of a company's ability to amalgamate individual network pictures to network insight. For example, Kragh and Andersen (2009) suggest that the ability to achieve changes in a network is dependent on the degree of overlap between managers' network pictures. In addition, Håkansson, Havila, and Pedersen (1999) adopted the organizational learning perspective and found that the quality and nature of relationships in a network are entwined with the learning from that network. Mouzas and Naudé (2007) identify five challenges that managers need to consider when attempting to mobilize other actors in their networks: developing network insight; introducing new business propositions; concluding the deal; developing the social contract; achieving sustained mobilization. Mouzas, Henneberg, and Naudé (2008) even argue that capability to enhance common network insight leads to competitive advantage, and they suggest the amalgamation process to manage the objectification of individual network pictures to network insight. Thus, network insight is achieved through the amalgamation process. According to Mouzas, Henneberg, and Naudé (2008, p. 172), "the amalgamation process defines the mechanism of how the real, and subsequently the objectified view becomes apparent." Figure 4 depicts the amalgamation process and the identified enablers and barriers it contains.

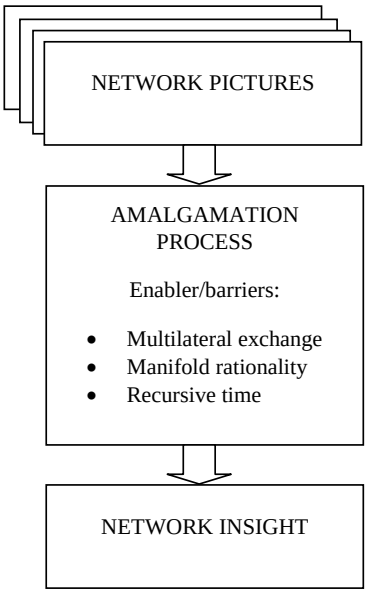

Figure 4. Amalgamation process (Mouzas, Henneberg, and Naudé, 2008)

The amalgamation process includes three enablers/barriers to develop network insight: multilateral exchange, manifold rationality, and recursive time (Mouzas, Henneberg, and Naudé, 2008). Next, these three enabler/barriers are discussed. *First,* network insights are amalgamated through numerous levels within and between organization structures. Thus, managers cannot focus only on their own task-specific routines in their own organization; instead, multilateral exchange is required. In that sense, managers' openness to move beyond their existing task-specific exchange is required. Typically, this type of multilateral exchange should cover interaction between regional offices and headquarters, the research and development department, and the marketing and sales organization, as well as separate business units with their own characteristics. Thus, organizations have promoted cross-functional organization structures to enhance multilateral exchange (Larson and Gobeli, 1987; Canonico and Söderlund, 2010). In addition, recent development in value creating logics has emphasized the collaboration of organizations. For example, creating solutions is found to require intensified collaboration between organizational units (Tuli, Kohli, and Bharadwaj, 2007).

Second, manifold rationality is found to be a base on which to develop network insight (Mouzas, Henneberg, and Naudé, 2008). Typically, large companies which operate in B-to-B markets have separate organizational units for their specific target segments; for example, bulk products, custom products, and services. Business logics and the focus of interest on these organizational units might vary substantially. For example, a product unit might aim to sell high quality products to its customer, whereas the service unit might aim to sell as many services as possible to the same customer. Manifold rationality emphasizes the consideration of all relevant actors. In other words, a snippet of information might be insignificant for a manager, whereas that same information might be highly important for another manager from other facet. Furthermore, individuals in these organizations might have personal reasons for operating in a particular manner, and these can differ with what is "right" from the organizations perspective (Mouzas, Henneberg, and Naudé, 2008). Thus, understanding other managers' logic is fundamental to ensuring the development of network insight.

Finally, recursive time stands for the recursiveness of business practices. Time should not be understood as a linear process in companies but as a recursive practice (Mouzas, Henneberg, and Naudé, 2008). In practice, organizational habits and interactions, such as annual reports, periodic task reviews, and contractual agreement among companies, are examples of recursive time. However, at the individual level, the time perspective does not necessarily maintain the same pace. Schedules and time perspectives might vary substantially depending on the organizational unit and task. The need to understand the time perspective of others is especially emphasized when delivering complex solutions, as usually there are several organizational units involved in the development and delivery of the solution (Tuli, Kohli, and Bharadwaj, 2007). Thus, understanding the role and characteristics of time for other actors is important in the development of network insight.

As the depiction of the amalgamation process above suggests, interaction between actors within an organization is at the focal point when creating organizational level network insight. However, the extant literature on the emerging concept of network insight does not appear to discuss the role of communication between internal actors, although the process itself gives an indication that intense communication between actors in required. Nonetheless, communication is found to have a focal role in the success of cross-functional collaboration that is needed for multilateral exchange (Ford and Randolph, 1992; Turner, Utley, and Westbrook, 1998; Sy and Côté, 2004). The concept of internal communication is introduced more thoroughly in the next chapter.

2.4 Internal communication – lifeblood of organizations

Intra- and extra-organizational communication has been an object of academic interest for almost a century (e.g., Mohr and Nevin, 1990; Olkkonen, Tikkanen, and Alajoutsijärvi, 2000; Argenti, 1996). During this time, several bodies of knowledge have been developed to understand communication (Mohr and Nevin, 1990). Research on communication is approached, for example, from organizational and communication theory perspectives. In addition, as communication structures are found to be a part of a social network and thus form networked structures, the patterns of communication are also referred to, and studied as, communication networks (e.g., Mead, 2001; Aletta and Singh, 2011). According to Krone, Jablin, and Putna, (1987) communication is perceived as a transmission process comprising the message, the channel, feedback (in bi-directional communication), and communication effects. In addition, a vast number of concepts have been formed and employed to describe the phenomenon (Welch and Jackson, 2007). There are concepts, such as business communication (Reinsch 1996), management communication (Smeltzer 1996), corporate communication (Argenti 1996), and organizational communication (Mumby and Stol 1996). One of the most common concepts is corporate communication, which separates internal and external communication (Argenti, 1996). According to van Riel (1995, p. 26), corporate communication can be seen as "an instrument of management by means of which all consciously used forms of internal and external communication are harmonized as effectively and efficiently as possible, so as to create a favorable basis for relationships with groups upon which the company is dependant."

The variety of concepts that focus on intraorganizational communication is extensive. For example, employee communication focuses solely on intraorganizational communication, and is perceived to be a communication transaction to coordinate day-to-day activities (Frank and Brownell, 1989). Another widely employed concept is internal marketing (Ballantyne, Christopher, and Payne, 1995). However, this concept refers to a management philosophy of treating employees as customers, and thus adopts a divergent perspective (Grönroos, 2000). There is also an extensive number of related concepts, such as internal public relations (Jefkins, 1988), internal relations (Grunig and Hunt, 1984), staff communication (Stone, 1995), internal corporate communication (Welch and Jackson, 2007), and internal communication (Scholes, 1997; Chaney and Christensen, 2001; Cornelissen, 2004; Welch and Jackson, 2007; Linke and Zerfass, 2011). The concept of internal communication is variously defined. Scholes (1997, p. 18) adopts a strategic approach, defining internal communication as "the professional management of interactions between all those with an interest or 'a stake' in a particular organization". According to Welch and Jackson (2007), Scholes's definition is useful due to its strategic approach. Cornelissen (2004, p. 189) adopts a more tactical perspective and defines internal communication as "all methods (e.g., internal newsletter; intranet) employed by a company to communicate with its employees." Welch and Jackson (2007, p. 183) constructs the concept of internal communication close to the definition of Scholes (1997) by defining it as "the strategic management of interactions and relationships between stakeholders at all levels within organizations." The thesis grounds on the concept of internal communication as the clear focus is on intraorganizational communication and the involvement of all actors at all levels in an organization., Due to its strategic approach and wide focus in organizations, the definition of Welch and Jackson (2007) is adopted. Stakeholders are understood as all actors in an organization operating in a business network.

Internal communication is regarded as a crucial value producing process for organizations (Ahmed and Rafig, 2003). Previous studies have shown that competent management of customer related information is a prerequisite for the efficient management of customer

relationships (Möller and Rajala, 1999; de Chernatony and Segal-Horn, 2003; Biemans, Brencic, and Malshe, 2010). Internal communication has been argued to be the 'lifeblood of organizations' (Rogers and Agarwala-Rogers, 1976). Internal communication plays a crucial role in organizational performance as it can influence employee satisfaction, decision making, innovation culture, brand perceptions, and the consistency of customer interaction (e.g., Stayer, 1990; Smythe, 1996; Cleaver, 1999; Möller and Rajala, 1999; de Chernatony and Segal-Horn, 2003; Linke and Zerfass, 2011).The communication process itself varies in degrees of formality, frequency, and the means being applied (e.g., face-to-face meetings, telephone, e-mail, software applications, and databases). In addition, the direction, content, and complexity of communication vary (Hoegl and Gemuenden, 2001).

A limited amount of communication is not usually perceived as a problem (Tyrväinen, Kilpeläinen, and Järvenpää, 2005). On the contrary, in some cases, communication overflow is a prime cause of inefficient internal communication (Edmunds and Morris, 2000; Klausegger, Sinkovics, and Zou, 2007). Thus, the challenge appears to be obtaining the correct information at the correct time, rather than simply the quantity of information (Mounter, 2003; Bovée, Thill, and Schatzman, 2003). Moreover, selecting the proper information system is found to be crucial for effective communication (Braganza, Hanckney, and Tanudjojo, 2009; Zandi and Tavana, 2010). In the extant literature on internal communication, barriers hindering the communication appear to vary. For example, employment of technology in the intended fashion (Peters and Fletcher, 2004; Kouki, Pellerin, and Poulin, 2010; Garg and Goyal, 2011), incongruous social backgrounds within the teams (Wang and Haggerty, 2009), lack of clarity in communication (Robson and Tourish, 2005), employees' problems in discriminating between useful and useless information (Bovée, Thill, and Schatzman, 2003), and a failure to take cultural differences into account (Mounter, 2003) are argued to hinder internal communication. A variety of technological solutions, such as instant messaging, group meeting systems, and portable communication devices have been developed to improve internal communication. However, usually the challenge is found to be that these technologies are not necessarily employed efficiently (Peters and Fletcher, 2004).

In addition to the identified communication barriers, several drivers to promote internal communication have been proposed in various contexts. These include fostering an open communication climate (Wood, 1999; Quinn and Hargie, 2004), identifying bottlenecks (Lloyd and Varey, 2003), paying attention to cultural nuances and diversity (Mounter, 2003; Kalla, 2005), increasing informal information sharing (Quinn and Hargie, 2004; Kalla, 2005), and segmenting internal stakeholders (Spitzer and Swidler, 2003). Additionally, building a common frame of reference is found to promote internal communication (Eskerod and Riis, 2009).

The role of internal communication appears to be increasing, as companies which operate in B-to-B markets are transforming to new value creation logics (Fang, Paltimatier, and Steenkamp, 2008; Jacob and Ulaga, 2008; Jalkala et al., 2010). Instead of offering an integrated bundle of products and services, companies are beginning to offer more complete solutions (e.g., Sawhney, 2006; Davies, Brady, and Hobday, 2007; Tuli, Kohli, and Bharadwaj, 2007). Offering these complex solutions requires that an organization's entire knowledge base is utilized more efficiently in order to build more innovative solutions to customers. That necessitates greater interdependency between organizational units (Tuli, Kohli, and Bharadwaj, 2007). In addition, offering these solutions requires broader interaction with a customer (Cova and Salle, 2007), and this increased breadth requires efficient internal communication and knowledge transfer to maintain consistent interaction with the customer

(Nätti and Ojasalo, 2007). As solutions business appears to be the up-to-date value creation logic for companies which operate in B-to-B markets, the role of internal communication in the amalgamation of network pictures to network insights is studied in that setting. In addition, the prominent role of utilizing networks in solution business supports the choice to study the phenomenon in solution business. The extensive literature on solution business is introduced briefly in the next chapter.

2.5 Solution business – co-creating value with the actors of a network

Exchange has been argued to be the core concept of the marketing discipline (Bagozzi, 1975), with most current definitions of marketing explicitly including exchange in their formulations (Kotler and Armstrong, 2001). In marketing activities, value[9] has been the fundamental basis as all parties involved in market exchange expect to gain value from that exchange (Ulaga, 2003). Thus, one of a company's main strategic tasks is to manage its value creating logics. Ever fiercer competition and market globalization have, among other factors, pushed companies to more networked value creating logics (Fang, Paltimatier, and Steenkamp, 2008; Jacob and Ulaga, 2008; Jalkala et al., 2010). Thus, it is opined that a company's strategy is the art of positioning itself correctly in the value network (Normann and Ramirez, 1993).

Refocusing strategy in the value network has generated an extensive body of academic literature (Ulaga and Eggert, 2006; Peppard and Rylander, 2006; Matthyssens and Vandenbempt, 2008). According to the recent literature, a customer's needs are attempted to be satisfied through the relational process of co-creating value with the customer and network partners (Holm, Eriksson and Johanson, 1999; Kothandaraman and Wilson, 2001; Tuli, Kohli, and Bharadwaj, 2007). Thus, companies have been evolving from offering something to the markets to offering with the markets (Vargo and Lusch, 2004). Multiple rationales that drive companies to change in the value network have been identified. Olivia and Kallenberg (2003) argue that companies are refocusing their operations based on economic, competitive, and customer related reasons. According to Matthyssens and Vandenbempt (2008), standardization, growing customer experience, and copying successful business practices of rivals are drivers for change in the value network. Derived from this, value in B-to-B markets is increasingly created in the form of projects and solutions.

In the marketing literature, project and project business are variously defined. Perhaps one of the most commonly utilized definitions is Cova, Ghauri, and Salle's (2002) version. According to this definition, projects are "a complex transaction covering a package of products, services and work, specifically designed to create capital assets that produce benefits for a buyer over an extended period of time" (Cova, Ghauri, and Salle, 2002, p. 3). However, project business can be defined as "the part of business that relates directly or indirectly to projects, with the purpose of achieving objectives of a firm or several firms" (Artto and Wikström, 2005, p. 351).Typically, the discontinuous, unique, and complex nature of project business sets great challenges for management in the supplier company (Hadjikhani, 1996; Cova, Ghauri, and Salle, 2002; Bahroun, Campange, and Moalla, 2007; Artto and Kujala, 2008). As the delivery of projects typically requires a combination of products tailored and developed to the needs of a customer and related services, projects are closely related to the solutions.

[9] Anderson, Jain, and Chintagunta (1993, p. 5) define the value in business markets as ''the perceived worth in monetary units of the set of economic, technical, service, and social benefits received by a customer firm in exchange for the price paid for a product offering, taking into consideration the available alternative suppliers' offerings and prices.''

The concept of solution is variously defined, with no universally accepted definition. Tuli, Kohli, and Bharadwaj (2007, p. 5) define the customer solution concept as follows: "A solution is a set of customer-supplier relational processes comprising customer requirements definition, customization and integration of goods and/or services and their deployment, and post-deployment customer support, all of which are aimed at meeting customers' business needs." In addition, a solution is defined as "an integrated combination of products and services customized for a set of customers that enables customers to achieve better outcomes than the sum of the individual components" (Sawhney, 2006, p. 369) or "a customized, integrated combination of products, services and information that solves a customer's problem" (Sawhney, Wolcott, and Arroniz, 2006, p. 78). One of the most recent definitions is Evanschitzky, Wangenheim, and Woisetschläger's (2011, p. 657) version which proposes that solutions are "individualized offers for complex customer problems that are interactively designed and whose components offer an integrative added value by combining products and/or services so that the value is more than the sum of the components." However, the degree of integration and customization are considered as the key dimensions on which solutions can be categorized (Sawhney, 2006). The relation of projects and solutions is complex as there are differing perspectives on differences and similarities. According to Cova and Salle (2007), the similarities between these concepts are found to be in the management of supplier/customer interaction, the construction of the demand, and the offer as the value co-creation. In the present study, solutions are understood to closely relate to projects. Especially, solutions are found to be a type of complex project with a set of customer-supplier relational processes comprising requirements definition, customization and integration, and deployment and post-deployment aimed at meeting customers' business needs.

In addition to the concepts of projects and solutions, academic and managerial discussions have generated various concepts that adopt slightly differing perspectives on the issue, which are often interchanged (Nordin and Kowalkowski, 2010). Probably the most common concepts are solutions and solution business[10] (Sawhney, 2006; Davies, Brady, and Hobday, 2007; Tuli, Kohli, and Bharadwaj, 2007), service business (Olivia and Kallenberg, 2003; Vargo and Lusch, 2004; Fang, Paltimatier, and Steenkamp, 2008; Gummesson and Mele, 2010), system selling (Mattson, 1973; Hanan, Cribbin, and Donis, 1978; Günter and Bonaccorsi 1996), hybrid products or hybrid offerings (Shankar, Berry, and Dotzel, 2009; Ulaga and Reinartz, 2011), product-service systems (Tukker, 2004) or product-service bundles (Stremersch, Wuyts, and Frambach, 2001), and project marketing (Hadjikhani, 1996; Cova, Ghauri, and Salle, 2002; Skaates and Tikkanen, 2003).

In solution business, the customer is integrated into the solution development process and thus the value is co-created. To co-create solutions with customers requires a dilated depth and breadth of interaction (Cova and Salle, 2007; Tuli, Kohli, and Bharadwaj, 2007). The depth of interaction is required both at the level of a supplier's involvement and the degree to which a customer is willing to interact, and the breadth of interaction that indicates the extent of supplier/customer contacts, involving many functions inside and outside both companies (Cova and Salle, 2007). Thus, solution development and sales cannot be organized as any single function in an organization. The successful delivery of solutions requires support from all functions, including product development, marketing, sales, operations, and finance (Storbacka, 2011). Thus, organizational and capability changes are required when offering solutions as companies reposition themselves in the value chain (Galbraith, 2002; Wise and Baumgartner, 1999). According to Storbacka (2011), the logic of solution business diverges

[10] Among discussion about solution and solution business there are slightly differing perspectives, such as integrated solutions (Windahl et al., 2004; Brady, Davies and Gann, 2005; Brax and Jonsson, 2009; Storbacka, 2011) and customer solutions (Sawhney, 2006; Tuli, Kohli and Bharadwaj, 2007; Cova and Salle, 2008).

from the logic of product business: more collaborative management is required; the customer has to be involved more in the business planning; the measures and incentives that control the business have to acknowledge the cross-functional nature of solution business.

Gaining profit through delivering complex solutions, instead of goods or services, has proved to be a challenge (Tuli, Kohli, and Bharadwaj, 2007). The gap in analytic thinking between headquarters and operational managers is found to form an internal barrier when moving to solution business (Matthyssens and Vandenbempt, 2008). Cova and Salle (2007) adopt a marketing based perspective on solutions and found that an organization must manage four challenges: the change in the orientation of the company; the need for new capabilities and skills; the transformation of the structure and processes within the organization; the implementation of the transformation process within the organization. In addition, changing the mindset of employees with a vision of traditional product and services is argued to be a substantial barrier when moving to solutions business (Davies, Brady, and Hobday, 2006).

Authors who ground their research on the closely related concept introduced earlier have also identified several challenges when repositioning a company in the value network. For example, Olivia and Kallenberg (2003) study change in the value network employing the service business concept and note that there are three successive hurdles: first, the lack of trust in the economic potential of a service; second, the notion that service is beyond the scope of a company's competencies; third, failure in deploying a successful service strategy. In addition, Brax (2005) has also found in her study that there are several challenges when a traditional manufacturer becomes a service provider. The recognized challenges are classified under the following six categories: marketing; production; delivery; product-design; communication; relationship challenges. Communication related challenges comprise the lack of feedback from customers and shortcomings in communication both externally and internally. Tuli, Kohli, and Bharadwaj (2007) argue in their study that solutions do not necessarily fit all business areas and all customers. Solutions require open minded customers who are receptive to consideration of the benefits of customization and the formation of integrated systems.

2.6 Conceptual framework of the research

Several authors emphasize the salient role of being able to change the mindset of employees (Davies, Brady, and Hobday, 2006; Matthyssens and Vandenbempt, 2008) and communicate (internally and externally) effectively (Cova and Salle, 2007; Tuli, Kohli, and Bharadwaj, 2007) in a solution business. However, the extant research merely focuses on the identification of these challenges. Thus, a more profound understanding is needed on success in solution business. Research on the development of network insight in solution business offers a relevant setting that emphasizes the capability to create a common mindset and understand the surrounding network. In addition, the role of internal communication appears to be substantial in both developing network insight (Mouzas, Henneberg, and Naudé, 2008) and solution business (Cova and Salle, 2007; Tuli, Kohli, and Bharadwaj, 2007). However, there seems to be a research gap regarding the role of internal communication in the amalgamation of network pictures to network insights in solution business. Thus, the thesis attempts to address this research gap, which is approached by sub-research questions and answers in the individual publications. Figure 5 below depicts the conceptual framework of the thesis.

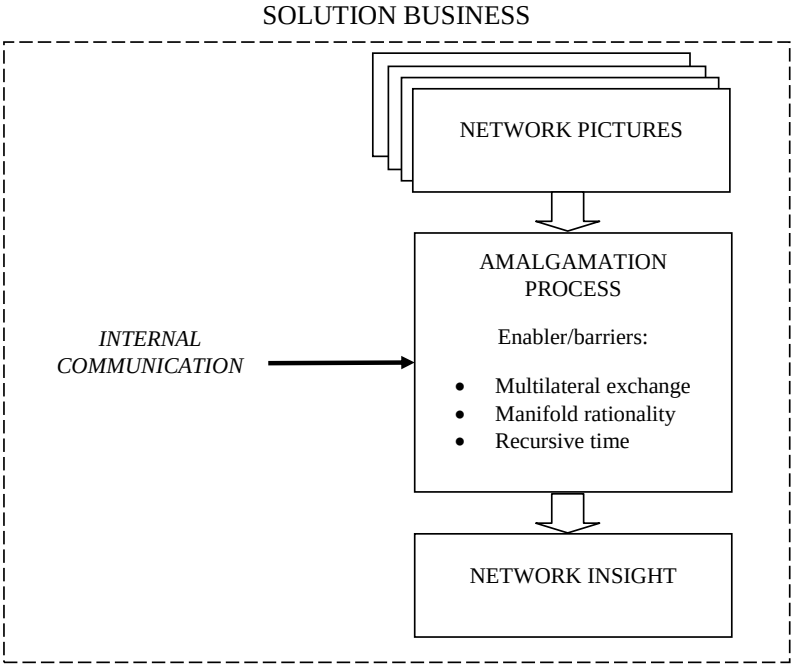

Figure 5. Conceptual framework of the thesis

The conceptual framework of the thesis comprises two main variables. The first variable, the amalgamation process as a whole, is the dependent variable (explained variable) that is attempted to be understood with the independent variable (explanatory variable). This independent variable is internal communication. The amalgamation process includes three conceptual grounds. The first conceptual ground is the individuals' network pictures. Understanding for the thesis is obtained from the extant literature described above in Chapter 2.2. In addition, network pictures are studied by two individual pieces of research (Publications 4 and 5). These focus on the content and revising process of network pictures. The second conceptual ground is the amalgamation process itself, at which the main contribution of the thesis is aimed. Preliminary understanding is obtained from the extant literature described in Chapter 2.3. The third conceptual ground is the network insight that develops from network pictures of the employees of the company in the amalgamation process. The emergent literature on network insight is employed for the theoretical ground as described in Chapter 2.3.

The fourth conceptual ground of the thesis is the independent variable (internal communication). Preliminary understanding is obtained from the extant literature described in Chapter 2.4. In addition, internal communication is studied by three individual pieces of research that focus on internal communication in the change process to solution business (Publication 1), internal communication in matrix organizations (Publication 2), and internal communication networks (Publication 3). The final element of the thesis is solution business, which is an increasingly adopted value creating logic that emphasizes the role of understanding and utilizing networks. Thus, solution business offers a relevant setting of study for the thesis. Preliminary understanding is obtained through the extant literature

introduced in Chapter 2.5. In addition, internal communication in project and solution business is studied by an individual research (Publications 1,2,3,and 4).

By leaning on the conceptual framework, the thesis aims to enhance understanding on the role of internal communication in the amalgamation of network pictures to network insight in solution business. The study aims to contribute to the literature on network insights and thus to the industrial marketing research (e.g., Mouzas, Henneberg, and Naudé 2008; Henneberg, Naudé, and Mouzas, 2010; Möller, 2010; Corsaro et al., 2011). In addition, by discussing internal communication, network pictures and network insights in the solution business setting, the study continues the line of argument advanced by Olivia and Kallenberg (2003), Davies, Brady, and Hobday (2006), Cova and Salle (2007) and Matthyssens and Vandenbempt (2008). The research design of the present thesis is introduced in the following chapter.

3 RESEARCH DESIGN

This chapter introduces and justifies the research design employed in the thesis. First, the research approach is depicted, including the ontological and epistemological basis of the study. Second, methods of the case study, social network analysis, and agent based modeling employed in the thesis are introduced. Thus, this chapter provides the reader with the justification for the methodological choices and their brief introduction. Third, the data collection and analysis applied in the thesis are described. Finally, tools for analyzing the quality of the thesis are offered to the reader.

3.1 Research approach

Description of the research enables the reader to judge the suitability of the adopted methodology to the phenomenon. However, the values and beliefs of the researcher performing the research should also be included in the paper as they equally contribute to the reader's ability to judge the study (Easton, 1995). These philosophical underpinnings might be referred to as an orientation or paradigm of the researcher[11]. Burrell and Morgan (1979) have suggested a widely adopted scheme to analyze the philosophical underpinnings behind any theory. They suggest four levels of analysis: the nature of the focal phenomena (ontology); the nature of knowledge of those phenomena (epistemology); the nature of man (human nature); the nature of methods to study those phenomena (methodology). To ensure the explicitness of a researcher's orientation, various research process models are suggested when research is planned (e.g., Anderson, 1983; Easton, 1995). In the present thesis, Easton's (1995) research process framework is adopted (Figure 6) as the framework has a clear focus on the researcher's orientation, on which choices in the process are based. In addition, the research process framework is closely linked to Burrell and Morgan's (1979) scheme to analyze philosophical underpinnings.

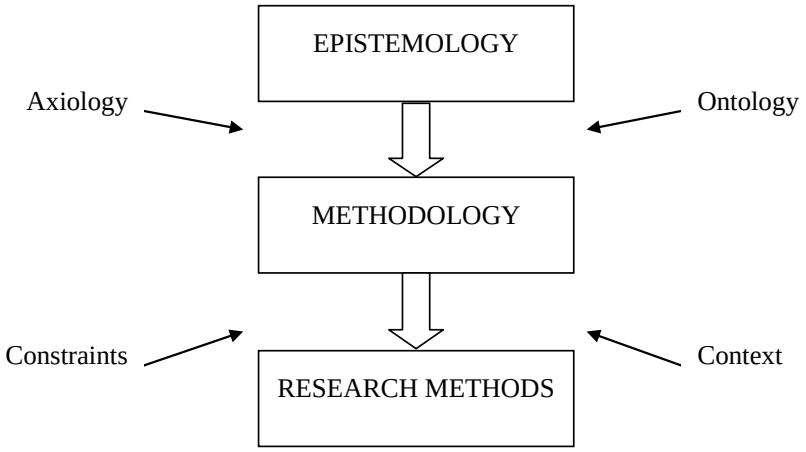

Figure 6. Research process framework (Easton, 1995)

The research process framework comprises four influencing factors: axiology; ontology; context; constraints. These influencing factors restrict and shape choices in the research

[11] According to Easton (1995, p. 423), "orientation is a broader and more philosophical concept in nature than paradigm. Paradigms are context specific and based in phenomena."

process while not determining the choices. The first influential factor is axiology, which refers to the values and goals of a researcher in performing a particular research. In practice, these individual characteristics might be altruism and an attempt to find the truth, or, at a more concrete level, earning a living or achieving degree. According to Easton (1995) these values and goals are rarely made explicit, but are nevertheless influential. Here axiology is simply introduced as an influencing factor, as attempting to explicitly describe the partially implicit factors of the author would be at least questionable. The second influential factor is ontology[12]. Ontological factors are inevitable researcher's assumptions. Usually these assumptions are subconscious perspectives and thus often invisible, unless attention is drawn to them. In the thesis, reality is understood to be socially constructed, and thus there is no unique, pre-existing "real world" (Muncy and Fisk, 1987; Astley, 1985). Derived from this it is assumed that there are no "right" network pictures or insights; instead, these are considered to be interpretations of an individual or a group of individuals.

The third influential factor is the content and context of the research. Despite heavy debate concerning the differences between physical and social sciences when choosing methodologies, it is evident that, for example, studying individuals differs from studying groups or societies (Easton, 1995). Thus, the context influences the choice of methodology. According to Easton (1995), one studying industrial networks should be concerned with the representativeness, the choice of sampling unit, the potential complexity of a network, and the importance of time. For example, at the theoretical level in the global economy there is one network; however, studying this network is impossible and thus sampling is necessary. Added to this, in the thesis, the theoretical and practical level contexts are described to increase the transparency of these influential factors. Referring to barriers to free choice that might be overcome in principle but not so easily in practice, the fourth influential factor is constraints such as time, resources, knowledge, creativity, and skills (Easton, 1995). In the present thesis, substantial constraint was not perceived, although the lack of time and partially the lack of resources have constrained longitudinal study on the phenomenon.

The phases of the research process are epistemological choices[13], methodological choices, and the choices of research methods that are based on the previous choices. The first choices are epistemological[14]. Referring Easton (1995, p. 420), epistemology might be understood "to include ways of knowing about the world - the nature, derivation, and scope of knowledge, as well as its claims to reliability." Thus, the epistemological choices of a researcher create a schema for methodological choices. There is a long running debate in the field of marketing concerning which tradition should be adopted by a marketing researcher (Anderson, 1983; Arndt, 1985; Hunt, 1990; Kavanagh, 1994). The extant literature introduces several epistemological traditions. Burrell and Morgan (1979) identify two contrasting objectivist and subjectivist paradigms. Peter and Olson (1983) contrast positivist/empiricist and relativist/constructionist perspectives. Järvensivu and Törnroos (2010) contrast naïve realism and naïve relativism. Easton (1995) identifies four orientations: positivism; conventionalism; realism; constructivism. These orientations are not monolithic in nature and include several differing branches. In addition, for example, constructivism is closely related to relativism, but opposite to positivism (Easton, 1995). However, reality usually encompasses the

[12] According to Kavanagh (1994, p.38) ontology can be determined as "the part of metaphysics which treats the nature and essence of things. In the social sciences its use is generally limited to the nature and essence of the social world and man's existence."

[13] Easton (1995) emphasizes in the discussion of epistemology that other dimensions, such as axiology and ontology are also involved, although usually implicit. Thus Easton's perspective on epistemology is broader and he interchangeably employs the concept of orientation to refer to epistemology.

[14] According to Kavanagh (1994, p.37) epistemology can be determined as "the branch of philosophy which deals with the origin, nature and limits of human knowledge".

orientation branches, and ontological oscillation[15] between these branches is not necessarily to be condemned (Easton, 1995; Weick, 1995).

The present thesis adopts constructivism as an epistemological ground. As with relativism, constructivism rejects the existence of a single "truth". However, where a relativist assumes that knowledge claims are relative, a constructivist perceives that what is termed reality is constructed (Easton, 1995). Thus, truth is considered a result of perspectives, and therefore knowledge and truth are not discovered, but created by the mind (Schwandt, 1994). Derived from this, knowledge cannot be inferred outside the context. In addition, as knowledge is socially constructed, the language is not simply a method for transmitting information, but the embodiment of knowledge constructing the reality (Astley, 1985).

Extant research grounded on the network approach is found to obtain both subjective and objective ontological orientations, whereas research, for example, grounded on transaction cost theories is found mostly to lean on the objectivistic world perspective (Möller, 1994). Thus, adoption of the constructivist orientation in the thesis is in accord with the extant literature as constructivism can be categorized to the subjective orientation. In addition, the currently dominant positivist research tradition in marketing has been criticized for implicitly regarding a customer as a discrete and passive target of a company's marketing efforts (Marsden and Littler, 1996). However, when studying solution business, understanding on the intensive interplay between actors is needed, and thus positivism has not been adopted as an epistemology of the present thesis.

The second and the third phases of the research process suggested by Easton (1995) are the methodological choices and the choices of research methods. The methodological choices are suggested to include strategic level options, for example, case research, qualitative methods, triangulation, and causal modeling; whereas choices of research methods are concerned with issues such as, for example, instruments and sampling. The methodology and research methods components of the research process in the present thesis are introduced in the following chapters. The introduction and justification of selections is divided to the deception of the methodological choices of the study and data collection and analysis.

3.2 Methodological choices of the research

The emergent research area of amalgamating network insights is approached in the thesis from various perspectives. These approaches (publications) include various research methods and thus it might be concluded that the thesis leans on triangulation (Jick, 1979), which is broadly defined as "the convergence of evidence on one meaning" (Johnston, Leach, and Liu, 1999, p. 207). According to Miles and Huberman (1994), there are five types of triangulation: data source; method; researcher; theory; data type. Data source triangulation refers, for example, to the collection of data from various persons or at different times. Method triangulation refers to utilizing multiple research methods to analyze and collect data. Researcher triangulation refers, for example, to the inclusion of multiple researchers to the study. Theory triangulation refers to employing different theories, for example, to explain results. Finally, data type triangulation is, for example, the combination of qualitative and quantitative data. The present thesis employs method[16] and data type triangulation (Miles and

[15] Burrell and Morgan (1979, p. 266) describe this oscillation as occurring when theorists often initially stress a highly subjectivist stance but "admit a more realist form of ontology by the back door."

[16] Employing multiple methods in a research has been given many names including blended research, integrative, multi-method, multiple methods, triangulated studies, ethnographic residual analysis, and mixed research (Harrison and Reilly, 2011).

Huberman, 1994). Employing triangulation is argued to enhance the quality and robustness of a research (Silverman, 2006). According to Jack (2010), the multi-method approach can provide richer data sources, explanations of researched phenomena, and even more robust theoretical understanding. However, triangulation introduces problems that should be noted. Employing too many badly selected methods might lead to an incoherent research setting, and thus findings might not be interrelated, which makes drawing conclusions from the findings complicated or even misleading (Silverman, 2006). However, the choice of methods in the thesis is based on individual pieces of research (publications), and thus the selection of the methods was based on the needs of these individual pieces of research. In addition, the emerging state of the research on network pictures and network insights supports the choice to lean on triangulation to achieve a wider perspective on the studied phenomena. The choice is made to increase trustworthiness. In addition, research on industrial networks is argued to sustain a somewhat limited range of methodologies, and thus divergent approaches are required (Easton, 1995; Borghini, Carú, and Cova, 2010).

The case study strategy was selected as the main research approach for the present study. In addition, social network analysis and simulation are employed to achieve a more profound understanding on the studied phenomenon, and to enable the research questions to be answered more thoroughly. The study combines qualitative and quantitative data, thus data type triangulation is employed. Introductions and justifications of the selected research methods are made in the following chapters.

3.2.1 Case study research

Case study research is widely employed in business-to-business (B-to-B) marketing research to research the decisions and behavior of groups and individuals within organizations, in intercompany relations, and industrial networks (Dubois and Gadde, 2002; Halinen and Törnroos, 2005; Easton, 2010). Despite extensive usage, there is neither unanimous understanding on the nature nor a definition of case study research. A social scientist, Yin (1989, p. 23), defines a case study as ‘‘an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used.’’ According to Eisenhardt (1989, p. 543), case studies have the potential to capture the dynamics of a studied phenomenon and defines case study as “a research strategy which focuses on understanding the dynamics present within single settings.’’ Halinen and Törnroos (2005, p. 1286) define case study in the network research context as “an intensive study of one or a small number of business networks, where multiple sources of evidence are used to develop a holistic description of the network and where the network refers to a set of companies (and potentially other organizations) connected to each other for the purpose of doing business.” Woodside and Wilson (2003, p. 493) emphasize the role of understanding the actor, and state that case study research “is inquiry focusing on describing, understanding and/or controlling the individual (i.e., process, animal, person, household, organization, group, industry, culture, or nationality).” In the present thesis Easton’s (2010, p. 119) definition is adopted, “Case research can (…) be defined as a research method that involves investigating one or a small number of social entities or situations about which data are collected using multiple sources of data and developing a holistic description through an iterative research process.” However, it is generally accepted that case study research is based on the study of a single or multiple cases on a particular phenomenon to reach an understanding or a general conclusion on the topic in question and to examine complex problems with the aim of identifying theoretical implications in a theory building approach (Borghini, Carú, and Cova, 2010).

Case study is found to be particularly useful when there is only a little knowledge on the phenomenon, current theories seem inadequate, in new research topic areas, the phenomenon is broad and complex, the phenomenon cannot be studied outside its natural context, and when studying complex and unique social systems (Bonoma, 1985; Eisenhardt, 1989; Easton, 1995; Miles and Huberman, 1994; Yin, 2008). Case studies are criticized due to a lack of statistical representativeness; however, they offer a depth and comprehensiveness for understanding the studied phenomenon (Easton, 1995). In addition, according to Halinen and Törnroos (2005), case study is a suitable method when studying change processes as it enables study on the contextual factors and process elements in the same real-life situation.

Case study research was selected as the main research approach of the present study for the following reasons. *First,* the amalgamation process from individual network pictures to network insight is a social phenomenon in which multiple persons are interacting with each other, and thus there is a need to understand a complex social phenomenon. *Second,* there is only a limited amount of prior knowledge on the role of internal communication when network pictures are amalgamating to network insight in the solution business setting. *Third,* the first publication on network insight was published in 2008 and there are still only a limited number of studies on the theory. Thus, the phenomenon is little known and the research topic is relatively new. Although research on personal and organizational cognition is extensive, research on the business network context is limited. *Finally,* the objective of the thesis is not to provide statically generalized results, but to offer a profound understanding on the role of internal communication in the amalgamation process to network insight.

A critical event in case study research is the selection of the studied case(s) and the unit of analysis (Yin, 2008; Eisenhardt, 1989). According to Eisenhardt and Graebner (2007) the selection of the case is termed theoretical sampling. When employing a single case approach, the selected case should be unusually revelatory, have extreme exemplars, or opportunities for unusual research access (Yin, 2008). In the multiple case approach, cases should be replicable or based on contrasting results (Yin, 2008).

In the thesis both single and multiple case approaches are employed. Publication 1 is a multiple case study comprising two cases. In the publication, challenges that relate to internal communication when companies move to solution business are studied. The selection of the cases to be studied in the publication was based on the following reasons. *First,* the two cases offer contrasting results of the studied phenomenon. The first case illustrates a setup in which a company has recently changed to solution business. The change has been enacted successfully over a fairly brief period of time. The second case illustrates an instance where the change to solution business has not been particularly successful. Thus, the factors affecting the success in the studied change can be identified more easily. *Second,* the cases are selected as they represent companies which have recently developed to solution business that operate in B-to-B markets. Thus, the change and its challenges are easy to identify. *Finally,* the selected companies include a substantial number of internal actors dispersed through several organizational units. Internal communication challenges are therefore well represented.

Publications 2, 3, and 4 are single case studies that scrutinize a carefully selected project sales case. The project sales case was researched with multiple approaches and settings to gain a comprehensive and in-depth understanding. Selection of the case company was based on the following reasons. *First,* it is an exemplar of a typical large company which operates in B-to-

B markets and which offers solution projects. *Second*, the number of employees in the company was substantially high, and thus internal communication and the amalgamation of network insight are relevant issues to study. *Finally*, the accessibility of reliable information concerning intercompany processes was good due to prior research collaboration. The specific project sales case was selected as it represented a typical project sales case involving multiple actors.

Publication 5 is grounded on agent based modeling, and thus case study research was not employed. The unit of analysis in Publication 1 is a company, and in Publications 2, 3, and 4 it is an internal communication network in a company. In Publication 5, the unit of analysis is an individual manager. Table 3 offers a brief introduction to the characteristics of the studied case companies. Information in the table is based on the contemporaneous state of the companies when the research data was collected.

Table 3. Introduction to characteristics of the studied case companies

Case company	Main type of business	Industry	Sales (€M)	Employees	Typical customers	Examined in publications
Company A	Supplier of metal-based components and integrated systems.	Construction, engineering, and steel.	>1,900	>12,600	Heavy machine building, steel construction companies, power plants, and road and railway construction companies.	1
Company B	Supplier of environmental and industrial measurement products and services.	Environmental and industrial measurement.	>200	>1,300	Meteorological and hydrological institutes, road organizations, defense forces, aviation organizations, and private sector with weather-critical operations.	1
Company C	Equipment manufacturer, service provider.	Lifting equipment.	>1,600	>9.700	Manufacturing and process industry, shipyards and docks.	2, 3, and 4

Company A (studied in Publication 1) is a supplier of metal-based components and integrated systems to the construction and engineering industries. Its offering includes metal-based solutions and bulk steel for the wide range of customers. The typical customers of the company are heavy machine building companies, various steel construction companies, power plants, and road and railway constructing companies.

Company B (studied in Publication 1) is a supplier of environmental and industrial measurement products and services to customers in meteorology, airports, roads, defense, energy, and various other industries. Its offering includes environmental and industrial

measurement goods and services. The typical customers are meteorological and hydrological institutes, road organizations, defense forces, aviation organizations, and private sector with weather critical operations.

Company C (studied in Publications 2, 3, and 4) is a manufacturer of cranes, and other materials handling equipment for logistics operators, such as ports, harbors, shipyards, and the offshore industry. Besides developing innovative technologies, the company places a strong emphasis on delivering qualified and consistent service to its customers.

3.2.2 Social network analysis

The paradigmatic change to understanding structures of the social world as being networked has generated the need to research these network structures rigorously. Thus, a research technique named Social Network Analysis (or network analysis) has become of interest to academicians and practitioners from a broad range of diverse fields including management (Borgatti and Foster, 2003). Social network analysis has long traditions and is formed in multiple disciplines, such as group dynamics, group theory, graph theory, and is strongly involved in the development of mathematics (Wesserman and Faust, 1994; Scott, 2007)[17]. This method can be employed for various purposes such as, for example, analysis of network size and structure, to study the interactional processes by which networks are created, to research network influences, to analyze networking behaviors, and to determine networking skills. (Coviello, 2005). Primarily, social network analysis focuses on how an actor is embedded within a network structure and how the structure emerges from the dyadic relations between individual actors. A fundamental property of social network analysis is that it expresses the degree of connection between actors in a network. More and stronger connections with shorter paths between actors might indicate that each actor is more robust and more capable of reacting quickly and effectively.

Social network analysis comprises various measures to analyze networks and individual actors in those networks. Most of the basic measures (i.e., centrality, centralization, and density) are based on the number and length of the pathways between actors. In practice, social network analysis is based on the analysis of relational data, which are information on the connections of actors (nodes) gathered to a matrix formation of, for example, contacts, interactions, e-mail correspondences, phone calls, family connections, and group attachments and meetings (Scott, 2007). The data can be formed as directed or undirected. Directed data includes information concerning the direction of each tie between two nodes, whereas undirected data only includes information on the existence of a tie between two nodes. In addition, the data can be evaluated or unevaluated. Valuated data include information concerning the strength of each tie between nodes, whereas unevaluated data do not.

The extensive number of earlier studies have shown that social network analysis is an effective method to analyze networks (e.g., Phillips and Phillips, 1998; Aboelela et al., 2007; M'Chirgui, 2007), communication networks (e.g., Grippa, 2009; Hancock and Raeside, 2010; van der Valk and Gijsbers, 2010), and projects (e.g., Mead, 2001; Nirmala and Vemuri, 2009). In the field of industrial marketing, social network analysis has been applied to study,

[17] Social network analysis was developed initially in a relatively non-technical form from the structural concerns of the anthropologist Radcliffe-Brown in the 1930s (Scott, 2007). After Radcliffe-Brown, there have been two separate groups studying Social Network Analysis and its primitive forms, one in Manchester University and other in Harvard University. Social network analysis became a more studied science field in the 1970s. Improvements in the field of mathematics made it possible to employ effective algorithms to analyze more complex matrixes and network data. Nowadays, the number of publications has increased substantially (Borgatti and Foster, 2003).

for example, a company's network positions (M'Chirgui, 2007), interaction in a building owner-centered network (Tuomela et al., 2005), and an industrial buyer's purchasing linkages (Buckles and Ronchetto, 1996). Employing social network analysis to study the role of internal communication in the amalgamation of network pictures to network insight offers a structured and rigorous method to analyze the flow of internal communication and the nature of the communication network within companies operating in solution business. In addition, the focus on social phenomenon such as communication supports the selection.

3.2.3 Simulation

Simulation is a method to imitate the operations of the real world or systems over time and its origins reach back to the 1950s (Forrester, 1958; Banks et al., 2001)[18]. Simulation is employed in various contexts, such as education (e.g., flight simulations; gantry simulators in the context of ports), testing (e.g., enhancements in product lines; changes in a road network), and research (e.g., business processes; market behavior)[19]. Despite the wide application area, simulation in social sciences is a relatively young research tool, thus offering an alternative method to build theories (Gilbert and Troitzsch, 2005). In practice, simulation offers a method to build simulated real-life conditions based on observations and the extant literature, and then test changes in that model based on controlled variables derived from the aims of the research.

Simulation also has some limitations that need to be acknowledged. First, the replication of simulation models is challenging as the assortment of models is wide. Thus, when building a model, it should be left at a relatively simple and understandable level. According to Axelrod (1997) even the simplest models might lead to significant implications by increasing understanding on the relations between elements of the system. The second limitation concerns balancing between the generality, realism, and precision of a model (Justus, 2005). The challenge is, for example, that when a model is highly realistic and precise, simulating a specific system decreases the generalizability, the extent to which it can be generalized, of that model.

Recent papers have recognized simulation as a suitable tool for management research (Warren, 2005; Gary, Kunc, Morecroft, and Rockard, 2008; Gary and Wood, 2011). Its particular strength is that simple models can be employed to support research on abstract phenomena that are difficult to study quantitatively with traditional research methods, especially when a longitudinal research approach is required. Both of these elements are central to the research focus of the thesis as its interest is to understand the development of the network insight. *First,* network pictures, network insight, and internal communication are inherently abstract, making their measurement empirically challenging. *Second,* interest in the dynamics of network pictures requires a longitudinal approach.

There is a variety of alternative approaches to simulation, such as discrete event simulation, system dynamics, and agent based modeling (or agent based simulation) (Dooley, 2002). Agent based modeling (adopted in the thesis) refers to the simulated system being modeled as a set of interacting agents in a modeled system environment (Lättilä, Hilletofth, and Lin,

[18] According to Robinson (2004, p.4) simulation can be defined as "experimentation with a simplified imitation (on a computer) of an operations system as it progresses through time, for the purpose of better understanding and/or improving that system."

[19] For more in-depth description of the purposes of simulation in social sciences, see Axelrod (1997).

2010). The actions of simulated agents are based on their own interest with limited knowledge of the entire system (Macal and North, 2006). However, these agents might collaborate with other agents in the system and learn from each other, and thus change their decision making logics. Agent based modeling concentrates on individual decision makers, who employ local information and make local decisions to reach their desired goal (Wooldridge and Jennings, 1995). Although there is no unanimous definition of agents, Woolridge and Jennings (1995) introduce four general characteristics. First, agents are autonomous as they operate by themselves. Second, agents are capable of interacting with other agents in the system. Third, agents can act and react based on changes in the system. Fourth, agents can operate in a proactive manner. However, alternative methods of categorizing characteristics of agents are addressed, for example, by Macal and North (2006) who propose five characteristics of an agent: identifiable and self-contained; situated; goal oriented; autonomous and self-directed; flexibility. Macy and Willer (2002) introduce four key characteristics of agents: they are autonomous; interdependent; their actions are based on following simple rules; they are adaptive and backward looking.

The extant literature identifies several spurs to adopt agent based modeling as a research approach (Bonabeau, 2002; Nilsson and Darley, 2006; Macal and North, 2006; Gilbert, 2008; Watkins and Hill, 2009). For example, utilization of agent based modeling is beneficial when the population of entities is heterogeneous and individual entities are dissimilar, when agents exhibit complex behavior (e.g., adaptation; learning; sense-making), and when the interaction between agents is non-linear. Agent based modeling is adopted as a research device based on a threefold perspective. *First*, the thesis aims to understand a phenomenon that is inherently based on heterogeneous individuals. *Second*, the phenomenon can be categorized as a complex social interaction. *Third*, the extant research has asserted that agent based modeling is a suitable method to study social phenomena (Flache and Macy, 1996), networks (Macy and Skvoretz, 1998; Macy and Willer, 2002), and B-to-B contexts (Watkins and Hill, 2009).

3.3 Data collection

Both having their own strengths and limitations, qualitative and quantitative methods are employed in the present thesis. Qualitative methods are found to be suitable when the emphasis of a research is to create understanding and make observations in a natural setting (Reichardt and Cook, 1979). In addition, qualitative methods are found suitable when studying organizations, groups, and individuals (Strauss and Corbin, 1990). However, qualitative methods are usually time-consuming and non-generalizable. Conversely, quantitative methods offer a logical and critical approach, which usually focuses on reasons; for example, in social events (Reichardt and Cook, 1979; Ghauri and Gronhaug, 2005). However, quantitative methods lack the ability to create an in-depth understanding on the studied phenomenon. Usually, qualitative methods are utilized to create an understanding on a studied phenomenon and to develop a hypothesis, which is quantitatively tested (Ghauri and Gronhaug, 2005). The present thesis combines both of these approaches as there is relatively little known regarding the studied phenomenon, and thus approaching it from various perspectives is found to extend understanding on the phenomenon widely. In addition, the approach is in accord with the decision to lean on triangulation in the present study. Publications 1-4 are qualitative studies, whereas Publication 5 is a quantitative study. In addition, Publications 2 and 3 include quantitative elements as social network analysis is employed. Table 4 summarizes the data and the utilized methods of the publications of the thesis.

Table 4. Summary of the data and the utilized methods

Publ.	Objective	Data	Company	Method
1	To increase understanding on the supplier's internal communication challenges in the change process to solution business.	Empirical, 12 semi-structured interviews in two case companies.	A and B	Multiple case study, content analysis.
2	To enhance understanding on customer related internal communication between the functional and divisional structures of the matrix organization during the early phases of the project sales process.	Empirical, 10 semi-structured interviews, and questionnaire s (n=23).	C	Single case study, social network analysis, content analysis.
3	To determine key factors that influence internal communication in project sales networks.	Empirical, 10 semi-structured interviews, and questionnaires (n=23).	C	Single case study, social network analysis, content analysis.
4	To increase understanding on the person's perceived power in the early phase of the project sales process.	Empirical, 16 semi-structured interviews, and questionnaires (n=17).	C	Single case study, content analysis.
5	To shed light on the dynamic nature of network pictures.	Simulated data.	---	Agent based modeling.

The empirical (primary) data of the present thesis was collected with semi-structured face-to-face interviews[20] (n=28) and questionnaires (n=23). In addition, secondary data, such as company e-mail correspondence, annual reports, brochures, and web pages were employed to gain an in-depth understanding on the studied companies. Interviews were selected to be the qualitative data collection technique as they provide a real interaction between the researcher and respondent, and provide an opportunity to specify the answers. These qualities are required when studying a phenomenon of which little is known. Interviews can be categorized as structured, semi-structured, and unstructured (Ghauri and Gronhaug, 2005; Eriksson and Kovalainen, 2008). In structured interviews there is a standard format of interview with fixed response categories. Conversely, unstructured interviews offer almost full liberty to discuss a particular issue. Semi-structured interviews lie between the two other, and usually include predefined issues and topics that are discussed during the interview. Semi-structured interviews were employed in the present thesis as these offer a method to combine theory based interview questions without restricting the opportunity to specify and discuss answers.

Three interview question sets were employed due to the differing aims of the individual publications. In Publication 1, the interviews included themes such as the concept of solution,

[20] The concept of thematic interviews and open-ended questions has sometimes been employed interchangeably to semi-structure interviews (Silverman, 2006).

the change process from equipment provider to solution provider, and challenges in each development phase in greater detail (Appendix 1). Selection of the interviewees was based on snowball sampling (Biernacki and Waldorf, 1981) to identify the most relevant respondents. The respondents were asked to name additional interviewees who were involved in, and knowledgeable on, the topics covered. Thus, the number of interviews in Publication1 totaled twelve (n=12). The interviews were conducted in collaboration with the co-authors of the publication.

Informant selection in Publications 2-4 was executed with the assistance of a person occupying a focal position with a broad understanding on the studied case. This proved to be the Sales Director of the Sales and Marketing Department, and his suitability derived from his work experience and position in the organization. First, he offered e-mail correspondence from the company's data storage. This studied e-mail correspondence involved e-mails concerning the studied project sales case and those sent during it, and involved approximately 300 e-mails. The e-mails identified 39 of Company C's personnel involved in the studied case. Second, the selection of interviewees was based on discussion with the Sales Director and the co-authors of Publications 2-4. As such, the most relevant informants were identified (n=10). The interview questions of Publications 2-4 broadly addressed themes such as the nature of internal communication, characteristics of the project sales process, and internal communication during the sales process (Appendix 2).

In addition, for Publication 4, the extant understanding on the studied case was complemented with interviews that concentrated on the individual's perceived power. The selection of the interviewees was based on the results from earlier phases in the study. The interviews focused on the same project sales case with a fixed timeframe. These six complementing interviews (n=6) addressed themes comprising the concept of power, individual actor's power in the context of project marketing, individual actor's perceived power in the context of project marketing, and themes that discussed the results of the previously distributed questionnaire (Appendix 3). As the interviews focused mainly on the results from previous phases of the research process, the ten month gap between the first and second sets of interviews was not perceived as a problem. Detailed information from the respondents, interview dates and durations are included in Appendix 4. All interviews for Publications 2-4 were conducted by the present author.

In addition to the interviews for Publications 2-4, the data set was complemented with data from the questionnaires that had a twofold purpose. *First*, the purpose was to collect data for the social network analysis in Publications 2 and 3, and, *second*, to collect data on the perceived power within industrial project sales for Publication 4. Questionnaires were employed as a data collection method for social network analysis as the collection of data by other means (e.g., interviews) would have been very time consuming and would not offer additional data for the analysis. In addition, collecting data with questionnaires alongside archival data is the most commonly employed method of acquiring relational data for social network analysis (Wesserman and Faust, 1994).

The questionnaire was sent to 36 persons identified from the e-mail correspondence[21]. The questionnaire was sent utilizing online survey software. Of the 36 individuals, 23 answered the questionnaire, yielding a response rate of 64%. In the case of Publication 4, 17 respondents could be included in the research, and thus the response rate for the publication

[21] Three employees identified from the archival data were no longer in the service of the case company; thus, they were not sent the questionnaire.

was 47%. The questionnaire contained three phases. *First*, the respondents were asked to name eight persons in the focal company with whom they had interacted most during the studied case sales project. Free recall of eight persons is considered adequate to achieve a reliable representation of the network when collecting data for social network analysis (Rapoport and Horvath, 1961; Wesserman and Faust, 1994). *Second*, the respondents were asked to intuitively position all of the named persons in a power/interest matrix[22]. However, it must be noted that not all respondents named, and thus positioned, eight persons. *Finally*, respondents were asked to position themselves in the matrix. To ensure that respondents understood what was meant by the dimensions in this case before answering the matrix question, the employed concepts and the dimensions of the matrix were thoroughly explained in the questionnaire,.

Publication 5 is based on simulation method. A simulation model of a changing network between companies and the perceived network picture of different decision makers is developed in the publication. The decision makers are assumed to have differing abilities in renewing their network pictures of simulated business network. They are assumed to make decisions based on their network pictures at a given point in time. The presupposition is that if a network picture corresponds broadly to the network conditions at a given point in time, decision quality is high, and vice versa. The dynamics of the companies' cooperation linkages in the simulated business network are controlled by employing a set of control variables that describe the environmental dynamism (Dess and Beard, 1984). Environmental dynamism refers to the rate of change, instability, absence of pattern, and unpredictability (Dess and Beard, 1984; Priem, Rasheed, and Kotulic, 1995; Hough and White, 2004; Street, Street, and Lamont, 2010). The variables utilized in the present study are: interval time, amplitude, and trend. The simulation is executed with agent based modeling, which enables the creation of freely forming and developing network structures. The objective of the model is to simulate two distinct tasks. First, to simulate the dynamics of relationships between various companies in a supplier network and, second, to simulate a manager's understanding on the relationships between various companies in the network. The simulation of the relationships between companies concretizes the manner in which dynamics in a networked business environment are implemented in the model. The manager's perception of the surrounding network represents the focus of the thesis, the manager's network picture. Thus a network picture represents a single manager's understanding on the network between the companies. This network picture changes over time as the manager makes sense of the business environment. The focus of the simulation model is on the gap between the simulated business environment and the manager's network picture.

3.4 Data analysis

The data analysis of interviews in Publications 1-4 employed three steps of inductive content analysis: data reduction; data clustering; data abstraction (Miles and Huberman, 1994). The analysis method was selected since it offers rigorous and stepwise approach to process the data. In the data reduction phase, informants' expressions relating to the studied phenomenon were separated from the data. Each of the publications has its own category of expressions that were followed. In the data clustering phase, the expressions were categorized according to core consistencies and meanings. The categories were formed based on the research question of each publication and its goals. In the final phase, the categories were abstracted to

[22] The power/interest matrix classifies actors in relation to the power they hold and the extent to which they are likely to show interest (Mendelow, 1981; Johnson, Scholes, and Whittington, 2006). Thus, the power/interest matrix provides a method to group actors and manage them for practitioners and academicians (see Publication 4).

the themes. The themes formed the base for drawing the conclusions that included the interpretative process, in which it was attempted to identify regularities and patterns with the help of the developed coding scheme, mind maps to condense the data, and tables summarizing the data and findings. To increase validity, the authors of each individual publication discussed thoroughly the findings and conclusions. Furthermore, quotes from interview transcripts were included in the publications to demonstrate the drawing of conclusions from the data to a reader.

Social network analysis in Publications 2 and 3 was utilized to increase understanding on the internal communication network. The analysis was performed with UCINET software. Social network analysis offers various measures with which to study characteristics of a network. To study an internal communication network within a company, two network level measures and three individual level measures were employed in Publications 2 and 3. Network level measures indicate the overall structure of the network. The *first* measure, network centralization, was selected to indicate the focus of communication on a single person or a small group of people. The *second* measure, density, is perhaps the most widely employed group level measure indicating a network's structure as a whole (Wesserman and Faust, 1994) and indicates the extent to which a communication network at group level is knitted, or its knittedness. Centralization and density are opined to be important complementary measures as density describes the general level of cohesion in the form of a graph, whereas centralization describes the extent to which this cohesion is organized around particular focal points (Scott, 2007). The employed network level measures are introduced in Table 5.

Table 5. Network level measures employed in the present study

Measure	Employed in publications	Definition	Purpose	Data form used
Network Centralization	2 and 3	"(…) centralization measure is an expression of how tightly the graph is organized around its most central point." (Scott, 2007, p. 89)	To indicate the degree to which communication is centralized around a single person or small group. More centralized groups tend to be more hierarchical in nature.	Directed and valuated.
Network Density	2 and 3	"The density of a directed graph is equal to the proportion of arcs present in the digraph." (Wesserman and Faust, 2007, p. 129)	To reveal group cohesion, network "knittedness" and its complement.	Directed and unvaluated.

In addition to network level measures, three individual level measures are employed to identify a network's key individuals. The *first* individual level measure is degree. This commonly employed measure is selected to reveal the most extrovert persons and those most communicated to by others. According to previous studies, degree is a suitable measure by which to study communication in temporary organizations such as solution or project teams (Mead, 2001). The *second* individual level measure is Freeman betweenness (Freeman, 1977), which is selected to reveal the individuals who are involved most in a communication flow and thus are in most central position. In addition, the central position usually indicates power in a network. The *final* measure, reach closeness, is utilized to reveal the extent to which single actors are reachable, or their reachability, and their position in a network. The

maximum score for reach closeness is achieved when every other actor is one step away from the focal actor. The degree of reach closeness lessens as actors are two or three steps away, and so on. (Hanneman and Riddle, 2005). These measures are selected to represent those that are most commonly employed (Wesserman and Faust, 1994), and are also the most suitable for the present study to illustrate the nature of internal communication networks during project sales. The employed individual level measures are introduced in Table 6.

Table 6. Individual level measures employed in the present study

Measure	Employed in publications	Definition	Purpose	Data form used
Centrality, InDegree and OutDegree	2 and 3	"(…) number of other points to which a point is adjacent." (Scott, 2007, p. 83)	To indicate the level of extroversion (OutDegree) and the stress of communication (InDegree). Higher numbers indicate more connectivity.	Directed and valuated.
Centrality, Freeman Betweenness	3	"The extent to which a particular point lies 'between' the various other points in the graph." (Scott, 2007, p. 86)	To indicate the extent to which a person is "in the middle" of information flow. Parties high in this measure often influence what flows in the network, and often serve as gatekeepers and brokers of information.	Directed and valuated.
Centrality, Closeness, Reach	2	"(…) measures of how close each actor is to all others." (Hanneman and Riddle, 2005, p. 12)	To study the reachability of actors and its diversification between functional and divisional matrix structures.	Directed and unvaluated.

Analysis of the questionnaire data for Publication 4 was conducted from answers concerning the power/interest matrix, which determined the average answer. For example, the average placement of the first named person was defined based on all placements of the first named person in the matrix, and so on. In addition, the average positions of the respondents themselves were located based on information as to where they were themselves positioned. These average answers could be calculated exactly, as the employed online survey tool offered specific coordinate data on individual answers. The range of both coordination axes ran from 0 to 500. Finally, conclusions were drawn based on the results of the matrix supported by the in-depth interview data.

Analysis for Publication 5 was conducted based on the results from the simulation model, which was tested with parameter variation. As the model is based on random functions, the results were also analyzed employing Monte-Carlo analysis, which enables a researcher to generate dynamic confidence intervals for the trajectories of variables in the studied model. In Monte-Carlo analysis, a researcher specifies the probability distribution that characterizes the likely values of each parameter (Sterman, 2000). In the analysis for the Publication 5, each variable combination was replicated 100 times. Analysis was then performed with the average values from 100 repetitions for each parameter combination. The simulation time step was selected to be one week and total simulation time was 520 rounds, implying that simulation

time represents 10 years. Finally, the simulation model results were analyzed both visually and statistically. The visual results include the charts of individual coordinators against specific environmental factors. For statistical analysis, the regression models were made to estimate the impact of the interactions between the environmental factors. Thus, the simulation model results were utilized to analyze and conclude how different environmental aspects impact a person's ability to revise the network picture. Anylogic software was employed for simulation.

3.5 Quality of the research

The challenge of any academic research is to assure the reader of the quality and trustworthiness of the research. The extant literature has introduced several criteria with which to evaluate research. The classical framework is based on the three concepts of reliability, validity, and generalizability (Yin, 2008). According to Silverman (2006), reliability deals with replicability, and he noted that the question is whether or not some future researcher can repeat the research project and derive the same results, interpretations, and claims. Hammerslay (1990) defines validity as the extent to which an account accurately represents the social phenomena to which it refers. Generalizability refers to the ability to extend the results of a research to a wider context (Eriksson and Kovalainen, 2008). Miles and Huberman (1994) follow the critical realist research tradition and suggest five concepts of a criterion to evaluate research: the objectivity of qualitative work; reliability; internal validity; external validity; utilization.

These criteria are based on the realist and positivist research tradition and thus are poorly suited to various types of relativism and constructivism (Eriksson and Kovalainen, 2008). Therefore, to achieve quality of research, it is crucial that the evaluation criteria are selected in accord with the nature of the research. In addition, evaluation performed by the researcher of a study might be questionable. It can be argued that, in such a case, the researcher is claiming to evaluate the research objectively, although this cannot be achieved by leaning on the constructivist research tradition. Evaluation and judgment should be performed by the reader of the research, with the researcher simply suggesting tools for the evaluation. Thus, instead of evaluating the quality of the thesis here, a criterion to evaluate and judge the thesis is suggested, and actions taken to meet the criterion are depicted.

Building on relativist ontology and subjective epistemology, Lincoln and Guba (1985) introduce the substituting concept of trustworthiness for reliability, validity, and objectivity. Trustworthiness comprises four aspects: credibility; transferability; dependability; confirmability. According to Eriksson and Kovalainen (2008), particularly in constructivist research, trustworthiness operates as a goodness criterion for research. Due to its suitability for the philosophical underpinning of the thesis and its established position in the extant research, this criterion is suggested here as a tool for the reader to evaluate and judge the thesis (e.g., Lee and Cadogan, 2009; Biemans, Brencic, and Malshe, 2010; Alajoutsijärvi et al., 2012).

Credibility refers to the extent to which interpretations made in the research can be opined to be acceptable representations of the data. Thus, credibility deals with the strength of the logical links between observations and conclusions drawn in the study. The employment of method and data triangulation to approach the studied phenomenon enabled avoidance of problems associated with a single method in this specific research area and context.

Transferability expresses the degree to which the connection between the present research and previous research is demonstrated (Eriksson and Kovalainen, 2008). Thus, by ensuring transferability, the reader might compare and find similarities with other research contexts. The transferability of the present thesis was achieved by depicting the case companies and the studied case processes that the results of the thesis could transfer to other contexts. Although extensive and rich case descriptions were not supplied, quotations from interview respondents have been provided to complement the case depictions.

Dependability refers to the extent to which the researcher offers information on the research process and logics. Thus, dependability concerns the replicability of the research. The research process has been described as transparently as could in the present thesis. In addition, the means to achieve the research data are described. While attaching complete interview and questionnaire data to the thesis is impossible, the data set is stored for possible later studies.

Confirmability refers to linking findings and conclusions to the data in a manner that can be easily understood by others (Eriksson and Kovalainen, 2008). In another words, confirmability demonstrates that data and interpretations are related. Thus, confirmability is closely related to the concept of dependability. To ensure the confirmability of this thesis, the author has endeavored to make visible the chain of evidence. This has been addressed by describing the companies and cases, and by inclusion of quotations from the interviews. In addition, the logic of the drawn conclusions based on that data is described.

4 PUBLICATIONS AND REVIEW OF THE RESULTS

This chapter introduces the research papers that comprise the second part of the present thesis. Each of the individual publications is introduced by their objective, main findings and main contributions. In addition, the role of the publications in the thesis is reviewed to provide a more comprehensive understanding on its completeness. Publication 1 aims to provide a basic understanding on the empirical setting of the thesis by studying internal communication in the change to solution business. In addition, the study suggests that network insights should especially be studied more thoroughly in solution business. Publication 2 studies the internal communication in a matrix organization, which is a common structure in companies operating in project and solution business. Publication 3 studies internal communication more thoroughly by focusing on the early phases of project sales. Publication 4 sheds light on an actor's perceived power in project sales by approaching it from the angle of network pictures; thus, the publication also focuses more on the network picture literature. Publication 5 studies the change of network pictures and thus provides an understanding on the dynamics of network pictures. These individual publications have their own specific role in the thesis. Figure 7 illustrates the positioning of these publications to the conceptual framework of the thesis introduced in Figure 5. The arrows from the individual publications demonstrate the research focus of the study.

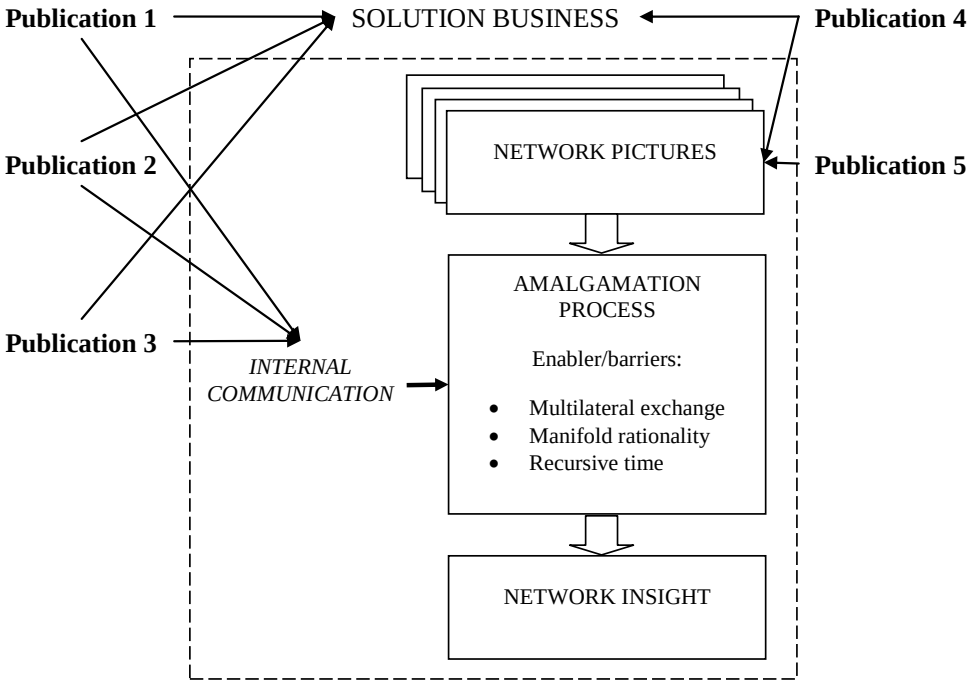

Figure 7. The positioning of the publications to the conceptual framework of the thesis

4.1 Publication 1 - Supplier's Internal Communication in Change Process to Solution Business - Challenges and Tentative Research Agenda

Objective

The study was conducted to increase understanding on the supplier's internal communication challenges in the change process to solution business. The extant literature has noted that the change process to solution business is a complex process that usually faces substantial challenges. Internal communication is identified to be one of these challenges. However, the extant literature has not scrutinized the role of internal communication thoroughly, and only notes its importance. The study was performed to address that research gap and to provide a tentative research agenda to study the gap.

Findings

The results of Publication 1 suggest eight of the most relevant challenges relating to internal communication when an industrial supplier changes to solution business. The study researches these challenges through three phases of the change process: unfreezing; moving; refreezing. The identified challenges at the unfreezing phase are 1) Assembling executors, and 2) Mindset of executors. The moving phase of the change process comprises three challenges that relate to internal communication: 3) Mindset of masses; 4) Organization structure; 5) Supporting technical tools. The final phase of the change process termed refreezing also comprises three challenges relating to internal communication: 6) Number of involved actors; 7) Internal cooperation; 8) Changed customer interface. In addition, based on its findings, the study suggests a tentative research agenda for future research.

Contribution

The study provides empirical evidence of two case companies concerning challenges that relate to internal communication when an industrial supplier changes to solution business. The study contributes to the solution business literature and practice by suggesting a framework to overcome internal communication challenges in the change to solution business. The framework can be employed to build the theory of solution business and especially provides a tool for managers to overcome these challenges. In addition, the study introduces a research agenda for researchers to further study challenges in the strategic change process to solution business. The research agenda comprises five of the most interesting topics that should be researched. These topics are briefly introduced and some suggestions concerning their approach are offered.

Role of Publication 1 in the thesis

Publication 1 combines the discussion of internal communication and change process to solution business. Thus, the study increases understanding on the role of internal communication in the change process and especially links that understanding to the solution business setting. In addition, the study identifies the important role of common network insight in solution business.

4.2 Publication 2 - A Social Network Analysis of Internal Communication in a Matrix Organization – The Context of Project Business

Objective

The key objective in Publication 2 was to enhance understanding on customer related internal communication between the functional and divisional structures of a matrix organization during the early phases of the project sales process. The objective is approached first by studying each of the matrix organization structures separately, and then by studying the interface between these structures.

Findings

The findings from a single case company which delivers complex, solution projects suggest that the internal communication network during the early phases of project sales is complex and involves multiple actors. These actors are horizontally and vertically dispersed in the organization structure. By studying the actors in the matrix organization structure, the results suggest that representation of the functional organization in the internal communication network during the early phases of project sales appears to be rather small. Thus, the interface between the organizational structures remains quite narrow.

Contribution

The study furthers understanding on internal communication patterns in a matrix organization during the early phases of project sales. The results suggest that the matrix organization structure's role as an improver of internal communication in the early phases of project sales appears to be inadequate. Thus, the study extends the research on project business and especially project marketing. In addition, the extant literature on organizational structures has a diverse understanding on a matrix structure's capability to enhance communication in the organization. Publication 2 contributes also to that discussion by offering an insight on the early phases of complex project sales.

Role of Publication 2 in the thesis

Publication 2 studies internal communication in an organization structure that is probably the most commonly employed organizational structure in project and solution based companies. Thus, the publication provides an understanding on internal communication in the organization structure that forms the context of the thesis. The publication links these two elements without considering the role of network pictures or network insights.

4.3 Publication 3 - Supplier's Internal Communication Network during the Project Sales Process

Objective

The main objective of the study was to enhance understanding on the internal communication network in companies which deliver complex projects. In addition, the objective was to determine the key factors that influence internal communication over the project sales process. The objectives were approached by studying a single case with in-depth interview and social network analysis.

Findings

The findings of the study suggest that the internal communication network over the project sales process includes parties from various hierarchical levels and organizational units. In addition, the results suggest that a non-centralized and rather dense communication network is formed during the project sales process. The role of internal communication is considerable as there is a large number of individuals involved. However, a relatively small group of actors appears to play a substantial role in the communication network, thus exerting considerable power over internal communication. In addition, four main barriers hindering internal communication can be identified: 1) Unregulated usage of technical systems; 2) Unsystematic and unstructured documentation; 3) Neglecting the impact of cultural differences; 4) Personal politicking. Furthermore, four main drivers that promote internal communication were identified: 1) Open communication atmosphere; 2) Non-hierarchical organization structures; 3) Variety of alternative communication channels; 4) Communication training.

Contribution

The study increases understanding on the nature of internal communication in project sales and provides suggestions to advance project marketing research and practice. Concretely, the findings suggest that there is a group of actors that stands out in the internal communication network during project sales and, deriving from the cross-functional project teams employed during project sales, the roles of personal politicking and an open atmosphere are emphasized in project business. Thus, future research on project sales should take into account the notion that a communication network does not directly follow the hierarchical structure of the project organization. Based on the identified nature of internal communication in the supplier's project sales process, Publication 3 advances the research on project management and project sales. In addition, the publication answers the call for the integration of project management with project sales and marketing perspectives by studying the project management process of communication during project sales. For practitioners, the study offers a list of barriers to, and drivers of, internal communication to be considered during project sales.

Role of Publication 3 in the thesis

Publication 3 contributes to the thesis by extending understanding on internal communication structures as well as on drivers and barriers in a project oriented company. Thus, the publication links the project and solution setting to internal communication, which is one of the main conceptual elements of the thesis. Especially, Publication 3 sheds light on internal communication networks.

4.4 Publication 4 - A Paucity of Person's Perceived Power within Industrial Project Sales

Objective

The study was conducted to enhance the understanding on a person's network picture in the early phase of a project sales process. More specifically, the study scrutinizes the dimension of power that has been found to be a dimension of network pictures. As the focus is on the individual's perception of his/her power, the concept of perceived power is utilized. While the extant literature discusses power at both the individual and company level, and there are also studies on power in the context of projects, there still appears to be a lack of discussion concerning an individual actor's perceived power in project business. Especially, there is a

lack of understanding on the early phases of the project, when the work roles and network pictures are novel and not stabilized. Nonetheless, the role of these early project phases appears to be emphasized in the changing nature of project business. Thus, there appeared to be a research gap to study.

Findings

The findings of the study indicate that, on average, persons involved to the sales process perceive their own power during project sales to be less than other persons' power, although their interest in the project was equal to that of the others. In the study, the other actors are understood to be the focal company's employees involved in the specific project sales case. In addition, the study suggests that the exiguity of perceived power during project sales affects a person's decision making and communication. Change in decision making is found to be manifested as the quality of decisions and risk taking. Time taken in decision making was found to increase when there is a low perception of power, as actors expend more effort on finding support for their decision or even in attempting to find a person with a higher level of power to make the decision on their behalf. In addition, decision quality was found to be jeopardized by a low perceived power level. Although a person might know of a better solution to a problem, he/she might be satisfied with another solution, if he/she believes his/her power is insufficient to have an effect. In addition, the perceived power level is found to affect the means of communication. A person with a high level of perceived power is likely to prefer more intimate communication methods, such as face-to-face or phone. The respondents reported that high perceived power is considered to make it easier to communicate negative issues, such as an unsuccessful negotiation with a customer. Additionally, communication is considered to be more persuasive by nature when the perceived power is low, as actors are found to avoid making decisions by themselves. Conversely, when perceived power is high, communication is considered to be more influential and confident.

Contribution

The results of the Publication 4 contribute to the research on project business by illustrating an actor's perceived power within industrial project sales. According to the results, during the early phases of the project, when uncertainty is high, work roles are not established, and the network pictures are not validated, the parties involved in the sales process perceive their own power during project sales to be less than other persons' power, although their interest in the project was equal to that of the other parties. In addition, the study suggests that the paucity of perceived power during project sales affects a person's decision making and communication. As such, the study extends the research on power in the context of projects and sheds light on the early phases of complex projects from the perspective of perceived power.

Role of Publication 4 in the thesis

Publication 4 illustrates solution business through a complex project sales process. In addition, the publication combines the research on network pictures and the sales of solution projects. Thus, the study links a part of the theoretical base of the thesis and the context of the thesis. For the purpose of the thesis, Publication 4 offers preliminary understanding on network pictures in solution type of businesses.

4.5 Publication 5 - Understanding the Revisioning of Network Pictures – Insights from an Agent Based Modeling Approach

Objective

The objective of Publication 5 of the thesis is to increase the understanding on the dynamic nature of network pictures. The objective is approached by longitudinal study of the relation between the change in the network and an actor's ability to revise the network picture. The dynamic nature of network pictures is approached by linking the actor's ability to revise the network picture to the changes in the business environment, and thus an attempt is made to understand how these are entwined. The dynamism of the business environment is controlled by the interval time of changes, the amplitude of changes, and the trend of changes.

Findings

The results of the simulation research show that a manager with a fast ability to revise the network picture performs better than a manager with a slow ability to revise the picture. The results indicate that when the interval time of change in the network increases, fast revisers benefit even more than slow revisers. However, the results show that as interval time increases to its extreme, the performance gap between fast and slow revisers narrows. In addition, the results indicate that an increase in the change of amplitude leads to better performance of a fast reviser. The final control variable, the trend of changes, exhibits more interesting behavior. According to the results, in a totally chaotic environment with a low trend of changes, faster revisioning is of truly great importance. However, once the trend of changes increases, the relative benefit of being a fast reviser diminishes greatly. Only the interaction between the interval time and trend variables is statistically significant. The results show that when both interval of changes and trend are low, a fast reviser appears to perform substantially better than a slow reviser. However, an increase in the trend of changes in the business environment equalizes the performance differences of both. In addition, the results indicate that when interval time increases, a fast reviser benefits more than a slow reviser; but when the interval time of changes is extremely high, the benefit to the fast reviser diminishes.

Contribution

By researching the relation between decision quality and an individual's ability to revise the network picture, the main contribution of the publication lays in the discussion of managing in a network (Ford, Gadde, Håkansson, and Snehota, 2003; Corsaro, Ramos, Henneberg, and Naudé, 2011). The findings of the publication enhance the understanding on which types of business environment merit a firm's investment in revisioning ability. In addition, the present study answers the call for longitudinal research on network pictures (Colville and Pye, 2010) by employing simulation as the research method. This research is one of the first attempts to study network pictures longitudinally, thus it offers a reference to continue researching the dynamics of network pictures.

Role of Publication 5 in the thesis

Publication 5 researches the dynamics of network pictures and thus provides an understanding on the effects of the changes of network pictures. Thus, the study links the concept of network pictures to their development. This understanding is required in the thesis as it studies the amalgamation of network insight with individual network pictures, which requires a change of network pictures at the personal level.

4.6 Summary of Publications 1 to 5

The five publications of the thesis have their own role in the thesis as introduced above. These publications build an understanding for the final conclusions of the thesis. Table 7 summarizes the publications by introducing briefly the titles, objectives, research questions, methods utilized, data sets, main findings, and main contribution of individual publications. Thus, the overview of the publications provides a basis for the conclusions drawn in the following chapter.

Table 7. Overview of the publications and their main findings

	SOLUTION BUSINESS	INTERNAL COMMUNICATION		NETWORK PICTURES	
	Publication 1	**Publication 2**	**Publication 3**	**Publication 4**	**Publication 5**
Title	Supplier's Internal Communication in Change Process to Solution Business - Challenges and Tentative Research Agenda	A Social Network Analysis of Internal Communication in a Matrix Organization – The Context of Project Business	Supplier's Internal Communication Network during the Project Sales Process	A Paucity of Person's Perceived Power within Industrial Project Sales	Understanding the Revisioning of Network Pictures – Insights from an Agent Based Modeling Approach
Objectives	To increase understanding on the supplier's internal communication challenges in the change process to solution business.	To enhance understanding on customer related internal communication between the functional and divisional structures of a matrix organization during the early phases of the project sales process.	To determine key factors influencing internal communication in project sales networks.	To increase understanding on the person's perceived power in the early phase of a project sales process.	To shed light on the dynamic nature of network pictures.
Research questions	RQ1: What are the supplier's internal communication challenges in the change process to solution business?	RQ1: What type of internal communication interface is formed between the functional and divisional matrix structures during the early phases of the project sales process?	RQ1: What type of communication network is formed during the early phases of the project sales process? RQ2: What are the barriers to, and drivers of, efficient internal communication during the early phases of project sales process?	RQ1: How do persons involved in project sales perceive their power in the early phase of the project sales process?	RQ1: How does a manager's ability to revise the network picture affect the quality of decisions in a dynamic business environment?
Method	Multiple case study; content analysis,	Single case study; social network analysis; content analysis.	Single case study; social network analysis; content analysis.	Single case study; content analysis.	Agent based modeling.
Data	Empirical, 12 semi-structured interviews in two case companies.	Empirical, 10 semi-structured interviews, and questionnaires (n=23).	Empirical, 10 semi-structured interviews and questionnaires (n=23).	Empirical, 16 semi-structured interviews and questionnaires (n=17).	Simulated.

Main findings	There are eight main internal communication challenges when a supplier changes to solution business: 1) Assembling executors 2) Mindset of executors 3) Mindset of masses 4) Organization structure 5) Supporting technical tools 6) Number of involved actors 7) Internal cooperation 8) Changed customer interface	Internal communication network in the early phases of project sales is complex, involving multiple actors. The representation of the functional organization in the internal communication network in the early phases of project sales appears to be rather poor. Matrix organization structure's role as an improver of internal communication in the early phases of project sales appears to be inadequate.	Internal communication network during the project sales process includes persons from various hierarchical levels and organizational units. During the project sales process, a group of persons stands out in the internal communication network, exerting considerable power over internal communication. Four main barriers hindering internal communication can be identified: 1) Unregulated usage of technical systems; 2) Unsystematic and unstructured documentation; 3) Neglecting the impact of cultural differences; 4) Personal politicking and four main drivers promoting the internal communication, which are 1) Open communication atmosphere, 2) Non-hierarchical organization structures, 3) Variety of alternative communication channels, and 4) Communication training.	Persons involved in the sales process perceive their own power during the project sales as being less than other persons' power, although their interest in the project was equal to that of the others. In addition, the study suggests that the exiguity of perceived power during project sales affects a person's decision making and communication.	A manager with a fast ability to revise the network picture benefits more in a dynamic business environment than a manager with a slow ability to revise the picture. However, an increase in the trend of changes in the business environment equalizes the performance differences of fast and slow revisers. In addition, when interval time of changes is in its extreme (high or low), the benefit to the fast reviser diminishes.
Main contributions	The study contributes to the solution business literature and practice by suggesting a framework to overcome internal communication challenges in change to solution business. In addition, the study introduces a research agenda to further study the challenges in the strategic change process to solution business.	The study furthers understanding on the internal communication patterns in a matrix organization during the early phases of project sales.	The study increases understanding on the nature of internal communication in project sales and provides suggestions to advance the project marketing research and practice. In addition, the study answers the call to integrate project management with project sales and marketing perspectives by studying the project management process of communication during project sales.	The study continues the research on power in the context of projects and sheds light on the early phases of the projects from the perspective of perceived power.	The study contributes to the discussion on the relation between network pictures, networking, and network outcomes researching the relation between decision quality and an individual's ability to revise the network picture. Second, the study offers a dynamic and longitudinal perspective on network pictures research, employing simulation.

5 CONCLUSIONS

The extant research has found that operating in a business network is fundamentally based on a person's subjective perceptions of the network. A company's capability to enhance common network insight is argued to lead to competitive advantage. However, developing these individual network pictures to a common company level network insight is a challenge for companies. According to the extant theory, these dispersed pieces of atomized network pictures can be unified to a common network insight through an amalgamation process comprising processes of multilateral exchange, manifold rationality, and recursive time. However, the extant body of literature appears to lack understanding on the role of internal communication in the formation of a network insight. Nonetheless, enablers/barriers of the amalgamation process provide an indication that understanding intraorganizational interaction plays a substantial role in forming organization level network insight. Thus, there appears to be a research gap. This gap is addressed in the present thesis. The purpose of the thesis is to enhance the understanding on internal communication in the amalgamation of network pictures to network insight in a solution business setting. To fulfill this purpose the following main research question was addressed.

> *What is the role of internal communication in the amalgamation of network pictures to network insights in solution business?*

In addition, six sub-research questions were addressed. These sub-questions form the basis of the answer to the main research question. The sub-research questions were addressed in the five individual publications in the second part of the thesis.

To satisfy the purpose of the study, the present thesis describes the research gap based on the extant literature in Chapter 1. The conceptual ground of the study is introduced in Chapter 2 by discussing the extant literature on the industrial network approach, network pictures and insights, internal communication, and solutions business. Chapter 3 includes the research design with the research approach, methodological choices adopted, and data collection and analysis. Chapter 4 briefly introduces the publications included in part two of the present thesis. In this chapter the objectives, findings, contribution, and the role of the individual publications in the thesis are summarized. Finally, in Chapter 5, the overall conclusions of the thesis are introduced in terms of theoretical and managerial implications. Derived from the results of the individual publications and the synthesized understanding gained during the research process, the thesis tentatively suggests that internal communication plays a substantial role in the amalgamation process of individual network pictures to network insight as it is a base of multilateral exchange, an intensifier and maintainer of manifold rationality, and an explicator of recursive time. In addition, the role is found to be emphasized in solutions business as it appears to require more advanced network insight for cross-functional collaboration.

5.1 Theoretical implications

The theoretical and conceptual ground of the thesis was mainly built on the literature concerning network pictures and insights, internal communication, and solution business. Thus, the theoretical implications of the present thesis address various frontiers. These implications to the theory are discussed in the following sub-sections.

5.1.1 Contributions to network literature

First, based on the results of the individual publications, internal communication is found to play a substantial role in multilateral exchange; for example, enabling knowledge transfer between individuals across organizational functions without the need to switch duties to understand each other's perspectives. In addition, intensive internal communication is needed to create manifold rationality. In other words, while a snippet of information can be important for a manager and the same information can be important for another manager from another facet, an understanding on the needs and perspectives of others has to be obtained. Furthermore, while it is not necessary to spread widely all information, achieving manifold rationality assists with rationalizing the communication flow. In addition, internal communication is needed to explicate the usually differing time perspectives of others. Having good comprehension of others' differing time perspective enables individuals to time their actions and reactions more efficiently, for example communication and its content. In that, internal communication plays substantial role, since being a central process to create that comprehension. Specifically, the role of developing a common network insight is substantial in solution business, in which effective cross-functional collaboration is required to create innovative solutions. Thus, as a whole, the present study demonstrates that internal communication plays a substantial role in the amalgamation process of network pictures to network insight, thereby contributing to the emergent discussion on network insights (Mouzas, Henneberg, and Naudé, 2008).

Second, identification of the imbalance of internal communication between functional and divisional matrix organization structures contributes to the amalgamation process (Mouzas, Henneberg, and Naudé, 2008). According to the finding, it might be argued that the matrix organization structure's role as an intensifier of multilateral exchange in the early phases of project sales process is inadequate (Publication 2). In addition, challenges in manifold rationality might lead to the separation of an internal communication network into cliques. Thus, a broad network insight might not be formed, but separately formed with differing perceptions on the surrounding business network.

Third, the study contributes to the discussion on the relation between network pictures, networking, and network outcomes (Ford, Gadde, Håkansson, and Snehota, 2003; Henneberg, Naudé, and Mouzas, 2010; Corsaro, Ramos, Henneberg, and Naudé, 2011), and researches the relation between decision quality and an individual's ability to revise a network picture (Publication 5). More precisely, the findings extend understanding on which types of business environment merit a firm's investment in its revision ability; for example, by enhancing the information flow concerning the business environment. In addition, the present study answers the call for longitudinal research on network pictures (Colville and Pye, 2010) by offering a dynamic and longitudinal perspective on network pictures research, employing simulation and, more precisely, agent based modeling (Schelling, 1969; Macal and North, 2006; Gilbert, 2008).

5.1.2 Contributions to the project and solution literature

First, the study suggests a framework to overcome internal communication challenges in the change to solution business (Publication 1), and thus contributes to the research on solution business. The framework is particularly relevant in the solution business setting in which intraorganizational communication is emphasized (Cova and Salle, 2007; Tuli, Kohli, and Bharadwaj, 2007). Based on the extant literature on solution business, internal communication, change processes, and analysis of the two illustrative cases, it is suggested

that internal communication challenges in the change to solution business can be placed in eight primary categories during the three phases of the change. The framework addresses the research gap in solution business research. As such, the study continues the line of argument advanced by Davies, Brady, and Hobday (2006), Cova and Salle (2007), and Matthyssens and Vandenbempt (2008). In addition, the study indicates that the role of network insight in solution business is substantial as collaboration between organizational units is required.

Second, a research agenda is offered to study further the change to solution business from the internal communication perspective (Publication 1). The research agenda comprises five topics that should be researched. The agenda contributes to the body of the literature on solution business as it provides a preliminary categorization of the most interesting research topics. By utilizing the agenda, future research can be focused on the research areas that have theoretical and practical relevance.

Third, the study contributes to the body of the literature concerning organization structures (Publication 2), and more specifically to the discussion on a matrix organization structure's capability to enhance internal communication (Ford and Randolph, 1992; Turner, Utley, and Westbrook, 1998; Kupernas, 2003; Sy and Côté, 2004; Wellman, 2007; Laslo and Goldberg, 2008). The extant discussion is overshadowed by disagreement on whether the structure enhances communication or not. The study demonstrates that internal communication network in the early phases of project sales are complex and involve multiple actors. However, representation of the functional organization in an internal communication network during the early phases of project sales appears to be rather poor. Derived from the imbalance in a communication network between functional and divisional matrix structures, and a narrow communication interface between the matrix structures, it can be argued that the matrix organization structure's role as an improver of internal communication in the early phases of the project sales process appears to be inadequate.

Fourth, the study increases understanding on the nature of an internal communication network during a project sales process (Publication 3). The study empirically establishes that an internal communication network during the project sales process includes persons from various hierarchical levels and organizational units. In addition, during the project sales process, a group of persons stands out in the internal communication network, exerting considerable power over internal communication. Thus, the study contributes to the body of the literature on project marketing (Cova and Holstius, 1998; Cova, Ghauri, and Salle, 2002; Cova and Salle, 2007) and project management (Artto and Kujala, 2008; Eskerod and Riis, 2009; Ingason and Jónasson, 2009). From the perspective of the amalgamation process, the findings shed light on the extent and nature of multilateral exchange in a company. It can be argued that in a large company with a complex organizational structure, internal communication plays the role of a unifier if this structure is substantial. Especially when selling complex projects, this role is emphasized as the combination of involved persons in the sales process changes.

Fifth, the study contributes to the research on project marketing by identifying the main barriers and drivers for effective internal communication during the project sales process (Publication 3). The extant understanding on internal communication in project management was not extended to project marketing, and there has even been a call for integrating project management with project and marketing perspectives. Thus, research on internal communication during the project sales phase was required. Identification of these main barriers and drivers provides a basis to research the approaches to developing internal communication during project sales. Intensified internal communication might be manifested

to a customer as more consistent communication with the supplier, faster information propagation, and more sophisticated solutions to needs. From the perspective of the amalgamation process, identified barriers and drivers indicate the factors that possibly restrict or enhance multilateral exchange.

Finally, the present study contributes to the research on project business by illustrating a person's perceived power within the sales of a complex industrial project (Publication 4). According to results, during the early phases of the project, when uncertainty is high, work roles are not established, and network pictures are not validated, the persons involved in the sales process perceive their own power during project sales to be less than other persons' power, although their interest in the project was equal to that of the others. In addition, the low perceived power level is found to have an effect on a person's decision making and communication. Thus, the study extends the research on power in the context of projects (Vaaland and Håkansson, 2003; Aaltonen, Kujala, and Oijala, 2008) and sheds light on the early phases of projects from the perspective of perceived power. From the perspective of the amalgamation process, the findings shed light on the factors that might restrict the multilateral exchange that is a barrier/driver of the process (Mouzas, Henneberg, and Naudé, 2008). The findings indicate that when perceived power is at a low level, the internal communication required for manifold rationality might be inefficient.

5.2 Managerial implications

Managerial implications are drawn from the findings and conclusions of the present study. At the broader level the implications help practitioners in developing the common perception of the surrounding business network, termed network insight. Achieving sophisticated network insight enhances, among other aspects, the cross-functional collaboration and knowledge transfer needed especially in solution business. Thus, *first,* the thesis offers an introduction to the importance of network insight in solution business. In addition, the thesis introduces the amalgamation process including the barriers and drivers to develop network insight. Thus, managers should adopt the amalgamation process suggested by Mouzas, Henneberg, and Naudé, (2008) as a framework to build network insight in their company.

Second, the thesis proposes a framework to tackle the challenges of internal communication during change to solution business (Publication 1). For example, assembling executors with a proper mandate and defining the characteristics of solution business in the case of a particular company, especially in the early phases of the change, plays a large role in the success of the change. In addition, according to the findings, the role of sales in the change process to solution business is substantial. Thus, selling the first solution as a reference for others should be supported (see Salminen and Möller, 2006). Lessons from the first case can be employed to support a change in the mindset of other persons in the company. Furthermore, as addressed by the study, internal communication plays a substantial role at every step of the change. Thus, to succeed, managers should plan how to communicate effectively and efficiently during the change. Enhancing internal communication is required when operating in solution business, as cross-functional collaboration enables the harnessing of all potential knowledge in creating innovative and unique solutions for customers. Utilizing the framework in a systematic manner offers a means to avoid failure of the change process to solution business.

Third, the study demonstrates the weakness of a matrix organization structure in assuring effective internal communication, especially in the early phases of the project sales process

(Publication 2). The study does not suggest that the matrix organization structure is a poor organizing choice; it simply demonstrates a weakness that can be tackled with proper actions. The findings of the study are of particular significance to companies operating in project business. As projects are discontinuing and unique, a project network has to be reformed every time a project begins. Usually, participants change, at least partially, between projects. Thus, for example, a project manager should emphasize communication flow in the early phases of project sales in those areas where it is needed also in the later phases of project sales. A means to enhance cross-functional collaboration is to ensure that relevant employees in both organizational functions acquire a description of the sales process, actors, and their relationships, by defining explicitly the process for knowledge transfer during project sales.

Fourth, the study demonstrated the complexity of internal communication networks during the early phases of project sales, and offers a framework to avoid the barriers of internal communication and promote the drivers of internal communication (Publication 3). The present study suggests that as there is a group of prominent parties in a communication network, these persons need to be identified to support the information flow in the network. For example, employing social network analysis, by conducting research on or even as an implementing method in the communication system, managers can identify key actors in the communication network (see Mead, 2001). In addition, the framework developed in the study enables the development of internal communication in a systematic manner. By diminishing the barriers and promoting the drivers, practitioners can facilitate knowledge integration and, in turn, become more competitive in sales situations. Defining the rules of communication and ensuring that everyone follows these rules can have a great impact on the effectiveness of communication. In addition, in building technical systems, one method with which to improve the quality of information is to avoid employing open fields in which information can be entered in various formats. Thus, confusion when retrieving information can be avoided.

Fifth, the study demonstrates the perceived power levels during the early phases of a project sales process and concludes that the perceived power is low although interest in the project is equal. This applies to decision making and communication. Thus, managers should observe and nurture the perceived power levels of employees. Managers can observe the perceived power by employing the power/interest matrix. The data on the matrix can be collected, for example, with questionnaires as in Publication 4. With the results, managers can evaluate the necessity for any actions. If actions are required, a method to observe and enhance perceived power is to employ superior-subordinate discussions in which an employee can express his/her perceived power. Still, perceived power can be a sensitive issue for discussion, in which case parallel methods should be developed to measure and support the perceived power of an individual actor.

Finally, the study reveals business network characteristics in which the support of network picture revisioning is beneficial and, conversely, those where the investment in the revision is not particularly beneficial (Publication 5). In business networks that require fast revisioning of network pictures, managers should invest in the provision of information concerning a business network to their employees more efficiently. Conversely, these resources should be targeted to other needs if the characteristics of a business network do not require fast revisioning. Concretely, an approach to making the network visible, for example, is the utilization of the social network analysis method. The results should be discussed with employees. However, this method is more suitable for obtaining a preliminary understanding rather that ongoing surveillance and, thus, other means should also be utilized. Taking advantage of cross-functional teams to share perceptions on the surrounding network between

organizational units in a controlled manner might be a means to ensure the efficient revisioning of network pictures.

5.3 Suggestions for further research

As is usual when conducting research, answering one question tends to lead to the appearance of other questions. Thus, the present thesis also opens some future avenues. *First*, the present study addresses the amalgamation of individual network pictures to network insight and, further, it researches the role of internal communication in that process. Although the concept of network pictures has attracted substantially more research interest than network insight in the extant literature, it does not consider the role of network insight a developer of individual network pictures. As the extant understanding maintains, network pictures are shaped by the ongoing sense-making process of the surroundings, and that sense-making is affected by information from both outside and inside the company. However, the extant literature has not researched the divergence of these sources of information. More specifically, the link from network insights to the sense-making process of network pictures has not been researched. Thus, questions concerning how the sophistication of network insight impacts the effectiveness of making sense of the surroundings, and whether their relationship is linear or curvilinear, might be raised. Simulation can provide a means with which to tentatively approach these questions.

Second, the present study focuses mainly on the role of internal communication during the early phases of project and solution sales. Thus, more studies are needed on other phases to gain a broader understanding on the role of internal communication in the amalgamation process. It can be expected that after the project or solution is sold, and when the sales and marketing functions are transferring responsibility more to the organization's operational units, the role of internal communication changes. In addition, it is expected that failure to fulfill obligations in the early phases might be manifested as problems. Thus, future research should address questions such as how the role of internal communication in the amalgamation process changes in various phases of project sales.

Third, in the thesis, the focus is only on internal communication and excludes the role of external communication in the amalgamation process. It might be expected that external communication also plays a substantial role; however, this might differ from the role of internal communication. External communication, for example, might be biased intentionally or unintentionally by the purposes of an external actor. Bias might lead to the development of network insight in an unfavorable manner and thus negatively impact the sophistication of a company's network insight. The role of external communication might be approached by making a network picture visible in the manner suggested by Ramos and Ford (2011); in which case, the individual network picture might be regarded longitudinally and an attempt made to determine the role of external information. However, by this method, researching the role of external communication is conducted through network pictures instead of directly researching network insights. Nonetheless, this might provide an approach as the extant research does not provide a means to make network insight visible.

In sum, research on the amalgamation process of network insights seems to offer fruitful future research field that have substantial practical relevance. Furthermore, to encourage further research, it is hoped that this study has provided a perspective on the importance of internal communication, and its diversity in the amalgamation process of network insights, and more broadly, in B-to-B companies.

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APPENDIX 1: INTERVIEW FRAME 1 (PUBLICATION 1)

Background information (5 min)

Describe the concept of solution (10 min)

Draw a sketch depicting the network during a typical solution case, which in your opinion describes best the network setting in solution business (15 min)

Describe the change process from equipment to solution provider in your company (20 min)

Describe the challenges in each development step in more detail (20 min)

How the challenges are changing in the future? (10 min)

Is there anything else to add? (10 min)

APPENDIX 2: INTERVIEW FRAME 2 (PUBLICATIONS 2-4)

Background information:

Nature of internal communication:

Project sales process:

Clarification of the studied case:

- Description and timeline of the studied case
- Internal communication during the studied case

Additional comments:

APPENDIX 3: INTERVIEW FRAME 3 (PUBLICATION 4)

The concept of power:

Individual actor's *power* in the context of project marketing:

Individual actor's *perceived power* in the context of project marketing:

***Your answer* in the power/interest matrix at the questionnaire (June 2008):**

***Average answer* in the power/interest matrix at the questionnaire (June 2008):**

APPENDIX 4: INTERVIEW DATA (PUBLICATIONS 1-4)

Nr	Firm	Respondent	Date	Duration
1	A	Chief Strategy Officer	20.5.2009	59 min
2	A	Senior Vice President	24.6.2009	68 min
3	A	Vice President	24.6.2009	60 min
4	A	Chief Technology Officer	25.6.2009	110 min
5	B	Director	26.3.2010	62 min
6	B	Senior Vice President	26.3.2010	50 min
7	B	Director, Channel Partnerships and Development	26.3.2010	80 min
8	B	Head of Customer Commitment	26.3.2010	79 min
9	B	Executive Vice President	29.3.2010	80 min
10	B	Head of R&D, Project Office	29.3.2010	58 min
11	B	Executive Vice President	29.3.2010	65 min
12	B	Head of Project Management Office	29.3.2010	50 min
13	C	Director	06.3.2008	49 min
14	C	Sales Manager	06.3.2008	57 min
15	C	Marketing and Sales Director	06.3.2008	64 min
16	C	IT Specialist	28.3.2008	101 min
17	C	Marketing and Sales Director	28.3.2008	45 min
18	C	Marketing and Sales Manager	28.3.2008	17 min
19	C	Director, Straddle Carriers	28.3.2008	42 min
20	C	Project Manager	11.4.2008	22 min
21	C	Director	30.4.2008	58 min
22	C	Marketing and Sales Director	14.5.2008	34 min
23	C	Sales Manager	20.3.2009	55 min
24	C	Project Manager	20.3.2009	52 min
25	C	Sales Director	20.3.2009	55 min
26	C	Director	20.3.2009	52 min
27	C	Marketing and Sales Director	20.3.2009	68 min
28	C	Director	23.3.2009	40 min
				Sum: 1,632 min
				Average: 58 min

PART 2: PUBLICATIONS

PUBLICATION 1

Ryynänen, H., Pekkarinen, O., and Salminen, R.T. (2012),

Supplier's Internal Communication in Change Process to Solution Business - Challenges and Tentative Research Agenda.

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Supplier's Internal Communication in Change Process to Solution Business - Challenges and Tentative Research Agenda

Harri Ryynänen · Olli Pekkarinen · Risto T. Salminen

Abstract: This research examines supplier's internal communication when a company is changing to being a solution provider. The focus lies on the internal communication challenges during the change. The qualitative case study comprises two cases of the change process to solution business. The results indicate that there are eight main internal communication challenges when a company is changing to being a solution supplier. In addition, the study offers a categorization to manage these challenges and conduct further research thereon.

Keywords: Internal communication · Solution business · Change process · Empirical research · Case study

Introduction

One of a company's main strategic tasks is to manage its value creating logics. Ever fiercer competition, and market globalization, have among other factors pushed companies towards more networked value creating logics (Fang, Paltimatier and Steenkamp 2008, Jacob and Ulaga 2008, Jalkala, Cova, Salle and Salminen 2010). Thus, it is said that a company's strategy is the art of positioning itself correctly in the value network (Normann and Ramirez 1993). Refocusing strategy in the value network has generated an extensive body of academic literature (Ulaga and Eggert 2006; Peppard and Rylander 2006, Matthyssens and Vandenbempt 2008). According to the literature, a customer's needs are attempted to satisfy through the relational process of

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co-creating value with the customer and network partners (Holm, Eriksson and Johanson 1999, Kothandaraman and Wilson 2001, Tuli, Kohli and Bharadwaj 2007). Thus, companies have been evolving from offering something to the markets, to offering with the markets (Vargo and Lusch 2004). The academic discussion has generated various concepts adopting slightly differing perspectives on the issue. Probably the most common concepts are solution business (Sawhney 2006, Davies, Brady and Hobday 2007, Tuli, Kohli and Bharadwaj 2007), service business (Olivia and Kallenberg 2003, Vargo and Lusch 2004, Fang, Paltimatier and Steenkamp 2008, Gummerson and Mele 2010), system selling (Mattson 1973, Hanan, Cribbin and Donis 1978, Günter and Bonaccorsi 1996), and project marketing (Cova, Ghauri and Salle 2002, Skaates and Tikkanen 2003). However, changing position and focus in the value network closer to customers, has proved to be quite a challenge for supplier companies (Davies, Brady and Hobday 2006, Matthyssens and Vandenbempt 2008). Pricing offerings, overcoming a lack of internal trust regarding the economic potential, and deploying a successful strategy have been found to set a great challenge for the change process (Olivia and Kallenberg 2003, Sawhney 2006, Tuli, Kohli and Bharadwaj 2007). In addition, an organization's external and internal communication has been recognized as one of these challenges (Cova and Salle 2007).

The existing literature focuses on the role of internal communication during organizational change (e.g. Daly, Teague, and Kitchen 2003, Proctor and Doukakis 2003), and there are studies on change in the value network, moving closer to customers (e.g. Davies, Brady and Hobday 2006, Tuli, Kohli, and Bharadwaj 2007, Matthyssens and Vandenbempt 2008). However, there seems to be a dearth of studies focusing specifically on the role and challenges of internal communication during the change process to a new business model, although their importance is noted. In addition, there is a paucity of understanding on how these internal communication challenges vary during separate phases of the change process to the new business model. In the present study, the solution business literature is predominantly followed, since its established position in the academic literature and the concept depicts the studied phenomenon sufficiently. The research gap is approached with a research question: *what are the supplier's internal communication challenges in the change process to solution business?*

The complex social phenomenon of the study is approached through a qualitative case study (Miles and Huberman 1994, Yin 2008) comprising two case companies. They have been selected to represent actors operating in business-to-business markets, and that have recently developed their organization towards the solution business. In addition, the cases represent a typical company expanding value propositions through solution business. The structure of these case companies is complex, with a substantial number of internal actors, and thus the internal communication challenges are well represented. The study identifies the main internal communication challenges when changing to solution business. The results of the study show that there are eight main internal communication challenges when a supplier is changing to solution business. The present study contributes to the solution business literature by suggesting a framework to overcome internal communication challenges in the change to solution business. In addition, the study introduces a

research agenda for further study on the challenges in the strategic change process to solution business.

Solution business

The solution concept has been an object of great interest during recent years, and thus has generated a quite extensive amount of research (e.g. Sawhney, 2006; Davies, Brady, and Hobday 2007, Naudé et al. 2009). Tuli, Kohli and Bharadwal (2007, p. 5) have defined the customer solution concept as follows: "A solution is a set of customer-supplier relational processes comprising customer requirements definition, customization and integration of goods and/or services and their deployment, and post-deployment customer support, all of which are aimed at meeting customers' business needs". Thus, a solution is not just a customized bundle of goods and services that is exchanged for a price – it is more like an ongoing relational process in which value is co-created by defining, meeting, and supporting a customer's evolving needs. Although there is no unanimous and rigorous definition of the solution concept, the level of integration and customization are perceived to increase when offering solutions (Sawhney 2006, Davies, Brady, and Hobday 2007, Nordin and Kowalkowski 2010).

Gaining profit through delivering complex solutions, instead of goods or services, has proved to be quite a challenge (Tuli, Kohli and Bharadwaj 2007). Offering the solutions requires that the breadth of interaction with a customer is greater and the knowledge base is utilized more efficiently, which imposes on the organizational units a greater dependency on each other (Cova and Salle 2007, Tuli, Kohli and Bharadwaj 2007). Olivia and Kallenberg (2003) studies change in the value network through the service business concept and notes that there are three successive hurdles: first, the lack of trust in the economic potential of the service; second, the thought that the service is beyond the scope of the company's competencies; and third, failure in deploying a successful service strategy. Furthermore, a gap in analytic thinking between headquarters and operational managers forms an internal barrier when moving towards solution business (Matthyssens and Vandenbempt 2008). Cova and Salle (2007) take a marketing based view on solutions and found that an organization must manage four challenges: the change in the orientation of the firm, the need for new capabilities and skills, the transformation of the structure and processes within the organization, and the implementation of the transformation process within the organization. Davies, Brady and Hobday (2006) found that changing the mindset of thousands of employees with a vision of traditional products and services is perhaps the most significant barrier when moving towards solution business. The simple biases towards solution business were also found to be a barrier to transformation.

Role of internal communication in organizations and change processes

The existing literature offers several concepts to describe the phenomenon of intra-organizational information sharing, such as employee communication (Frank and Brownell 1989), corporate communication (Argenti 1996, Cornelissen 2004), internal

marketing (Ballantyne, Christopher and Payne 1995), business communication (Reinsch 1996), management communication (Smeltzer 1996), organizational communication (Mumby & Stol 1996), and internal communication (Smythe 1996, Scholes 1997, Bovée, Thill and Schatzman 2003, Mounter 2003, Mazzei 2010). The present study adopts the concept of internal communication, since it has a clear focus on the internal activities coordinated by managers and takes into account all levels of the organization, including formal and informal communication. In addition, the concept is utilized successfully in the previous studies researching organizational change (Daly, Teague, and Kitchen 2003, Proctor and Doukakis 2003).

Internal communication is regarded as a crucial value producing process for organizations, and is suggested to be one of the prime management tasks in companies (Zahay and Peltier 2008). Previous studies have shown that the competent management of customer-related information is a prerequisite for the successful management of customer relationships (Möller and Rajala 1999, de Chernatony and Segal-Horn 2003). Marketing activities are increasingly spread among several organizational units, such as multifunctional teams and account management systems, thus the role of internal communication is emphasized. At the same time, the emphasized role of internal communication has led to an increase in communication methods and channels (Bovée, Thill and Schatzman 2003). The amount of received information is increasing rapidly, creating an information overload (Edmunds and Morris 2000). Thus, the challenge seems to be getting the right information at the right time, rather than simply an amount of information (Mounter 2003, Bovée, Thill and Schatzman 2003). A variety of technology based communication tools has been developed to intensify internal communication. However, employees usually fail to use the technology in the intended fashion (Peters and Fletcher 2004). In addition to discriminating between useful and useless information, the failure to take cultural differences into account, and managers' inability to evaluate their effectiveness as communicators, are perceived to be the challenges of internal communication (Quirke 1996, Bovée, Thill and Schatzman 2003, Mounter 2003, Jabri, Adrian, and Boje 2008).

Many areas of business today are subject to significant change due to e.g. globalization, shorter business cycles, and technological advances. In turn, the constant changes in the business environment drive companies to change. These planned changes are often conceptualized as processes, described as a sequence of single or collective events that describe how things change over time (Van den Ven 1992, Pettigrew, Woodman, and Cameron 2001). Academics have introduced various models to depict change processes (e.g. Burke and Litwin 1992, Kotter 1996), but none has as yet generated a broader awareness than Lewin's (1947) change model. Although Lewin's model has faced some criticism (Dawson 1994, Johnstone, Dainty, and Wilkinson 2008), it is said to be a suitable framework to discern a change process and conceptualize a planned change (Hendry 1996, Greer and Ford 2009). Lewin (1947) conceptualized change as a process with three phases: unfreezing, moving, and refreezing. The first phase, unfreezing, initiates the change by constructing the base for the change. The phase begins when the need for change is detected and it may vary in source and form (Zand and Sorensen 1975). In addition, the phase includes recognizing and assembling the driving forces for change. The second phase, moving, comprises choosing the course of action from the alternatives, the

modification of behaviour, and obtaining new work patterns. The final phase, refreezing, seeks to stabilize the company in a new quasi-stationary equilibrium (Burnes 2004). In other words, it is time to reap the rewards and ensure the organization is relatively safe from regression.

The significance of internal communication in change processes has been widely recognized. Incompetent internal communication is perceived as one of the main reasons for failure in change processes (Murdoch 1997). Furthermore, Harshman and Harshman (1999) have noted that communication within the organization is a key factor impacting how well the organization performs during the change program. Change requires taking several internal communication issues under consideration, such as the company's size, structure, corporate cultures, ownership and corporate politics (Daly, Teague and Kitchen 2003). Furthermore, trust is an important part of change (Proctor and Doukakis 2003). Smythe (1996) has recognized that communication has two key objectives in change management. The first is to create understanding, for those who need to adopt new processes, of what will change and the reason for the change. The second is to establish a process whereby employee expertise and knowledge can usefully impact the change and its design.

The existing literature focuses on the role of internal communication during organizational change (e.g. Daly, Teague, and Kitchen 2003, Proctor and Doukakis 2003) and the change from a goods dominant company to a solution provider (e.g. Davies, Brady and Hobday 2006, Tuli, Kohli, and Bharadwaj 2007, Matthyssens and Vandenbempt 2008). However, there seems to be a dearth of studies on the role and challenges of internal communication when changing position in the value network towards customers, although its importance is noted (Cova and Salle 2007). In addition, there is a call for further studies on the coordination mechanisms that improve intra-organizational effectiveness in solution business (Sawhney 2006). Thus, the present study attempts to fill the gap and research a supplier's internal communication challenges in the change to solution business.

Research design

The case study strategy was selected as the main research approach for the present study, since there is only limited prior knowledge of the studied phenomenon (Yin 2008, Eisenhardt 1989). According to Yin (2008), the need to understand complex social phenomena such as internal communication supports also the choice of the case strategy. The selection of the studied case companies was made by means of theoretical sampling (Eisenhardt and Graebner 2007), following the guidelines of Yin (2008). The selected case companies represent organizations operating in business-to-business markets, which have recently developed to solution business. Furthermore, the organization structures of the selected case companies are complex, including a substantial number of internal actors. Thus, the internal communication challenges are well represented. The first case illustrates a setup where a company has recently changed to solution business. The change has been enacted successfully in a fairly brief period of time. The second case illustrates an instance where the change towards solution business has not been particularly successful. Although the

second case company succeeded in transforming itself into a solution provider, it faced significant challenges.

The empirical data collection for this qualitative study was conducted through thematic interviews. The informants were chosen on the basis of possessing a broad understanding of the studied change process. In the first case, the interviews covered four upper level directors, and in the second case, eight upper level directors (n=12). The interviewees' function in the case companies varied (e.g. sales and marketing, services, research and development, human resources, project management, and production line management). The wide variety of functions enabled a broad representation of the issues a manager faces in the change process. The duration of the interviews was from one to two hours and they were audio recorded as well as transcribed. The themes covered in the interviews were: the concept of solution, the change process from equipment provider to solution provider, the challenges in each development phase in greater detail. In order to create a more in-depth overview of the case company, annual reports, company brochures, and the company's web pages were employed as a secondary data source.

The data analysis utilized three steps of inductive content analysis tradition: data reduction, data clustering, and data abstracting (Miles and Huberman 1994). In the data reduction phase, informants' expressions relating to the studied phenomenon were separated from the data. Expressions concerning issues such as solution business, internal communication, challenge, and organizational change were taken into account. In the data clustering phase, the expressions were categorized according to core consistencies and meanings. In the final phase, the categories were abstracted to the themes. The themes represented the internal communication challenges in the change process. In order to increase the validity of the study, the first and second authors followed the analysis process through separately and compared the results.

Case studies: recognizing internal communication challenges in the change process towards solution business

Our research on internal communication challenges leans on Lewin's (1947) three step model of a change process: unfreezing, moving, and refreezing. In the present study, the separate phases are understood as follows. In *the unfreezing phase*, the company outlines, among other factors, what the new strategy (solution business) would require and mean to its business. *The moving phase* starts after the decision to move towards the new strategy is taken and comprises, among other factors, organizational changes, changes in business networks, and retraining employees. *The refreezing phase* can be considered as a period of time after the first solution and includes, among other factors, operational and tactical decisions, improving communication, managing knowledge and controlling networks.

Case company Alpha: a supplier of metal-based solutions

Case company Alpha is a supplier of metal-based components, systems and integrated systems to the construction and engineering industries. Net sales amount to

almost 3,000 million euros and there are around 12,000 employees working in 27 countries across Europe, which makes internal communication challenging. Alpha is a good fit for this study, as it recently transformed itself from a traditional industrial materials supplier into a customer oriented solution provider.

The industry in which Alpha operates was subject to many mergers and acquisitions at the beginning of the 2000s. Alpha conducted an industry analysis in early 2003 and concluded since it was a relatively small actor in the market they should refocus their strategy or face the threat of becoming a victim of the ongoing consolidations. Thus, they decided to move towards customers in the value network to differentiate the company from its competitors. The solution business model seemed to be worth studying, so the industry analysis initiated the *unfreezing phase* of the change process. The core team of five persons started to study solution business and what it could mean to the company, first to determine what it would and would not imply. In addition, there was an emphasis on defining the goal of the change process. The core team had to figure out which kinds of resource they should acquire to be able to act efficiently as a solution provider. It became clear early on that acquisitions and recruitment would be necessary. One of the core team's most critical tasks was to sell the solution business idea to the company's top management. The decision to move towards solution business was made in summer 2003, which initiated the *moving phase*, where the number of persons included in the change process started to increase rapidly. At the early stage, Alpha began a massive recruitment drive to acquire know-how and a customer oriented mindset. For example, the Chief Strategy Officer noted:

"Traditionally there have been lots of good workers in the company, but starting to make this kind of a jump requires a huge amount of new in-house human resources."

During 2004–2008, the case company made 14 acquisitions to obtain the required resources. From an intra-organizational perspective, the change meant unlearning the former traditions as well as learning the new way of doing business. First Alpha had to make sure that everyone knew what solution business is and what changing towards it would mean. This raised opposition to the change. However, well organized communication proved to be a way in which to reduce the opposition. The Chief Strategy Officer and the Senior Vice President, Marketing noted:

"At the beginning the opposition to the change was significant, which is quite natural when starting suddenly to talk about a kind of business [solution business] that the company does not presently practice. That's why communication concerning the solution business was purposefully overemphasized."

"If you want to change the course of a big ship, you have to make clear choices. And in that kind of communication you cannot have any more than three messages."

The new business model would create some requirements in terms of technical support tools, such as an increased need to gather variable data from a wider and more profound customer interface. In addition, the need for a broader understanding of

the value network set some requirements for technical support tools. However, one of the main challenges was the changed role of the sales. Alpha had to change its customer portfolio to meet the solution offering and the change had to be communicated to the sales personnel. In addition, the sales personnel had to be trained for a more consultative style of selling as opposed to selling a bundle of goods and services. Besides the sales personnel, Alpha aspired to change the mindset of every employee to take the whole value network into account.

The creation of the first solution in April 2004 started the *refreezing phase*, where the focus is on moving away from the strategic level towards the tactical and operational levels. This phase includes developing, selling and delivering solutions. At an early stage, Alpha found that solution business requires a broad customer interface. In addition, the number of actors involved in solution sales and delivery was increasing. Thus, the management of information from several customers' actors was perceived as a great challenge. Globally spread actors made the situation even more challenging. Intensifying internal communication without inflicting information overload was also perceived to be a challenge. Alpha had further found that in the refreezing phase the intensifying interaction between organizational units is a great challenge. For example, the role of internal communication was found to be emphasized in pricing a solution, delivering a solution with high quality customer care, and internal learning of a solution.

Case company Beta: a supplier of environmental and industrial measurement solutions

Beta is a supplier of environmental and industrial measurement products and services to customers in meteorology, airports, roads, defence, energy, and various other industries. Beta has 1,400 employees in 12 countries, with net sales of around 210 million euros. Beta is an ideal case company, since it began its change process towards solution business in early 2003, and thus the challenges of the change process are clearly to the fore. In addition, broad access to the separate functions in the organization supports its selection as a case company.

As in the case of Alpha, Beta found itself in an industry undergoing fundamental change. Beta employed an external consultant to analyze the company's possible future directions. The consultant proposed two potential alternatives, either to focus clearly on component manufacturing or become a supplier of value added solutions. The decision to move towards solution business in 2003 began the *unfreezing phase* of the change process. Beta was highly enthusiastic about the solution business model and the decision to move that way was swiftly made. One challenge was to expend enough time and effort to define what solution business would require and to determine the change process goal. It became clear that there was no single person or team with an adequate mandate to lead and manage the change process. Although there were many people involved in the decision to move towards solution business, the responsible person or a team was missing at the later phases of the change process.

Beta's three divisions each had their own business model at the time, and thus selling the idea of solution business internally was challenging. The decision was

nevertheless made in late 2003, which initiated the *moving phase* of the change process. It was decided that the change would begin in a single division supported by functional units (e.g. services, project management, R&D, and human resources). Thus, the move towards solution business was not that visible at the company level as a whole. In addition, former changes in the business models had impacted attitudes towards business model changes. The Vice President of R&D unit put it thus:

"…we still have the challenge that we have been involved in almost every possible business that you can imagine."

Beta operates in a high-tech industry and has a tradition of highly educated personnel. Thus, Beta didn't feel the need to recruit more experts to understand the ways in which to customize offers to meet customer needs. In addition, Beta had already offered services to its customers and therefore didn't feel the need to invest in services either. With the exception of taking on a few new managers, Beta didn't recruit or make acquisitions, but started an internal six step program to transform itself into a solution business in the selected business division. Although Beta engaged in intra-organizational training and communication with regard to solution business, there was no clear and comprehensive message. Also the extent and amount of training seemed insufficient. Thus, the impact of the message was inadequate and the change didn't seem to be going forward. An executive vice president put the reason thus:

"I argue that it derives from the fact that our selling organization has long acted in an undisciplined and individualist manner."

The challenge presented by the changed sales process was noted also by the director in the sales and marketing department:

"…the information [from the customer] has to be shared, and you have to have experts who talk to other experts and share information, too. The time of the lone cowboy is totally over."

According to the director in the sales and marketing department, the first challenge in the internal communication of the changed sales process is twofold. First, the personnel interacting with the customer has to share the information and perceptions from the customer interface with the rest of the organization. In Beta, solution architects vacancies were established to act as a link between departments and thus create a greater insight into customer needs. Another method Beta employed was to use back office insights to build sales teams. However, as the Senior Vice President, Human Resources noted, the challenges for the back office to follow front office needs were substantial:

"I think that the great challenge is in the product development that can be quite apart from the customer… Or you have to have good mechanisms to mediate the customer needs and understanding the customer. In addition, since we are not transforming entirely to solution business, as we also have other kinds of business

models, this is quite a challenge for a product manager…to understand that the products are involved in the solutions as well as sold as single instruments."

The second challenge was that the organization's intellectual capital has to be utilized across departmental boundaries, but the change was occurring in only one of the three product departments. Thus, when the intensified internal communication was needed, it didn't work effectively. The inefficiency of interdepartmental communication emerged in the *refreezing phase* of the change process, when the organization started to provide solutions for its customers. The beginning of the refreezing phase was traced to 2006, when the first solution started to be built. However, opinions concerning the beginning of the refreezing phase varied substantially among the interviewees. Since changing to solution business was initiated from a single department, the persons with the changed mindset seemed to be alone at the beginning of the sales process. Although building the first solutions had required a substantial amount of resources, those first solutions were perceived important for internal education. The reference solution was communicated internally to create trust in solution business as well to educate especially sales personnel to change their mindsets. A director in the Services department depicts the effects of the change in the mindset.

"…we had a good [solution selling] case in 2006, when we had done the thinking work, and a customer contacted Beta. …the customer said that he wanted 12 sensors. He happened to call a person who has been involved in the solution business thinking, and he [the salesman] understood the need to ask a counter question, what are you going to do with those sensors. …the 12 sensors would be nice and easy to sell, but [by asking the question] the deal has grown tenfold. Still it is not the main thing, but we had learned through that case."

However, a person's mindset does not change unless the person has good reasons to change it. The challenge is that providing solutions is more time consuming than simply selling products. Thus, the former incentive system is no longer relevant. Reforming and communicating new incentive systems was found to be a crucial for the change process. A director in the sales and marketing department depicted the challenge as follows:

"Regarding incentives there is a problem in that generally the incentive is based on net sales. Solution business does not take place quarterly, on the contrary it takes place over longer periods. Those persons that are able to do it should be rewarded."

The role of technical tools was perceived to be substantial. The technical tools for interdepartmental communication had to be refocused in order to be able to share dispersed knowledge and create innovative solutions. In addition, it was found that providing solutions requires face-to-face or at least some form of real-time communication between departments. Especially sharing tacit knowledge was attempted to utilize through face-to-face communication. Thus, communication

channels and directions as to how to use them had to be adjusted to match the changed needs.

The interviewed persons' perceptions of the solution business seemed to vary substantially. Some perceived solution business as an interconnected network of actors collaborating closely without clear phases. However, some interviewees perceived the solution business more as a sequential process divided into successive phases. The third separable group seemed to draw a clear distinction between the responsibilities of the organizational units. In these depictions, there is a clear phase division into sales, production and after sales. Other departments are seen to support the process. The interviewees' functions varied in these groups, and thus the functions do not explain the difference in the depictions. The discrepancy in the perceptions of solution business indicates that interpersonal communication is challenging. The communicated message is easily distorted if the respondent perceives the solution business and surrounding business network differently.

Introducing a framework to overcome internal communication challenges in the change to solution business

Evidence in the data highlighted several challenges relating to internal communication, which were collected and categorized under the phases of the change process. The data indicate eight main challenges. Figure 1 depicts the internal communication challenges in the separate change process phases, and thus introduces a framework to overcome these challenges.

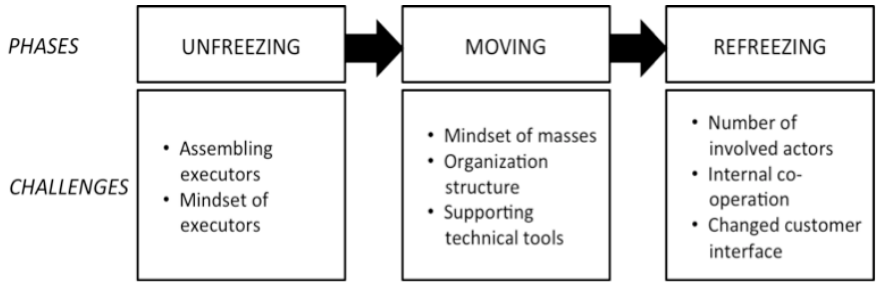

Fig. 1: A framework to overcome internal communication challenges in change to solution business

The first internal communication challenge in the unfreezing phase is *assembling the executors*. The value of committed executors was emphasized in Alpha, where the core team prepared for the change process e.g. by defining solution business in the context of their own company. In Beta, the there was no person or team responsible for orchestrating the change. Assembling the executors requires wide ranging intensive communication in the organization to cover all departments and found the key players in them. The second challenge in the unfreezing phase is *the mindset of executors*. Case Alpha illustrates that convincing top management is a crucial task. Olivia and Kallenberg (2003) note that the lack of trust is a hurdle in moving towards a

more customer oriented and value producing business. The lack of trust seemed to be a challenge until the first solutions were successfully made. Forming a common mindset among executors demands intensive internal communication. The organization can with a collective mindset compile a strategy to take it through the change process (Olivia and Kallenberg 2003).

The moving phase of the change process towards solution business comprises three main challenges. The first and perhaps the most critical for internal communication is *the mindset of masses*. A solution mindset is not easy to embrace in a product-centric company, because many of the deeply held assumptions about selling, marketing and producing have to be reversed (Sawhney 2006). Beta held a variety of perceptions of the solution business, value creating logics and business networks. Without the common perception of the prevailing business logic and surroundings, the communicated messages could easily distort or be misunderstood. The second challenge in the moving phase is *the organization structure*. Case Alpha shows that changing to a solution business model can require the acquisition of know-how from outside the organization, which in this case meant acquisitions and recruitment. Making these new, as well as the old, organization structures work together towards a mutual goal set a great challenge for internal communication. In addition, the changed role of sales has a substantial impact on internal communication. Sales have to co-operate more intensively at the intra-organizational level to be able to construct solutions, and thus it is necessary to retrain sales staff in order for them to operate in a more holistic fashion. The change requires creating and communicating an appropriate incentive system that takes the changed business model into account.

The third main challenge in the moving phase is *the supporting technical tools*. According to the data, the role of technical tools that support internal communication is important. Since building successful solutions requires more intensified co-operation amongst internal departments and actors, technical tools and systems e.g. in manufacturing, sales, research and development, and accounting, cannot be isolated. All the information in these systems must be interlinked so that it is freely on hand. In addition, tools to meet the increased need for intra-organizational interaction have to be redefined and created. Unless proper communication tools are built and their usage managed, there is a risk of tumbling into information overload in the later phases of the changed business model. The overload can be a serious challenge for the organization's ability to utilize its entire knowledge (Edmunds and Morris 2000). However, supporting technical tools can transfer only explicit knowledge and thus tacit knowledge transfer should be done by other means.

In the refreezing phase of the change process, the organization is stabilizing its transformation and ensuring that it does not regress. The first challenge is *the number of involved actors*. For a successful change process, there has to be a critical mass of involved actors to impact the change process positively (Fang, Palmatier, and Steenkamp 2008), and co-operation between the front and back office functions in solution creation is crucial (Sawhney 2006). Thus, the number of actors involved in the solution business increases, setting a significant challenge for internal communication. In addition, service elements that are usually included in the solution offerings are arranged from local offices located near to the customer. Alpha gathered some of

these service elements through acquisitions and recruitment to attain a good understanding of the customer's business. Well managed internal communication is needed to direct globally scattered actors.

The second challenge in the refreezing phase is *the internal co-operation*. Case Beta illustrates that unsuccessful co-operation between departments with separate business models can endanger successful solution creation as well as the entire change process. In addition, various authors have noted that co-operation with the front and back offices is crucial to solution business (Davies, Brady, and Hobday 2006, Sawhney 2006, Tuli, Kohli, and Baharadwaj 2007). Thus, structures and methods for internal communication have to be well formed to concretize co-operation. In addition, several authors (Sawhney 2006, Tuli, Kohli, and Baharadwaj 2007), as well as both the Alpha and Beta cases, illustrate that pricing a solution is a challenge for organizations during the sales process. Pricing requires an in-depth understanding of the solution's value structure, necessitating intense co-operation. In addition, the solutions are basically individually customized, thus emphasizing the role of pricing in the sales process. As various informants in Case Beta noted, the role of sales is being transformed from a purely selling function towards one of coordination. Thus, Sales has to take more responsibility for internal communication and knowledge sharing, especially in the sales process itself.

The third challenge for internal communication in the final phase of the change process is *the changed customer interface*. Co-creating solutions with customers and external partners widens the interaction interface. Solution selling does not take place only between sellers and purchasers, a wide range of actors is involved in the co-creation process from both the customer's and partner's side. Furthermore, interaction is occurring at a variety of levels in these organizations. Managing information at a wide and profound interface sets a great challenge for internal communication. Failure in internal communication can lead to inconsistencies in the customer interface and shortcomings in communication with the customer.

Conclusions

The aim of the present study was to increase understanding on the supplier's internal communication challenges in the change process to solution business. The present study contributes to the research on solution business by suggesting a framework to overcome internal communication challenges in the change to solution business. Based on the extant literature on solution business (e.g. Davies, Brady and Hobday 2007, Tuli, Kohli, and Baharadwaj 2007), internal communication (e.g. Mounter 2003, Proctor and Doukakis 2003), and change processes (e.g. Burke and Litwin 1992, Kotter 1996, Greer and Ford 2009), as well as the analysis of the two illustrative cases, it is suggested that the internal communication challenges in the change to solution business can be placed in eight primary categories (see Figure 1). In doing so, the study continues the line of argument advanced by Olivia and Kallenberg (2003), Davies, Brady and Hobday (2006), Cova and Salle (2007) and Matthyssens and Vandenbempt (2008). In addition, the study offers a tentative research agenda to study further the change to solution business from the internal communication perspective.

Proposal for research agenda

Based on the observations and considerations, a tentative research agenda is formulated for the change process to solution business from the perspective of internal communication. The eight challenges identified in the present study are assessed on their uniqueness and attractiveness as research topics. The four most interesting topics are introduced in the following. The first, and perhaps the most interesting, research topic is the need for *intensified internal co-operation*. Although the extant literature (Davies, Brady, and Hobday 2006, Sawhney 2006, Tuli, Kohli, and Baharadwaj 2007) has touched on the issue, making the uniqueness of the topic a little low, the attractiveness of the topic seems to be high. As the cases illustrates, co-operation between organizational units is needed to be able to offer and create solutions. For example, further research in this area needs to clarify what requirements the pricing of solutions set for the management of internal communication. In addition, further research is needed to understand the coordination mechanisms when selling solutions.

The second suggested research topic is the *changed customer interface*. From the perspective of internal communication, the topic seems to be quite under researched. However, the width of involved actors in interaction with customers in solution business increases (Cova and Salle 2007). Thus, the growing variety of actors from several organizational functions is setting a great challenge for internal communication. Further research in this area should shed light on how the diffusion of customer-related information could be managed in the solution business context. In addition, success stories from genuine solutions sales cases from the perspective would be welcome.

The third interesting future research topic from the perspective of internal communication in the change to solution business is the whole *organization structure*. The change of organizational structure is a challenging task for management, in which communication plays a large role. In the change to solution business, for example the role of sales and assimilating the possible acquisitions set specific challenges. Although the study points out the challenge of organizational structure from the perspective of internal communication, more research is needed. The extant literature scrutinizes the role of internal communication in the change of organization structure (e.g. Daly, Teague and Kitchen 2003, Proctor and Doukakis 2003), however more understanding is needed on what special characteristics solution business sets for the change in the organization structure. In addition, further research is needed to understand the role of the sales unit in the change process to solution business.

The fourth suggested research topic from the perspective of internal communication is the *mindset of masses*. As the extant literature notes, a solution mindset is not easy to embrace in a product-centric company (Sawhney 2006). In addition, as case Beta illustrates, the mindsets can vary substantially even in the later phases of the change process. The mindset can have a major impact on the success of the change process. Although the uniqueness of the topic is not high, emerging new openings in the field of industrial networks and sense-making can offer a new perspective on the topic. For example, the fast growing literature on the concepts of network pictures and network insight are interesting perspectives from which to approach the complex social reality of communication (e.g. Henneberg, Mouzas, and

Naudé 2006, Henneberg, Mouzas, and Naudé 2009, Mouzas, Henneberg, and Naudé 2008, Colville and Pye 2010).

Finally, the change process in the value network is approached leaning on the extant solutions business literature. Adopting other theoretical bases could validate the results of the present study and may provide interesting insights into the issue. For example, approaching the change in the value network through the concepts in the extant literature, such as service business (Olivia and Kallenberg 2003, Vargo and Lusch 2004, Fang, Paltimatier and Steenkamp 2008, Gummerson and Mele 2010), system selling (Mattson 1973, Hanan, Cribbin and Donis 1978, Günter and Bonaccorsi 1996), or project marketing (Cova, Ghauri and Salle 2002, Skaates and Tikkanen 2003), could offer new understanding and perspectives on the change process in the value network from the perspective of internal communication.

Managerial implications

For managers, the study offers a framework to predict and tackle internal communication challenges when moving towards solution business. According to the results, the role of sales in the change process to solution business is substantial. Thus, selling the first solution as a reference for others should be supported. In addition, lessons from the first case could be used to support the change in the mindset of other persons at the company. As case Alpha illustrates, assembling executors with a proper mandate in the early phases of the change plays a large role in the success of the change. Thus, the team should be assembled with care before the change is initialized at the company. Finally, as the study addresses, internal communication has a substantial role to play at every step of the change, so managers should plan how to communicate effectively and efficiently in the change in order to succeed.

Limitations

The conclusions must be treated with care as they are based on two case studies representing specific organizations and market characteristics. Nevertheless, the similar sized industrial organizations with similar starting points in the change process share several features in our results. Adding more cases could have offered more information to support the implications. However, the study does not aim for statistical generalization based on hypothesis testing, but provides explorative ideas as a source of theory building and testing (Eisenhardt 1989).

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A social network analysis of internal communication in a matrix organization – the context of project business.

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A social network analysis of internal communication in a matrix organisation – the context of project business

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Abstract: Empirical studies addressing the internal communication interface between the matrix organisation structures in the context of project business are scarce. In particular, there seem to be no studies on the early phases of project selling, even though those phases have a substantial impact on ultimate project success. This study addresses the gap by researching a well selected project selling case through social network analysis and content analysis of in-depth interview. The study offers an insight into the complexity of internal communication in a matrix organisation in the context of project business. The results indicate that internal communication is imbalanced in the matrix structures at the early phases of project selling. The study proposes that the matrix organisation is a rather inadequate agent for the improvement of internal communication flow in the early phases of project selling.

Keywords: internal communication; corporate communications; business information; project sales; project business; project management; matrix organisation; cross-functional organisation; empirical research; social network analysis; case study.

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1 Introduction

Project business and project management have attracted considerable attention among academics and practitioners in recent years (e.g., Turner et al., 1998; Mead, 2001; Artto and Kujala, 2008; Canonico and Söderlund, 2010; Alin et al., 2011). The significance of the project business model in business-to-business markets is rising. However, project business itself is changing (Jalkala et al., 2010). Instead of offering an integrated bundle of products and services, companies are transforming the business model to offer more value added solutions (Sawhney, 2006). The new business model requires that the organisation's entire knowledge base is utilised more efficiently, which obliges organisational units to be more interdependent (Tuli et al., 2007). Thus, alongside the changing project business, emphasis is being placed on the role of internal communication in project business organisations.

In overcoming the challenge, project business organisations have preferred organisation structures that support knowledge sharing, efficient information flow, and the competent allocation of resources to rationalise internal communication. Thus, multi-project organisations have adopted cross-functional organisation structures, such as the matrix organisation structure (Larson and Gobeli, 1987; Canonico and Söderlund, 2010). Previous studies indicate that the benefits of the matrix structure are twofold. Despite the extensive literature, there seems to be a lack of empirical studies on the internal communication interface between the matrix structures in the context of project business. In particular, there seem to be no studies relating to the early phases of project selling, despite the fact that those phases have a substantial impact on ultimate project success. Furthermore, the role of project business seems to be increasing in the business-to-business markets. The present study attempts to shed light on the research gap.

The purpose is to increase understanding of customer related internal communication between the functional and divisional structures of the matrix organisation during the early phases of the project sales process. The research question is stated as: *what kind of internal communication interface is formed between the functional and divisional matrix structure during the early phases of the project sales process*. The question is addressed first by studying each matrix structure separately and then studying the interface. The research employs a single exploratory case study, where the selected case company represents a typical project -based organisation, and the case represents a typical multinational project sales process. The case is analysed through social network analysis (Wesserman and Faust, 1994; Scott, 2007) supported by in-depth interviews. The resulting data are analysed using the content analysis method (Miles and Huberman, 1994).

This study proposes that the internal communication network at the early phases of project selling is complex, involving multiple actors. In addition, it seems that the influence of functional organisation in the internal communication network at the early phases of project selling is rather small. Thus, the matrix organisation appears to be rather inadequate as an improver of internal communication flow in the early phases of project selling. The study addresses the importance and complexity of internal communication patterns in a matrix organisation during the early phases of project selling, thus contributing to the literatures on matrix organisation performance (e.g., Kupernas, 2003;

Wellman, 2007; Laslo and Goldberg, 2008) and project management (e.g., Ramsing, 2009; Hanisch et al., 2009; Alin et al., 2011) in the context of internal communication.

2 Literature review

Intraorganisational information flow has been an object of academic interest for almost a century. During this time, several different concepts have been formed and employed to describe the phenomenon of intraorganisational information and knowledge sharing (Welch and Jackson, 2007). One of the most common concepts is corporate communications, which separates internal and external communications (Argenti, 2006). According to van Riel (1995, p.26), corporate communications can be seen as "an instrument of management by means of which all consciously used forms of internal and external communication are harmonised as effectively and efficiently as possible, so as to create a favourable basis for relationships with groups upon which the company is dependant". Employee communication is a concept that focuses on intraorganisational communication alone, and is perceived to be a communication transaction to coordinate day-to-day activities (Frank and Brownell. 1989). Another widely used concept is internal marketing (Ballantyne, 1997). However, the concept refers to a management philosophy of treating employees as customers, and thus adopts a divergent perspective (Grönroos, 2000). There are also extensive related concepts, such as internal public relations (Jefkins 1988), internal relations (Grunig and Hunt 1984), and staff communication (Stone, 1995). However, the present paper leans on the concept of internal communication.

The concept is defined in a variety of ways. Scholes (1997, p.xviii) adopts a strategic approach, defining internal communication as "the professional management of interactions between all those with an interest or 'a stake' in a particular organisation". According to Welch and Jackson (2007), Scholes' definition is useful because of its strategic approach, whereas Cornelissen (2004) focuses more on the communication methods and adopts a tactical perspective. Cornelissen (2004, p.189) defines internal communication as "all methods (internal newsletter, intranet, etc.) used by a firm to communicate with its employees". Chaney and Christensen (2001) argue that internal and external communications cannot be separated through a notion of fuzzy organisational boundaries. However, the present paper leans on the Scholes view of internal communication, because of its strategic approach. Attention is limited to employees involved in the studied case project. In addition, no distinction is drawn between informal and formal communication flow; because the object of study is customer related information, the majority of the information is assumed to be formal communication.

Internal communication is regarded as a crucial value producing process for organisations (Ahmed and Rafig, 2003). In addition, an organisation's capability to build and manage effective internal communication networks is becoming more crucial (Möller and Rajala, 1999). For example, increased business cycle speed is perceived to be a reason for the greater role of internal communication (Smythe, 1996). However, the limited amount of communication is not usually perceived as a problem (Tyrväinen et al., 2005). On the contrary, in some cases communication overflow is a prime cause of inefficient internal communication (Edmunds and Morris, 2000; Klausegger et al., 2007). Thus, for example selecting the proper information system is found to be crucial for the effective communication (Braganza et al., 2009; Zandi and Tavana, 2010).

The communication barriers seem to vary substantially. The use of technology in the intended fashion (Peters and Fletcher, 2004; Kouki et al., 2010; Garg and Goyal, 2011), incongruous social settings in the teams (Wang and Haggerty, 2009), employees' problems in discriminating between useful and useless information (Bovée et al., 2003), and a failure to take cultural differences into account (Mounter, 2003) are for example perceived to hinder internal communication.

The role of internal communication in project business has been found to be substantial. According to several authors, efficient internal communication between members of the project team is key to successful project management (Sanvido et al., 1992; Thamhain, 1992; Turner et al., 1998; Mead, 2001; Solesvik, 2011). However, there seem to be an orientation that project business is changing (Jalkala et al., 2010). Instead of offering an integrated bundle of products and services, companies are changing to offer more complete solutions. These solutions require broader interaction with the customer (Cova and Salle, 2007), and this increased breadth requires efficient internal communication and knowledge transfer to maintain consistent interaction with the customer (Nätti and Ojasalo, 2008). In addition, offering complex solutions requires that the organisation's entire knowledge base is utilised more efficiently, which necessitates greater interdependency between organisational units (Tuli et al., 2007).

Organisations have preferred organisation structures that support knowledge sharing, efficient information flow, and competent allocation of resources to rationalise their internal communication. This is one reason why multi-project organisations have adopted cross-functional organisation structures (Canonico and Söderlund, 2010). A matrix organisation is a mixed organisation structure, in which divisional and functional organisational structures are combined (Larson and Gobeli, 1987). In a divisional hierarchy, similar goods/services or types of customer form groups that shape the divisions, and in some cases the ongoing projects form the divisional structures. A functional hierarchy is formed comprising activities relating to the particular function, for example production, research, marketing, or even market areas. The primary benefit of the matrix organisation is that it allows the representatives of the various functions to contribute to the project team (El-Najdawi and Liberatore, 1997; Hirunyawipada et al., 2010). The matrix structure also enhances the use of resources, improves motivation and commitment, and intensifies information flow (Ford and Randolph, 1992; Turner et al., 1998; Sy and Côté, 2004). However, matrix organisations contain two chains of command, and this can result in power struggles and a lack of understanding as to who is in charge. In addition, matrix organisations tend to be prone to slow reaction time, and experience difficulty in monitoring and control (Larson and Gobeli, 1987; Ford and Randolph, 1992). Intensified communication is perceived to increase communication costs (Wellman, 2007).

In sum, the substantial role of internal communication in project business is recognised (Sanvido et al., 1992; Thamhain, 1992; Mead, 2001). Attempts to respond to the importance of this role are made, through a matrix organisation structure that supports internal communication (Ford and Randolph, 1992; Turner et al., 1998; Sy and Côté, 2004). However, there seems to be a lack of empirical evidence on what kind of communication interface and network is formed between the functional and divisional structures in a matrix organisation. In particular, the issue is interesting due to the twofold understanding of a matrix organisation's capability to improve internal communication (Ford and Randolph, 1992; Turner et al., 1998; Sy and Côté, 2004; Wellman, 2007).

Thus, there is a call for further study to clarify whether the advantages, mentioned in the earlier literature, are really advantages, and the disadvantages are really disadvantages (Wellman, 2007). The issue seems to be relevant for study because there is evidence that proper management can lead to successful internal communication in matrix organisations (Kupernas, 2003). The early project phases are of particular interest as the project team is novel and the network immature. Also, the early phases can engender additional costs in the later phases. This paper attempts to extend understanding from prior research and add new knowledge by researching the complexity of the internal communication in a matrix organisation during the early phases of the project sales process. The study offers empirical evidence from a multinational organisation delivering complex high value projects to its customers. The focus is limited to the observation of customer related information inside the organisation.

3 Research setting

The phenomenon, internal communication between matrix structures, was approached with a single case study strategy (Yin, 2008) using social network analysis (Wesserman and Faust, 1994; Scott, 2007). In addition, the in-depth data were analysed based on the content analysis method (Miles and Huberman, 1994; Patton, 2002). The case study strategy was adopted as the research approach, since there was only limited prior knowledge of the complex social phenomenon. Thus, the phenomenon and the research approach support the methodological selection of the study (Eriksson and Kovalainen, 2008; Yin, 2008). The case selection is the most important methodological decision (Dubois and Araujo, 2007), and thus in selecting the studied case, the emphasis was placed on the representativeness of the phenomenon and accessibility to reliable information on internal communication. More specifically, the number of actors involved in the case project and organisational structure of the case company were emphasised in the case selection process.

Social network analysis is a set of methods for the analysis of social structures, enabling research on the relational aspects of these structures (Scott, 2007). For the present study, it offers a structured method to research the internal communication between the matrix structures in the intraorganisational communication network. Thus, the internal communication network structure can be depicted and the most salient persons identified. Social network analysis comprises a wide range of measures to analyse networks. In the present study, the internal communication network is examined at the general level employing measures of centralisation and density. Two centrality measures are used to study the network: degree and reach closeness. Centralisation is a group level measure expressing the level of communication focus around a small group of actors. The second measure, density, is perhaps the most widely used group level measure indicating a network's structure as a whole (Wesserman and Faust, 1994). The measure indicates the knittedness of the communication network at group level. Centralisation and density are said to be important complementary measures, since density describes the general level of cohesion in the form of a graph, whereas centralisation describes the extent to which this cohesion is organised around particular focal points (Scott, 2007).

The centrality measure is used to study the network at the actor level. Wesserman and Faust (1994) introduced three measures of centrality: degree, closeness and betweenness.

In the present study, the measure of degree is used to reveal the most communicated (inDegree) and most actively communicating (outDegree) actors. The measure also indicates the encumbrance of communication flows between divisional and functional matrix structures. The final measure, reach closeness, is utilised to reveal the reachability of single actors and their positioning in the organisational structure. The maximum score for reach closeness is achieved when every other actor is one step away from the focus actor. The degree of reach closeness lessens as actors are two steps away, three steps, and so on (Hanneman and Riddle, 2005). Table 1 condenses the employed measures of the study and their depictions.

Table 1 Employed social network analysis measures of the study

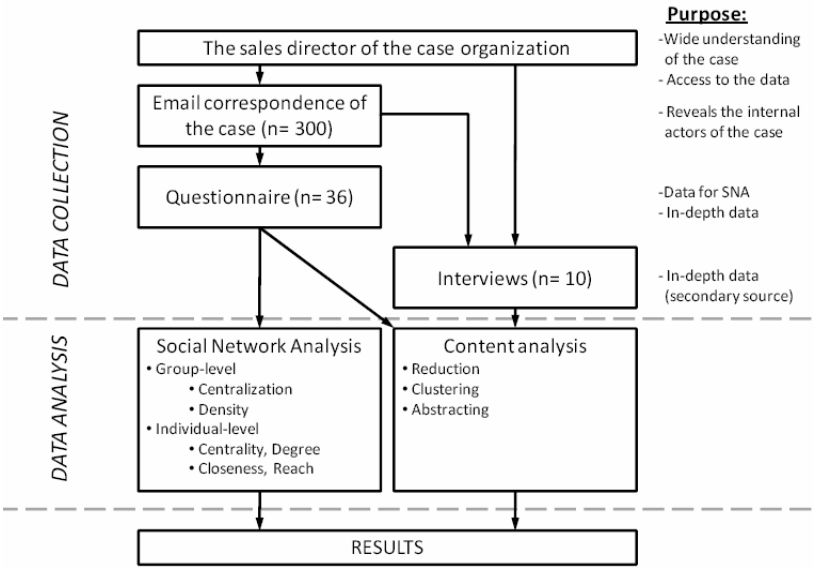
Measure	*Definition*	*Purpose*	*Form of the data*
Network centralisation (group level measure)	"…centralization measure is an expression of how tightly the graph is organized around its most central point." [Scott, (2007), p.89]	To reveal the cohesion of the communication network and to study the relation of incoming and outgoing internal communication in the network.	Directed and evaluated
Network density (group level measure)	"The density of a directed graph is equal to the proportion of arcs present in the digraph." [Wesserman and Faust, (2007), p.129]	To increase understanding of the overall structure of the communication network and complement the results of the centralisation measure.	Directed and unvaluated
Centrality, InDegree and OutDegree (individual level measure)	"…number of other points to which a point is adjacent." [Scott, (2007), p.83]	To reveal the most extrovert and communicated actors during the project sales process. In addition, to identify the encumbering of the actors at the communication interface between divisional and functional matrix structures.	Directed and evaluated
Centrality, closeness, reach (individual level measure)	"…measures of how close each actor is to all others." (Hanneman and Riddle, 2005)	To study the reachability of actors and its diversification between functional and divisional matrix structures.	Directed and unvaluated

3.1 Data collection and analysis

The selection of informants is a critical choice (Halinen and Törnroos, 2005), and thus was highly emphasised in the selection phase. Informant selection was executed with the assistance of a person occupying a focal position who had a broad understanding of the studied case; this proved to be the Sales director of the sales and marketing department, and his suitability derived from his work experience and position in the organisation. Figure 1 depicts the study's research process.

The data collection and analysis started with an analysis of e-mail correspondence between the focal company and the customer during the studied case. The purpose was to reveal the internal actors involved in the case. The e-mail correspondence identified 39 internal and 24 external actors. A questionnaire was sent to the 36 internal actors. The 23 answered to the questionnaire making the answer rate of 64%. According to the results there were 50 actors involved in the studied network. In sum, the questionnaire was sent to 72% of the involved actors. The share of actors who responded was found to be adequate to represent the internal communication network during the case. Thus, a second questionnaire round was not considered necessary.

Figure 1 Research process of the study



The questionnaire included questions on internal communication in general as well as during the sales process, but most importantly enabled collection of the data for the social network analysis. Respondents were asked to name freely eight internal actors with whom they had communicated concerning customer related issues during the case. In addition, information on the intensity of the communication was requested. Thus, the communication links can be analysed as valuated and directed. In the earlier literature on social networks, the free recall of eight persons is perceived to be adequate to achieve a reliable representation of the network (Rapoport and Horvath, 1961; Wesserman and Faust 1994).

To attain a profound understanding of the studied phenomenon, in-depth interview data were utilised to support social network analysis. The interview data (n = 10) must be treated as a secondary data source, since they were not collected directly for the purposes of the present study. However, the interviews dealt with themes of internal communication during the studied case and the sales process with the customer. In addition, the interviewed persons represented both the functional and the divisional matrix structures. The interviews were tape recorded and transcribed. The data analysis was followed by the traditional three-step inductive content analysis: data reduction, data clustering, and data abstraction (Miles and Huberman, 1994). First, expressions relating

to the studied phenomenon were separated from the data. Secondly, the expressions were categorised according to core consistencies and meanings. Finally, the categories were abstracted to the themes representing internal communication in a matrix organisation.

3.2 Case description

The studied case illustrates internal communication in a complex project sales process during its early phases. The case involves a dyadic buyer-seller relationship, including multiple personal level actors. Analysis of internal communication in matrix organisations is studied in the seller company, which is an international player producing materials handling equipment for logistics operators. Besides delivering customer specific product sets, the company places a high emphasis on delivering qualified and consistent service to its customers. The company's personnel numbers 10,000, which in itself makes internal communication challenging. The focal company is organised as a matrix structure. The divisional organisation structure comprises three product and service divisions, and the functional organisation structure three business areas. The three divisional organisation structures each have their own business model. The studied division offers products tailored for customer needs, whereas the second business division offers standard untailored products. The third division offers services including, e.g., maintenance, repair, and retooling its own and competitors' equipment. Thus, actors in the functional matrix organisation are involved in all of the business models.

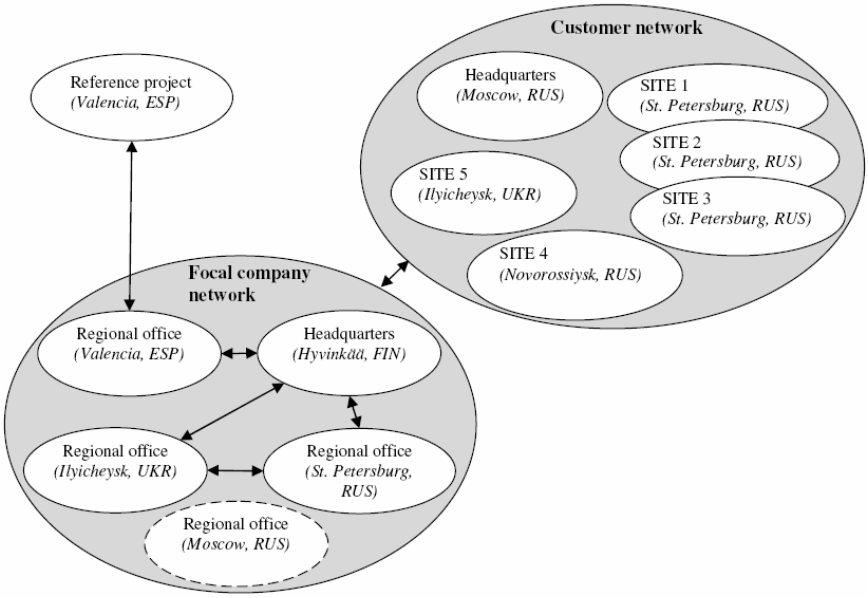
The seller company divides its project sales process into five phases. The first is a pre-phase that comprises decision-maker identification, value matching, and screening. The second, tendering/negotiation phase, includes tasks such as evaluation and devising payment methods. These two phases are perceived as the tasks of marketing and sales. Thereafter, the focal company sees to it that the delivery phase begins, which includes engineering, manufacturing, and handover/training. Next comes the warranty period, which includes, e.g., repair and support. These two phases are perceived as project organisation tasks. Finally, the support phase begins, which includes maintenance, repair, and modernisation.

The focal company negotiates with the customer on the delivery of materials handling equipment and service contracts. The studied case took in a period of ten months and covered the pre-phase and nearly the whole tendering/negotiation phase. The present study considers particularly this ten-month period to represent the early phases of project selling. The potential customer is one of the largest logistics companies in Russia, with which the focal company has an existing long-term relationship. The previous transaction with the customer occurred a few years previously. The estimated value of the new offer was substantial from the focal company's perspective. Figure 2 depicts the case project network and the arrows represent the communications flows.

The focal company's network comprises its headquarters in Finland (Hyvinkää) and regional offices in Russia (St. Petersburg and Moscow), the Ukraine (Ilyicheysk) and Spain (Valencia). The focal company has regional office also in Moscow. However the office was not directly involved to the sales case. The focal company's headquarters in Finland was leading the sales process and the St. Petersburg office also played a significant role, communicating intensively with the customer terminals in St. Petersburg, as well as with the customer's headquarters in Moscow and the container terminal in Novorossiysk. Thus, besides the focal company's headquarters, the St. Petersburg office also had good local relations with the customer. The focal company's Ilyicheysk office

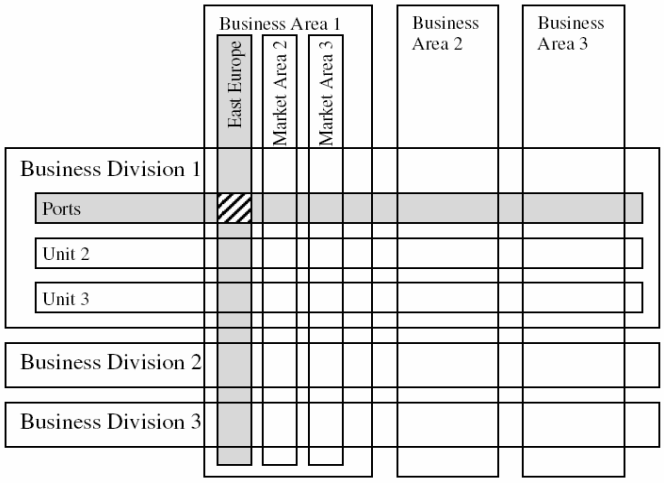
mostly interacted with the customer's container terminal in the same location. The Valencia office was only involved in the sales process during a reference visit to an earlier customer of the focal company.

Figure 2 Simplified case project network



The project involved internal actors from the Ports business unit, which is part of the divisional organisation structure. A part of the functional organisation structure was also involved, in the shape of the East Europe market area organisation. Figure 3 depicts the positioning of the case in the company's matrix structure. The cross-lined area in the figure depicts the internal communication interface between the matrix structures, and thus represents the focus of the study.

Figure 3 Position of the focal case project in the organisation structure



4 The internal communication network in matrix structures during the early phases of project sales process

The data analysis reveals that there are 41 actors from the divisional matrix and only nine actors from the functional matrix involved during the early phases of the project sales case. These 50 actors form 111 ties between themselves. 22% of the actors from the functional matrix organisation responded to the questionnaire, compared to 39% of the divisional matrix actors. Thus, the representation of both matrix structures is relatively even. Table 2 summarises the values of the selected social network analysis measures at each level of analysis (divisional, functional and entire communication network).

Table 2 Values of the selected social network analysis measures

Measure	*Value (divisional communication network)*	*Value (functional communication network)*	*Value (entire communication network)*
Network centralisation (group level measure)	By InDegree: 0.11	By InDegree: 0.27	By InDegree: 0.10
	By OutDegree: 0.16	By OutDegree: 0.06	By OutDegree: 0.14
Network density (group level measure)	0.053	0.097	0.045
Centrality, InDegree and OutDegree (individual level measure)	*InDegree:*	*InDegree:*	*InDegree:*
	1 Sales Director, Sales and Marketing: 30.0	1 Market Area 1 Manager: 4.0	1 Sales Director, Sales and Marketing: 33.0
	2 Unit 3 Director: 27.0	2 Various actors: 3.0*	2 Unit 3 Director: 33.0
	OutDegree:	*OutDegree:*	*OutDegree:*
	1 Unit 1 Director: 23.0	1 Market Area 1, Area Director, East Europe: 10.0	1 Sales Director, Sales and Marketing: 25.0
	2 Sales Director, Sales and Marketing: 22.0	2 Sales Manager, Market Area 1: 10.0	2 Unit 1 Director: 23.0
	Mean InDegree and OutDegree: 4.8	Mean InDegree and OutDegree: 2.2	Mean InDegree and OutDegree: 5.2

Notes: *Five actors have the same InDegree value in the functional communication network.
**Four actors have the same InReach value in the functional communication network.
***Three actors have the same InReach value in the functional communication network.

Table 2 Values of the selected social network analysis measures (continued)

Measure	*Value (divisional communication network)*	*Value (functional communication network)*	*Value (entire communication network)*
Centrality, closeness, reach (individual level measure)	*InReach:*	*InReach:*	*InReach:*
	1 Sales Director, Sales and Marketing: 15.0	1 Various actors: 2.5**	1 Sales Director, Sales and Marketing: 16.5
	2 Unit 3 Director: 13.8	2 Various actors: 2.0***	2 Unit 3 Director: 15.8
	OutReach:	*OutReach:*	*OutReach:*
	1 Chief Mechanical Engineer, Unit 5: 18.1	1 Sales Manager, Market Area 1: 6.0	1 Director, Port Cranes, Ports Management: 21.6
	2 Unit 1 Director: 17.6	2 Market Area 1, Area Director, East Europe: 5.0	2 Unit 3 Director: 21.3
	Mean InReach and OutReach: 6.9	Mean InReach and OutReach: 2.0	Mean InReach and OutReach: 7.6

Notes: *Five actors have the same InDegree value in the functional communication network.
**Four actors have the same InReach value in the functional communication network.
***Three actors have the same InReach value in the functional communication network.

4.1 Internal communication in the divisional matrix structure

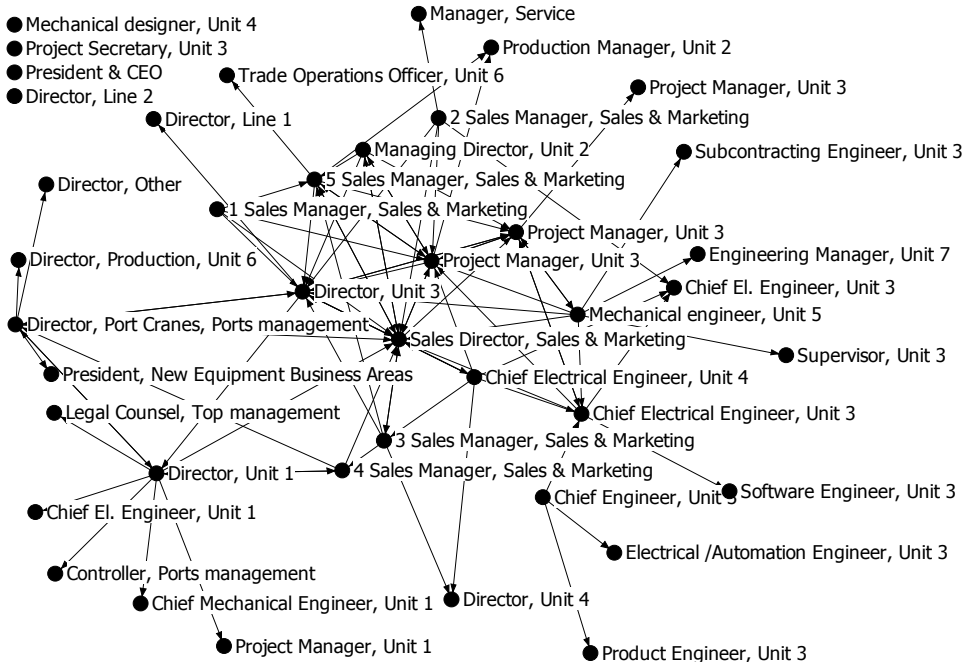
An examination of the internal communication network in the divisional matrix organisation revealed that there are quite a small number of actors dominating communication. The Product Unit 1 Director (23.0) and Sales Director, Sales and Marketing (22.0) communicate the most intensively of all actors in the divisional matrix organisation, measured by OutDegree values. The mean degree in the divisional matrix structure is 4.80. However, those actors who are most intensively communicated to by others, measured by InDegree values, are not precisely the same: namely the Sales Director, Sales and Marketing (30.0), and the Product Unit 3 Director (27.0). The substantial role played by the Sales Director is to be expected, since he was leading customer negotiations; these involved products from Product Unit 1 and 3, and thus the roles of the directors of those units are also substantial. The high InReach and OutReach values also indicate the major role of these actors.

The relation of the OutDegree and InDegree values reveals the most extrovert actors, i.e., the opinion leaders, in terms of the amount of communication that came to them. The Product Unit 5 Chief Mechanical Engineer (6.00) and a Sales Manager at Sales and Marketing (3.30) seem to be the most extrovert in relation to received communication. This is an interesting finding, since neither of them appears to be a member of the project sales process core team. However, the most communicated persons revealed to be the Chief Electrical Engineer of Product Unit 3 (2.00) and the Product Unit 3 Director (1.80).

Thus, it seems that the communication network during the early phases of the sales process is quite scattered. However, network centralisation measured by OutDegree (0.11) and InDegree (0.16) is fairly healthy. Communication flow is not overly centralised around a small number of actors making the network vulnerable. In addition, network density (0.053) is adequate, since values above 0.03 are considered to suggest faster information propagation and greater group cohesion in directed data (Aboelela et al., 2007). The internal communication network in the divisional matrix organisation is depicted in Figure 4. The isolates in the upper left corner of the figure are actors that have been communicated with by functional actors but not by divisional actors, despite being members of the divisional matrix organisation.

The actors with the highest reach values are almost the same as those measured by the degree values. Thus, the Sales Director, Sales and Marketing, the Product Unit 3 Director and Product Unit 1 Director are the most central persons by the reach centrality measures. In sum, there are three actors who can be considered the most central in the divisional matrix structures communication network, measured by centrality (degree and closeness, reach). The centrality of these actors is partially explained by their leading position in the project sales process. The overall cohesion of the communication network is adequate measured by centralisation and density.

Figure 4 Internal communication in the divisional matrix organisation during the case

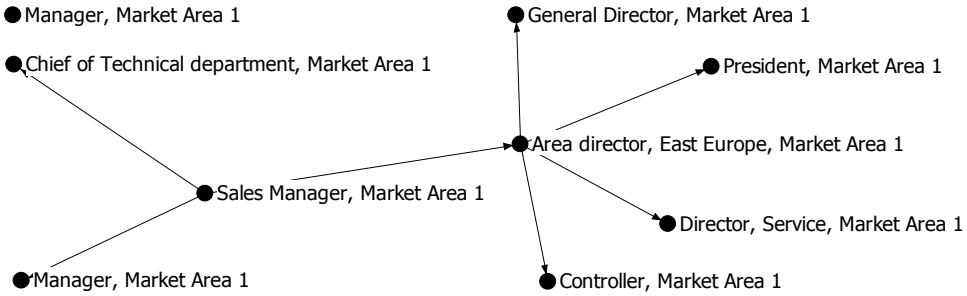


4.2 Internal communication in the functional matrix structure

An examination of the substantially smaller communication network in the functional matrix organisation revealed that a Market Area 1 unit manager (4.00) is the most communicated actor. The mean InDegree in the functional matrix organisation is 2.20.

Too few actors in the functional matrix organisation responded to the questionnaire to enable analysis identifying the most active communicators. In addition, the closeness values measured by the reach should be considered with care, since the size of the functional organisation is limited. The degree of centralisation of the entire communication network measured by OutDegree (0.27) and InDegree (0.06) is quite low. The internal communication network in the functional matrix organisation is depicted in Figure 5. The isolated actor in the upper left corner of the figure (Manager, Market Area 1) has been communicated to by the divisional but not functional actors. He is, however, a member of the functional matrix organisation.

Figure 5 Internal communication in the functional matrix organisation during the case

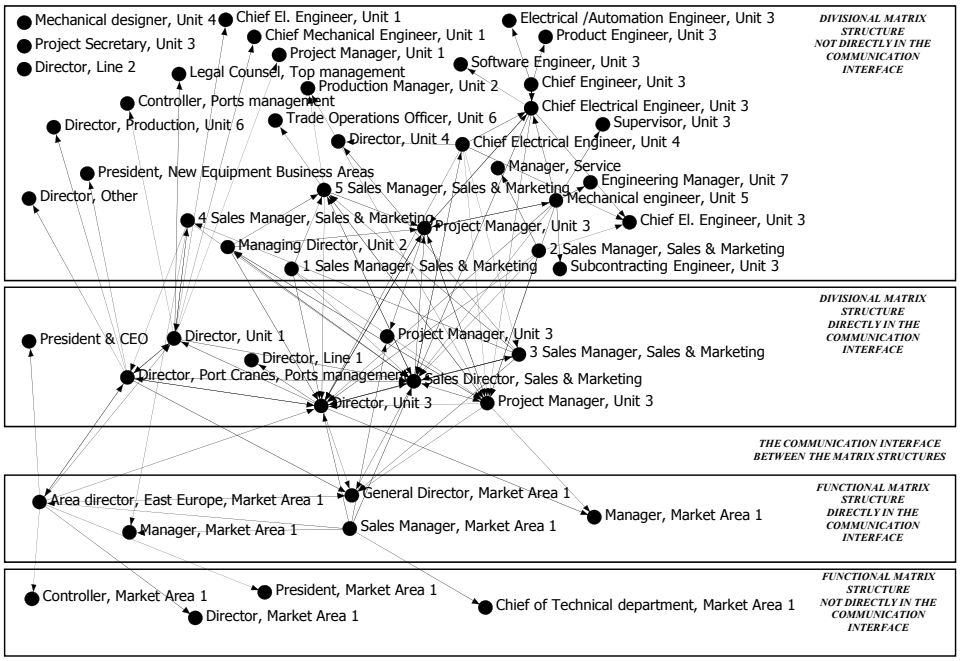


In sum, the number of involved nodes for internal communication during project sales in the functional matrix organisation is significantly low compared to the divisional organisation. Although network cohesion seems to be stronger than in the divisional matrix organisation, these values cannot be directly compared. The centralisation and density values show a high degree of correlation with network size, but the divisional and functional organisations are of different sizes so the values cannot be compared. In addition, it is difficult given the low number of actors to draw conclusions on the degree and reach values.

4.3 Internal communication interface between the functional and divisional matrix structure

The communication interface from the divisional to the functional matrix structure is built on nine ties, which is only 8% of all communication ties in the internal communication network (n = 111). The communication flow from the functional organisation to the divisional organisation is even poorer, comprising just 6% of all ties. Thus, it can be concluded that the communication interface between the functional and divisional organisations during the early phases of the project sales process is sparse. Figure 6 depicts the entire internal communication network. The uppermost rectangle shows the divisional actors not directly communicating with the functional actors. The second rectangle depicts the divisional actors forming the communication interface with the functional actors. The third rectangle is the functional organisation's communication interface with the divisional organisations. The ties forming the communication interface between the divisional and functional matrix organisations are shown between the second and third rectangles. The bottom rectangle depicts the functional actors not directly communicating with the divisional actors.

Figure 6 Internal communication between matrix organisation structures



The most central actors measured by degree value (see Table 2) seem to be located in the divisional matrix organisation. However, the most central actors in the functional organisation are still quite well positioned at the entire network communication level. Measured by InDegree and InReach, the general director of Market Area 1 is the functional organisation's most centralised actor. The InDegree (16.0) and InReach (12.8) values are above the mean InDegree and InReach values for the entire network (5.2; 7.6). Measured by OutDegree and OutReach, the Sales Manager, Market Area 1 and Area director, East Europe, Market Area 1 are the most central actors in the functional organisation. Their OutDegree and OutReach values are also above the mean values of the entire network. This indicates that although the number of ties between matrix structures is low the intensity of communication in fairly good. However, communication between the matrix structures is highly focused on these few actors, and thus imposes a high risk of knowledge distortion and assertion. The overall cohesion of the entire communication network seems to be opportune, although network density is quite low. That however is to be expected, since the network data are calculated as directed.

Dual management of the matrix organisation in project business is a serious challenge for the project team (Larson and Gobeli, 1987). The data analysis indicates that there are three persons distinguished by their centrality. Although this finding refers to power struggles, the in-depth data did not support this challenge. The interviews reveal that the sales director is leading the project sales process. In addition, the negotiations concern products from both product units managed by the most central product unit directors. Thus, it is quite natural that these actors should stand out. The situation can nevertheless be challenging for the actors in the functional matrix structure, since all of these central actors are located in the divisional matrix structure.

The representations of matrix structures are somewhat imbalanced and the communication interface rather narrow. The finding indicates that in this multinational sales process, local relations and knowledge in the functional organisation are not utilised and shared effectively with the divisional organisation. In reverse, knowledge and the potential to satisfy customer needs are not delivered effectively to the functional organisation. This might make it challenging to offer more value added projects that emphasise the co-creation of value with the customer and the utilisation of the entire company's knowledge base (Sawhney, 2006). Poor communication between matrix structures can also increase the risk of inconsistencies in communication with the customer. For example, if information of interactions, meetings, and agreements with customer are not delivered between the matrix structures, the likelihood of inconsistency grows (Ford et al., 2002).

Insufficient internal communication in the early project phases can lead to increasing challenges and costs at the very end of the project delivery. If micro-level relationships are not transferred from actors interacting with the customer in the early project phases to those involved in the delivery phase, most of those relationships will have to be rebuilt, which requires resources and thus incurs additional costs. Internal communication between organisation structures must be effective in order to offer the customer high quality services. In the present case, the representation of the services organisation is rather poor. Thus, neither perceptions nor knowledge are shared. In later project phases, this can lead to inconsistencies and additional costs, and the case company places a high emphasis on delivering qualified and consistent services to its customers.

5 Conclusions

The results of the study present three main conclusions. *First*, the internal communication network at the early phases of project selling is complex, involving multiple actors. Furthermore, project business is shifting towards more value adding business models (e.g., solution business), where there will be a greater number of internal actors involved (Jalkala et al., 2010). The organisation's knowledge base has to be utilised more widely to be able to create these value added solutions (Tuli et al., 2007). Thus, increasing complexity emphasises the role of internal communication between matrix structures. *Secondly*, the representation of the functional organisation in the internal communication network at the early phases of project selling appears to be rather poor. Thus, including local micro-level relationships and understanding customers business from local view in the multinational context is ineffective and insufficient. This could derive some future challenges in the project delivery process. Thus, organisations should emphasise the role of the functional organisation in the early phases of project selling. *Finally,* it can be concluded that the matrix organisation's role as an improver of internal communication in the early phases of project selling seems to be quite inadequate. According to the studied case, there is imbalance between the representations of matrix structures in internal communication network and the communication interface is rather narrow. However, the existing studies have shown that the matrix organisation structure improves internal communication (Ford and Randolph, 1992; Turner et al., 1998; Sy and Côté, 2004) and thus it is expected that the representation of matrix structures and the communication interface between them is going to be improved in the later phases of project.

The findings of this study are of particular significance for companies operating in the project business. Since projects are discontinuing and unique, project network has to be reform each time a project begins (Cova et al., 2002). Usually, which actors are involved, changes at least partially between projects. Thus, precepts that help a manager form and administer the project network both internally and externally are welcome. In focusing on internal communication related issues, this paper offers insights on communication structures during the early phases of project selling. Thus, a project manager should emphasise the communication flow in the early phases of project selling in those areas where it is needed for success in the later phases of project selling.

These conclusions contribute to Wellman's (2007) concern as to whether the benefits of the matrix organisation structure are indeed benefits. In addition, the study strengthens some of the previously found challenges regarding internal communication in the matrix structure (Ford and Randolph, 1992; Kupernas, 2003). Above all, the study furthers understanding of the internal communication patterns in a matrix organisation during the early phases of project selling, and thus contributes to the literatures on matrix organisation performance (e.g., Kupernas, 2003; Wellman, 2007; Laslo and Goldberg, 2008) and project management (e.g., Ramsing, 2009; Hanisch et al., 2009) in terms of internal communication.

5.1 Limitations and future directions

The present study has some limitations, which have to be taken into account when digesting its implications. The choice of a single case study impacts the generalisability of the results (Eisenhardt, 1989). Thus, the results are more relevant to organisations with similar characteristics and facing analogous markets and customer expectations. In addition, having in-depth data from multiple sources supports the profound understanding of the focal case. Adding more cases could have offered more information to support the implications. However, the study does not aim for statistical generalisation based on hypothesis testing, but provides explorative ideas for theory building and testing (Eisenhardt, 1989).

The study provides many opportunities for future research. First, more evidence on the nature of internal communication in matrix organisations in the context of project business is needed to assess the validity of the results. Further studies should cover organisations with different features to increase validity. Secondly, in the present study, internal communication is examined solely during the early phases of project selling. Thus, further studies should extend the research into the project delivery process. For example, a more longitudinal approach could offer understanding of knowledge transfer from the selling organisation to the customer support organisation, and its effects on the customer relationship.

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Supplier's Internal Communication Network during the Project Sales Process

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Abstract

The nature of internal communication networks in project sales has remained largely unexplored. This paper sheds light on a supplier's internal communication network during a project sales process by utilizing social network analysis and in-depth qualitative data. We analyze the project sales process and related internal communication network of a material handling equipment provider. The results illustrate the non-centralized and complex nature of internal communication networks, and highlights four barriers to and four drivers of efficient communication during project sales. Above all, utilizing communication training seems to be the most efficient way to improve internal communication.

Keywords

Internal communication, project sales, project marketing, customer relationships, social network analysis, case study

Introduction

Communication plays an important role in reducing the high levels of risk, uncertainty and complexity associated with projects. The pivotal role of communication in the selling and execution of projects has been recognized in several studies (e.g. Cova and Salle, 2007 Kujala, Murtoaro and Artto, 2007; Lecoeuvre-Soudain, Deshayes and Tikkanen, 2009; Jalkala, Cova, Salle and Salminen, 2010). Besides the external communication between the project firm and its stakeholders, the internal communication within the project organization also has a great impact on the success of a project (Ritter and Gemünden, 2003; Peters and Fletcher, 2004; Lecoeuvre-Soudain and Deshayes, 2006). Although the critical role of internal communication in project sales has been long recognized, it has been a largely neglected topic in the field. Studies on project sales and marketing have mainly focused on the interaction between buyers, sellers and actors in the project 'milieu' network (Cova, Ghauri, and Salle, 2002). A greater understanding of the characteristics of personal level internal communication networks during the project sales process is needed.

The nature of internal communication networks during the project sales process remains largely unexplored and more knowledge on the barriers and drivers for efficient internal communication is needed (Henderson, 2008). In addition, critical questions need to be asked about what kind of communication networks are activated in project situations. These questions are essential in understanding the quality and effectiveness of communication in project sales and management situations (Ramsing, 2009). The present study addresses these gaps by analyzing the internal communication network in a complex matrix organization company delivering materials handling solutions for logistics operators. The purpose of the

study is to determine key factors influencing internal communication in project sales networks. We address this purpose through the following research questions:

1) What kind of communication network is formed during the early phases of the project sales process?
2) What are the barriers to and drivers of efficient internal communication during the early phases of project sales process?

We address these questions with the help of social network analysis and in-depth qualitative data by exploring an internal communication network formed during a project sales process. Social network analysis allows us to depict the communication network that is formed within the project sales organization and analyze the constitution and nature of that network. In this study, we focus specifically on customer related internal communication. The results indicate that the nature of the internal communication network during the project sales process is highly complex, including persons from various hierarchical levels and organizational units. During the project sales process, a group of persons stands out in the internal communication network. They exert considerable power over internal communication. Our findings suggest that there are four major barriers that hinder internal communication and four major drivers to promote it. According to the results, companies should in particular organize communication training that emphasizes efficient documentation based on common regulations, taking into account the diverse target groups and fostering openness in the communication.

The findings contribute to the project management and sales literature and research on internal communication by increasing understanding of the nature of internal communication in project settings. In addition, our study answers to the call for integrating project

management with project sales and marketing perspectives (Cova and Salle, 2005; Lecoeuvre-Soudain and Deshayes, 2006; Deshayes and Tikkanen, 2009) by studying the project management process of communication during project sales.

The paper is organized as follows. We first review the role of internal communication in project settings and derive insights from research on internal communication and the project management and sales literature. The project management literature offers an understanding of the internal dynamics of a project during the project sales process (Artto and Kujala, 2008; Eskerod and Riis, 2009; Ingason and Jónosson, 2009), while the project marketing literature offers the customer-oriented approach (Cova and Holstius, 1993; Cova, Ghauri and Salle, 2002; Cova and Salle, 2007). Although the focus of the study is on a single project, we acknowledge the programme and portfolio management perspective as a view to the phenomenon (Blomquist and Müller, 2006; Winter and Szczepanek, 2008; Pellegrinelli and Garagna, 2009). The subsequent section introduces the research setting and is followed by the results section. Finally, the paper concludes with a discussion on the theoretical and managerial implications as well as limitations and future research avenues.

Literature review

Internal communication and its role in project management and sales

Internal communication is the process by which information flows between persons in organizations (Mohr, Fischer and Nevin, 1996). It has been termed the 'life-blood of organizations' (Rogers and Agarwala-Rogers, 1976). The communication process varies in degrees of formality, frequency and the tools that are being applied (e.g. face-to-face meetings, telephone, e-mail, software applications and databases). In addition, the direction,

content and complexity of communication vary (Hoegl and Gemünden, 2001). Internal communication plays a crucial role in organizational performance as it can influence employee satisfaction, decision making, new product development, brand perceptions, the consistency of customer interaction, and effectiveness to develop innovations (e.g. Stayer, 1990; Smythe, 1996; Cleaver, 1999; de Chernatony and Segal-Horn, 2003; Gemünden, Salomo and Hölzle, 2007; Ernst, Hoyer, and Rübsaamen, 2010).

The existing literature discusses several barriers to efficient internal communication such as information overload (Edmunds and Morris, 2000), lack of clarity in communication (Robson and Tourish, 2005), difficulty to discriminate between useful and useless information (Bovée, Thill and Schatzman, 2003), cultural differences (Mounter, 2003), and the challenge of getting the right information at the right time (Bovée, Thill and Schatzman, 2003; Mounter, 2003). A variety of technological solutions, such as instant messaging, group meeting systems, and portable communication devices have been developed to improve internal communication. However, these technologies are not necessarily used efficiently (Peter and Fletcher 2004). In addition, building a common frame of reference is found to promote internal communication (Eskerod and Riis, 2009).

The importance of internal communication in the marketing, selling and management of projects has been identified in several studies (e.g. Goczol and Scoubeau, 2003; Lecoeuvre-Soudain and Deshayes, 2006; Ajmal and Koskinen, 2008; Henderson, 2008; Lehtimäki, Simula and Salo, 2009). Inefficient internal communication has negative impacts on project team members' satisfaction and productivity (Henderson, 2008). In addition, a lack of internal communication could make the supplier's interface seem fragmented to the customer (Nätti and Ojasalo, 2008). Thus, inadequate internal communication can substantially harm

customer relationships (Lecoeuvre-Soudain, Deshayes, and Tikkanen, 2009). Despite the prominent importance of interpersonal communication in project sales, there are only a few studies focusing specifically on this issue. Lievens and Moenaert (2000) distinguish between intra-project and extra-project communication and discuss the role of communication per se in these. Goczol and Scoubeau (2003) link external corporate communications to project marketing and discuss how external project communication is integrated strategically in project management.

Alongside communication barriers, several drivers to promote internal communication have been proposed in various contexts. These comprise fostering an open communication climate (Wood, 1999; Quinn and Hargie, 2004), identifying bottlenecks (Lloyd and Varey, 2003), addressing cultural nuances and diversity (Mounter, 2003; Kalla, 2005), increasing informal information sharing (Quinn and Hargie, 2004; Kalla, 2005), and segmenting internal stakeholders (Spitzer and Swidler, 2003). In addition, suitable information technology, organization structure, and culture have been noted as primary infrastructure capabilities in advancing knowledge integration and internal communication (Gold, Malhotra, and Segars, 2001). Employing the correct composition of persons with the required types of capability is also critical to efficient communication in teams (Hauschildt and Kirchmann, 2001). Gemünden, Salomo, and Hölzle (2007) study role models in the context of innovation process, and suggest that teams should include four types of person: power promoters, possessing necessary hierarchical power; expert promoters, possessing specific technical knowledge; process promoters, connecting the power and expert promoters; relationship promoters, with strong ties to others outside the organization (Hauschildt and Kirchmann, 2001; Gemünden, Salomo, and Hölzle, 2007). The process and relationship promoters' role is substantial in efficient internal communication, as they connect persons from various

organizational units and develop good personal relationships with players from whom they gather critical information (Walter and Gemünden, 2000).

Internal communication during the project sales process

Although the literature on project marketing and sales is rich in research and insights on how to build and develop interaction with external stakeholders, the dynamics of internal communication and its role in the project sales process remains unclear. Successful interaction with the potential customer and other network actors during the project sales process is largely dependent on internal communication (Nätti and Ojasalo, 2008; Lecoeuvre-Soudain, Deshayes and Tikkanen, 2009). In other words, the quality of the interactions between the supplier and customer organizations will be largely determined by the effectiveness of managing external and internal communication flows during the project sales process.

The project sales process includes the search, preparation, bidding, negotiation, implementation, and transition of a project (Cova and Holstius, 1993). The sales process is typically long and complex, and may include several sub-processes and activities such as responding to invitations to tender, short-listing, and the tendering of bids. These sub-processes require extensive communication within and between supplier and buyer organizations as well as with other network actors (e.g. consultants, engineering offices and non-business actors). The management of a firm's relationships to a local network of business and non-business actors, named the "milieu", is central (Cova and Hoskins, 1997). The project supplier needs to integrate the knowledge of different individuals to serve the achievement of a common goal and in order to formulate a competitive offer. Integrating specialist knowledge from different competence areas requires intensive communication

within the project sales team, which is often dispersed in different locations and organization departments.

In the early phase of the project, the supplier typically receives an inquiry or request for proposal (or budget proposal), or simply a message from a potential/existing customer directly or via its sales agent or subsidiary in the customer country in question. How the inquiry is acted upon next is not always self-evident. Basically, the sales manager or area sales manager is in charge of coordinating communication with the multiple known individuals, and this may span divisions and national borders. Yet this alone is not the whole picture. The value of the potential deal may influence the interest and involvement of top management. Similarly, persons who already have very good personal relationships with the customer company are always of great importance, even if their role would not formally seem to be so evident. Furthermore, very practical but significant issues, such as good foreign language skills, and especially speaking the language of the customer country, are of great importance. It is also possible that an essential part of the delivered project (e.g. steel structures) will be manufactured by another supply partner in another country. Additionally, the supplier might be participating in financing the project in cooperation with a partner in yet another country. The engineering company, involved in most industrial projects, has to be treated well in terms of communication. All of this means that communication needs to be as coordinated as possible. And yet all the persons involved may have divergent (also personal) objectives, and subsequently can be reluctant to share their knowledge. As a consequence, the complexity and dynamics of the communication required between persons possessing tacit knowledge is very high, when trying to formulate a competitive offer.

Ramsing (2009) points out the importance of a strategic perspective on internal communication in project settings. Problematic relations between project managers, line managers, top management, and project team members increase the chance of conflicts (Ramsing, 2009). However, internal communication especially at the early phases of the project sales process has remained largely unexplored. Thus, there is a need for more knowledge on the nature of internal communication networks and the barriers to and drivers of efficient internal communication during the early phases of the project sales process.

Research setting

The research gap is approached by studying internal communication during the early phases of the project sales process in a company offering material handling equipment. The unit of analysis is the emerging and evolving internal communication network during the early phases of the project sales process. The selection of the studied project sales process was made by theoretical sampling (Eisenhardt and Graebner, 2007), following the guidelines of Yin (2008). The emphasis was placed on the representativeness of a typical large scale project sales case, and the accessibility of reliable information concerning internal communication during the project sales process. The selected case was studied by combining in-depth qualitative interview data with social network analysis.

Social network analysis is a research technique employed to study relationships between different actors, both individuals and organizations (Wesserman and Faust, 1994; Mead, 2001; Scott, 2007). The method focuses on how an actor is embedded in a network structure, and how that structure emerges from dyadic relations between actors. The method was adopted as it provides a sophisticated technique with strictly developed and defined measures

to analyze relational data based on matrix algebra and graph theory (Scott, 2007). The measures of social network analysis such as centrality, density, and betweenness are universally accepted to analyze network structures (Wesserman and Faust, 1994). These measures are specifically developed to understand the structures of a network and the positioning of an actor in that network. Furthermore, the focus of the present study, the internal communication during the project sales, is a type of network phenomenon, and thus a method that enables the complexity and nature of that network to be understood is required. As such, social network analysis offers suitable tools. In addition, the research questions of the study require an understanding of a social network in the form of an internal communication network during project sales, and thus a method offering tools to analyze and understand social phenomena is necessary. Social network analysis is specifically developed to understand social networks, and thus appears to be a justified choice (Wesserman and Faust, 1994; Scott, 2007).

Although the method can offer only a static depiction of the network in a certain moment of time, it still provides rigorously made depiction of that network in which actors are operating during project sales. In addition, the extensive number of earlier studies have shown that social network analysis is an suitable and effective method to analyze networks (e.g. Phillips and Phillips, 1998; Cross, Borgatti and Parker, 2002; Aboelela, Merrill, Carley and Larson, 2007; M'Chirgui, 2007), and communication networks (e.g. Grippa, 2009; Hancock and Raeside, 2010; van der Valk and Gijsbers, 2010), as well as projects (e.g. Mead, 2001; Nirmala and Vemuri, 2009).

Description of the studied supplier company and the project sales process

The selected case company is a large international matrix organization producing material handling equipment and services for ports, harbours, shipyards and the offshore industry. The company employs approximately 10,000 people and is structured in a matrix formation, comprising the functional organization (the Market areas) and the divisional organization (the Product units). The project sales processes are typically highly complex involving a variety of business and non-business actors and last from somewhat over a year to several years. The present study focuses on the early phases (marketing and sales) of the supplier company's project cycle (Figure 1).

[Insert Figure 1.]

In the studied project sales process, the focal company is negotiating with a customer on the delivery of materials handling equipment and service contracts. The studied case takes in a period of 10 months and includes the pre-phase and almost the whole tendering/negotiation phase. The present study considers particularly this 10 month period to represent the early phases of project selling. The project supplier company has a long-term relationship with the customer company, one of the largest logistics operators in Russia. The relationship between the two companies began in the 1980s. However, there had been no transactions during the past few years. In the studied project sales process, the supplier's offer included materials handling devices (e.g. container cranes), information systems (e.g. automatic control systems), and service contracts. The estimated value of the new offer was substantial from the supplier company's perspective. Figure 2 depicts the studied project sales process set-up, illustrating the variety of locations (4 countries, 5 supplier units, 5 customer units), the flow of communication (thin dashed lines and solid lines), and the focus of the study (thick dashed

line). The flow of communication depicted in the Figure does not consider communication between customer units.

[Insert Figure 2.]

The supplier company's headquarters in Finland was in charge of the sales process, while the regional office in St. Petersburg also played a significant role, communicating intensively with the customer's terminals in St. Petersburg, as well as with the customer's headquarters in Moscow and the container terminal in Novorossiysk. Thus, besides the focal company's headquarters, the St. Petersburg office also had good local relations with the customer. The supplier's Ilyicheysk office mostly operated with the customer's container terminal in the same location. The supplier has a regional office in Moscow, but it was not involved in the case. The supplier's regional office in Valencia was involved only during a reference visit to an earlier customer of the supplier company.

Research approach

Data was collected through in-depth interviews (n=10) and a structured questionnaire (n=23) submitted to individuals involved in the studied project sales process. In addition, archival organizational data provided secondary data. The data analysis was conducted using inductive content analysis (Miles and Huberman, 1994) and social network analysis (Wesserman and Faust, 1994; Scott, 2007). Figure 3 depicts the research process.

[Insert Figure 3.]

The data collection phase began with an analysis of the e-mail correspondence concerning the studied case. The case company had stored most of the e-mail correspondence sent and received during the studied project sales process phase. These e-mails (n=300) revealed 39 persons from the focal case company involved in e-mail correspondence. In addition, the e-mails revealed the involvement of 24 external persons, mostly from the customer company.

From the e-mail correspondence, key persons were identified based on the number of received e-mails, and the person's hierarchical status in the focal project supplier company. The ten most focal persons identified in this way were interviewed to obtain more in-depth understanding of the unit of analysis (n=10). The in-depth interviews took in the following themes: the nature of internal communication, the characteristics of the project sales process, and the role of internal communication during the sales process. The duration of the interviews was on average one hour and the interviews were recorded and transcribed verbatim. The data analysis employed three steps of inductive content analysis: data reduction, data clustering, and data abstracting (Miles and Huberman, 1994). In the data reduction phase, informants' expressions relating to internal communication during the studied project sales process were separated from the data. Expressions concerning issues such as internal communication, internal communication network, barriers to internal communication, and drivers of internal communication, were taken into account. In the data clustering phase, the expressions were categorized according to core consistencies and meanings. In the final phase, the categories were abstracted to the themes. The themes comprised the descriptions of the internal communication network during project sales, as well as the barriers to and drivers of internal communication in project sales.

For social network analysis, a structured questionnaire was sent to individuals involved in the e-mail correspondence. Of the 36 persons, 23 answered the questionnaire, yielding a response rate of 64 per cent. The respondents were asked to name freely eight internal persons with whom they had communicated concerning customer related issues during the case. In addition, information on the intensity of the communication was requested. Thus, the communication links can be analyzed as directed and valuated. The free recall of eight persons is considered adequate to achieve a reliable representation of the network when collecting data for social network analysis (Rapoport and Horvath, 1961; Wesserman and Faust, 1994). Social network analysis offers a wide range of measures to analyze networks, and in the present study we have limited our analysis to the four measures introduced in Table 1.

[Insert Table 1.]

The measures are selected to represent both the network and individual levels. The network level measures indicate the overall structure of the network. The network centralization measure is selected to indicate the focus of communication around a single person or a small group of people. Network density measures network cohesion at a general level (Wesserman and Faust, 1994). Two individual level measures are employed to identify the network's key individuals. The first individual level measure is degree. This commonly used measure is selected to reveal the most extrovert persons and those most communicated to by others. According to previous studies, degree is a suitable measure by which to study communication in project teams (Mead, 2001). The second individual level measure is betweenness, which is selected to reveal the individuals that are stressed most in the communication flow. In addition, the central position usually indicates power in the network. The measures are

selected to represent the most commonly used measures (Wesserman and Faust, 1994) and, on the other hand, to be those that are the most suitable for the present study to illustrate the nature of internal communication networks during project sales.

Results

There were 50 persons involved in internal communication during the studied project sales process. These persons form a network consisting of 111 ties between the individuals (Figure 4). The colour of a node depicts the organizational unit in which the persons worked during the case. The size of a node depicts the volume of communication received from others (InDegree). The bigger the node, the higher the volume of received communication. Since Figure 4 is based on the directed data, it should be observed with care, understanding that the tie between two persons can be unidirectional or bidirectional. The figure illustrates the complexity of internal communication patterns during the project sales and shows that the network consists of only a small group of central actors. In the following the nature of the internal communication network is analysed more in-depth with the selected measures (see Table 1).

[Insert Figure 4.]

The communication network during the project sales process

The internal communication network depicted in Figure 4 appears to be fairly well structured as measured by the selected social network analysis measures. Table 2 displays the results of the selected measures.

[Insert Table 2.]

The first selected network level measure is network centralization. The measure was selected to indicate the degree to which communication is centralized around a single person or small group. Communication network centralization was measured by inflowing communication to a person (InDegree), outflowing communication from a person (OutDegree), and the extent of communication mediators (Freeman Betweenness). The results indicate that communication is centralized more around persons who communicate to others than those who are communicated to, since the OutDegree value (0.145) is higher than the InDegree value (0.103). Measured by the betweenness, centralization is even lower (0.096). Thus, centralization seems to be fairly low. However, since the data used in the study is directed, there is some indication of centralization. For the project sales process, this kind of communication network indicates higher information propagation. On the other hand, there is a substantial need for communication management, since a significantly large number of internal persons are involved in the sales process communication network and thus the information can be scattered.

The network's density value (0.045) supports this conclusion. The result suggests that the overall knittedness of the directed network is at an adequate level, since values above 0.03 are considered to imply faster information propagation and greater network cohesion in directed data (Aboelela, Merrill, Carley and Larson, 2007). Thus, it seems that the structure of the internal communication network in a project sales process is not perceptibly centralized. Concluding this, neither is the project network distractively hierarchical. On the other hand, since the communication is widely dispersed, processes and methods to store the flowing information have to be efficient and commonly agreed upon. In sum, the project sales process includes several persons that are closely linked to each other. To understand the values

produced by the network level measures, the results must be complemented with personal level measures.

Scrutinizing the internal communication network via the selected personal level measures revealed the most communicated to (InDegree) and most communicative (OutDegree) persons, as well as those who occupy the most central position in the communication flow (Betweenness). The results of the degree measure indicate that the sales director, directors of product units 1 & 3, and the unit 3 project manager are the most central persons. These values are rather high compared to the mean degree values. Although the network level measures (centralization and density) suggest that communication network centralization is moderate, the personal level measures (degree and betweenness) identified a small group of key persons. This is surprising, since it could be assumed that in the project sales process the person leading the sales process would be the most central actor measured by communication. In the studied project sales process, the sales director is the formal leader. However, since the internal communication is dispersed among a group of persons, it can inflict confusion among other persons in the project sales network. In addition, if communication between the central persons is not efficient, decisions and actions taken by the formal manager of the sales process could be based on insufficient information.

To understand the roles of individual persons further, the betweenness values were analyzed. Betweennes is a commonly used measure to dissect the network power structure (Wesserman and Faust, 1994). The results revealed that the director of product unit 3, the sales director, and the Port Cranes director have the most central position in the communication flow. In comparing these values to the mean betweenness of the entire network, it can be concluded that these persons' betweenness values are significantly high, indicating that they exert

considerable stress on communication. These individuals possess substantial power in the network through the communication flow, since their potential to control the flow is extensive. In addition, as they link organizational units and players with the greatest hierarchical power, these persons appear to be the process promoters of the project sales network (Hauschildt and Kirchmann, 2001). In other words, these persons are the key players in the communication network.

Barriers to and drivers of effective internal communication in the project sales process

The second objective of the present study is to identify the barriers to and drivers of effective internal communication in the project sales process. Based on the analysis of in-depth interview data, four barriers to and four drivers of effective internal communication were found. The main barriers are 1) unregulated usage of technical systems, 2) unsystematic and unstructured documentation, 3) neglecting the impact of cultural differences, and 4) personal politicking.

The first barrier to effective internal communication is *the unregulated usage of technical systems*. Technical systems refer to intranets, customer relationship management tools, data archives, and production management tools. The value of technical systems facilitating communication was noted by the studied supplier company, but the management of their application was perceived to be inadequate, leading to information overflow and unreliable information in the information systems. In addition, cultural factors were perceived to affect the usage of technical systems. One explanation for the insufficient usage of technical systems in the case company is the substantial diversity of the systems supporting specific functions. In addition, according to the director of product line 1, data input to these systems was not systematically regulated and supported. Thus, the same information could be entered several

times in slightly different formations. And since the information was found to be insufficient and unreliable in these systems, the motivation to use and input the data was low. Thus, specific information was not necessarily available when needed. In the project sales context, insufficient usage of technical systems can thus lead to inconsistencies and poor learning between projects. Furthermore, insufficient internal communication could make the supplier's interface appear fragmented to customer (Nätti and Ojasalo, 2008).

The second barrier to effective internal communication in project sales was found to be *unsystematic and unstructured documentation*. The main challenges relate to way in which the documentation process was structured, the procedures for documenting informal information and tacit knowledge, and the motivation to document, especially if the information was not perceived useful to oneself. Although documentation does not directly influence the communication process itself, its indirect impacts can be considerable. For example, if the content of the communicated message is distorted or misleading based on the unstructured documentation, the intended effect of the message is endangered. In addition, from the programme and portfolio management perspective, the unsystematic and unstructured documentation may cause inefficiencies for learning across projects. According to a sales manager in the studied project sales process, document version management was inadequate. From the customer's perspective, supplier's unsystematic documentation procedures can lead to frustration due to the need to repeat specifications and needs. The role of efficient documentation as a success factor in project sales is also in line with the findings of Tuli, Kohli and Bharadwaj's (2007) who point out the importance of supplier's documentation emphasis in the context of solution business.

Neglecting the impact of cultural differences was pointed out by several informants. If cultural differences are not taken into account, they can form a substantial barrier to effective internal communication (Ajmal and Koskinen, 2008). The studied case indicated that communication is preferred with a person speaking the same language, even if a more advantageous communication channel existed and was known. For example, in the studied project sales process the Russians and Ukrainians preferred communicating with each other since they have a common language. In addition, the knowledge to select an efficient communication channel was usually insufficient when communicating with a person from a different culture. For example, in the studied project sales process the preferred communication channels differed between countries; Russians preferred face-to-face and telephone communication whereas Finns preferred e-mail. This is a significant challenge for project oriented companies operating in global markets, since production, sales, service and other company functions are usually dispersed to various countries. In addition, efficient customer services usually require local offices near the customer, yet the selling and management of a project could be located on the other side of the world. Thus, globally dispersed information has to be easily available. In this type of setting, the role of process promoters is substantial and their assurance of an efficient project sales network needs to be recognized (Hauschildt and Kirchmann, 2001; Gemünden, Salomo, and Hölzle, 2007). In the studied case, the sales director and the director of product unit 3 may be identified as the process promoters.

The final identified barrier to effective internal communication in project sales is *personal politicking*. This finding is interesting, since the notion of politicking emerged from several sources during the project sales case. For example, obscuring information and not imparting the whole truth was perceived to be a manifestation of personal politicking. Interestingly,

most of the persons that noted some politicking were at the director level in the organization. One explanation is that the persons are trying to gain more influence over the project. The phenomenon is emphasized especially in project business, since project teams have to be compiled for each project. Thus, there are no established management structures. In addition, the phenomenon was perceived to culminate in projects that involved several organizational units, since these units are attempting to gain more authority for themselves. Personal politicking leads to uncertainty, distorted information and finally the quality of decision making declines. In addition, politicking could appear to the customer as misguided power relations. Derived from this, it can be argued that the resultant harm might be extensive if process or relationship promoters in the communication network incline to personal politicking.

In addition to the barriers discussed above, the four drivers of effective internal communication in project sales were identified, which are 1) open communication atmosphere, 2) non-hierarchical organization structures, 3) variety of alternative communication channels, and 4) communication training.

The first identified driver of effective internal communication is an *open communication atmosphere*. The atmosphere in the studied case was mostly perceived to be open and trusting. The people involved in the project sales process were considered reliable and communicated relatively openly regardless of organizational hierarchies. Especially the supplier's sales managers considered the communication atmosphere to be open. The influence of this atmosphere on a project oriented company is substantial. Cross-functional project teams involve persons from various organizational units and several hierarchical levels. An open communication atmosphere supports internal communication free of organizational

boundaries. The finding is supported by the social network analysis of the communication network, since network centralization is moderate (Aboelela, Merrill, Carley and Larson, 2007). An open communication atmosphere manifests itself to the customer as ease of communication with various levels of the supplier organization without incurring conflicts.

The second driver is *non-hierarchical organization structure*. The absence of a strictly regulated hierarchical organization and communication structure was perceived to make it easy to communicate horizontally and especially vertically in the organization. For example, communication between the functional organization and divisional organization was seen to be straightforward as there was no regulated communication chain. The second driver differs from the first one, since the first driver is achieved by building trust for example through collaboration, whereas the second driver is achieved by building sufficient organization structures. Directors from both matrix organization structures, the director of Market Area 1 and the sales director, noted that the low degree of hierarchy supports internal communication in project sales. However, the social network analysis of the data indicated that the actual communication between these structures was rather low. Thus, it can be concluded that the reasons for the quite narrow communication interface between these organizational units lie elsewhere. In project business, hierarchical organization structures could hinder the communication flow, since there are usually several organizational units involved in the project. The communication flow between these units is of particular importance since the breadth of interaction with a customer in project business is widening (Cova and Salle, 2007). A non-hierarchical organization structure manifests itself to the customer as ease of communication with various levels of the supplier company with the expectation that the message will be communicated efficiently within the supplier organization.

The third driver of effective internal communication is *the variety of alternative communication channels*. The variety of communication channels is needed since the project team comprises persons from varied backgrounds and functions (e.g. culture, education, organizational tasks) the usage of communication channels and methods diverges substantially. For example, the director of Market Area 1 noted that there is a substantial difference in the preferred communication channels in communicating with Russians or Finns. In addition, the preferred communication channel seemed to vary also among persons working at the same location. However, e-mails seemed to be the most preferred communication channel. In the studied case, the challenge was the unregulated usage of these communication channels, and especially the technical systems. A wide variety of alternative communication channels manifests itself to the customer as consistent communication with the full breadth of supplier personnel.

The final identified driver of effective internal communication in project sales is *communication training*. According to the director of Market Area 1, especially in the functional organization of the studied project supplier, communication training was extensive and included areas such as constructing a clear message, cultural differences, and selecting the proper communication channel. Unique and complex projects require good communication practices so as not to result in inconsistencies with the customer. Training enables the broad and effective implementation of good communication practice. Successful communication training manifests itself to the customer as consistent and effective communication, both internally and externally.

Many of the identified barriers and drivers of internal communication are closely interlinked. For example, the unregulated usage of technical systems and the variety of alternative

communication channels, as well as communication training, impact to the usage of technical systems, documentation, and consideration of cultural differences. In addition, some of the identified barriers and drivers are closely linked by their nature, for example the open communication atmosphere driver and the personal politicking barrier are quite close each other. However, but the open communication atmosphere is build on trust and ease to communicate, whereas the personal politicking is diminished by determining roles and making the goals visible. Thus, deriving from the extensive process of internal communication, the indentified barriers and driver are closely related, but at different levels.

Conclusions

The present study offers twofold conclusions based on the empirical research into internal communication in a supplier's project sales process. *The first* objective of the study was to examine what kind of communication network is formed during the early phases of a project sales process. Our results suggest that a non-centralized and rather dense communication network is formed during the project sales process. Due to the large number of individuals involved, the role of internal communication is considerable. However, a relatively small group of persons seems to play a substantial role in the communication network (the sales director, the director of product units 1 and 3). The multiple organizational units involved in the project sales process places the unit directors in central position. As the results indicate, there are a small number of key individuals. Through these persons, information flow management has the greatest impact. Further, communication between these key players has the greatest impact on the efficiency of internal communication in the project sales process.

The second objective of the study was to answer the question of what are the barriers to and drivers of efficient internal communication during the early phases of the project sales process. Based on the analysis of the illustrative case, we suggest that there are *four main barriers* (Unregulated usage of technical systems, Unsystematic and unstructured documentation, Neglecting the impact of cultural differences, and Personal politicking) that hinder internal communication and *four main drivers* (Open communication atmosphere, Non-hierarchical organization structures, Variety of alternative communication channels, and Communication training) that promote the internal communication.

Theoretical implications

By leaning on the literatures of project management, project marketing, and research on internal communication completed with empirical evidence, the study increases understanding on the nature of internal communication in a project setting. Previous research on internal communication in a broad level has offered various challenges to and drivers of that communication (e.g. Lloyd and Varey, 2003; Eskerod and Riis, 2009; Edmunds and Morris, 2005). However, project business sets some special requirements for internal communication deriving from its discontinuing, unique, and complex nature (Cova, Ghauri and Salle, 2002). Thus, the findings from the previous studies are not completely exploitable for the project business setting.

Our study contributes to the extant literatures of project management and project marketing (e.g. Cova and Holstius, 1993; Cova and Salle, 2007; Eskerod and Riis, 2009; Ingason and Jónosson, 2009) by depicting the nature of internal communication and identifying the most relevant barriers to and drivers of internal communication especially in the project setting. Most of the findings (e.g. the substantial role of documentation, the usage of technical

systems, and the need to account for cultural differences) are in line with the extant literature on internal communication in organizations (Mounter, 2003; Eskord and Riis, 2007; Tuli, Kohli and Bharadwaj, 2007; Ajmal and Koskinen, 2008; Nätti and Ojasalo, 2008). However, deriving from the cross-functional project teams employed during project sales, for example we found the role of personal politicking and an open atmosphere to be emphasized in project business. In addition, internal communication is recognized as one of the most important factors in project sales (Lecoeuvre-Soudain and Deshayes, 2006). However, the nature of internal communication networks during the project sales process was remained largely unexplored. Thus, the present study contributes to that literature by illustrating the nature of internal communication network. Thus, future research on project sales should take into account that the communication network does not directly follow the hierarchical structure of the project organization.

Practical implications

Beyond the theoretical contributions of the present research, some implications to practice are offered. *First,* as can be seen in Figure 4, the results concretely show managers the diversity of internal communication in selling a project. To harness the required knowledge and resources, a manager needs to understand the extent and nature of the internal communication network. Additionally, in accordance with the results of the present study, a communication network requires a key person or a group of key persons who have a substantial impact on the effectiveness of communication. Thus, to enhance information flow within the network, these persons need to be identified. For example, practitioners can utilize social network analysis by conducting research on or even as a method of implementation in their communication system. The present study offers some guidelines on performing social network analysis in the

context of project organizations. In addition, a number of extant studies, including Mead (2001), introduce the usage of social network analysis to study project teams in companies.

Secondly, defining the rules of communication and ensuring that all parties follow these rules in practice can have a great impact on the effectiveness of communication. These communication practices should comprise who to communicate with or not in a specific situation, how to utilize the company's technical systems (e.g. intranets, email programs, customer relationship management tools, data archives, and production management tools), and what type of information must be communicated broadly within the organization. These rules are especially important when project organization is at an early stage.

Thirdly, when designing and building, for example, a customer relationship management tool, a highly pragmatic method of improving the quality of information in that system is to avoid employing open fields to input information. An open field here means the data input component of a technical system in which information can be entered wherever formation as the user desires. Thus, the same information can be entered several times in various formations; for example, the information "H-bar" can be entered as H-bar, bar-H, H-bearer, H shaped bar etc. This may cause a problem when searching for information as, dependent on the chosen search word, results may differ. Thus, employing input components that only provide pre-selected options in a particular situation (e.g. list menus) may lead to more consistent data in these technical systems, and thus facilitate more effective internal communication within the company.

Finally, as the extant literature has shown, internal communication has a significant impact on the success of project sales, and managers should therefore invest in their organization's

capability to communicate (Blomquist and Müller, 2006; Ajmal and Koskinen, 2008; Henderson, 2008; Lehtimäki, Simula, and Salo, 2009; Ramsing, 2009). In the present study, communication training that comprises efficient documentation, addressing diverse target groups, and fostering openness in communication, is perceived to be an effective method to improve that capability; usually, this type of communication training is put into practice with the help of specialist consultants. Intensified internal communication will manifest itself to customers as more consistent communication with the supplier, faster information propagation, and more sophisticated solutions to their needs.

Limitations and future research avenues

The proposed conclusions must be approached with care as they are based on a single case study, conducted in a firm with specific market characteristics. Thus, these results are more relevant to companies with the same types of business model and market. Adding more cases might have offered more information to support the implications. However, this study does not aim for statistical generalization based on hypothesis testing, but provides explorative ideas for theory building and testing (Eisenhardt, 1989). In addition, as the case study is inductive in character, its conclusions consequently have been developed inductively; as such, nothing can be deduced concerning the conclusions' causal antecedents. Furthermore, the present study focuses specifically on the early phases of the project sales process, and thus nothing can be concluded concerning internal communication over the latter phases of the project sales process. It can be assumed that the communication network will stabilize when the project communication practices and channels are established.

The academic literature on communication is fragmented and can be approached from several angles. This study offers a general insight on the present state, and suggestions for its

improvement when focusing on project sales. However, there is still much to study on internal communication in the project business context. One issue that might be studied is internal communication when management responsibility is transferred from marketing to the project organization, and also from the project organization to a local organization (service). These phases should be studied as it is essential to transfer knowledge, customers' values, methods of treating customers, and personal relations, so that customers experience consistent supplier behaviour. Another interesting avenue for future study is internal communication strategy and variations between business areas. The issue is relevant as strategies can and should vary, as various operating models require diverse communication strategies to effectively function. In sum, to encourage further research, it is hoped that this study has provided a perspective on the importance of internal communication, and its diversity in project management and sales.

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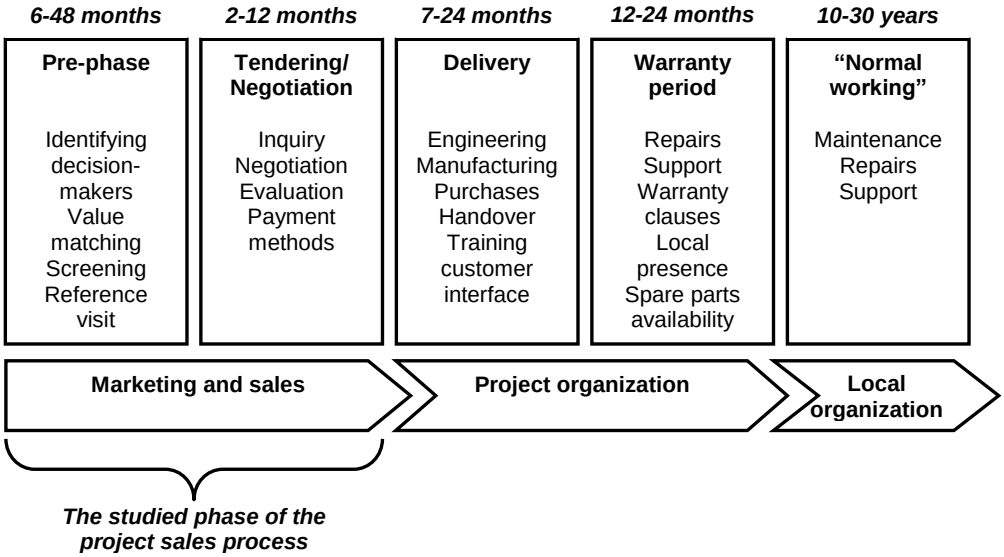

Figure 1. The supplier company's project sales process

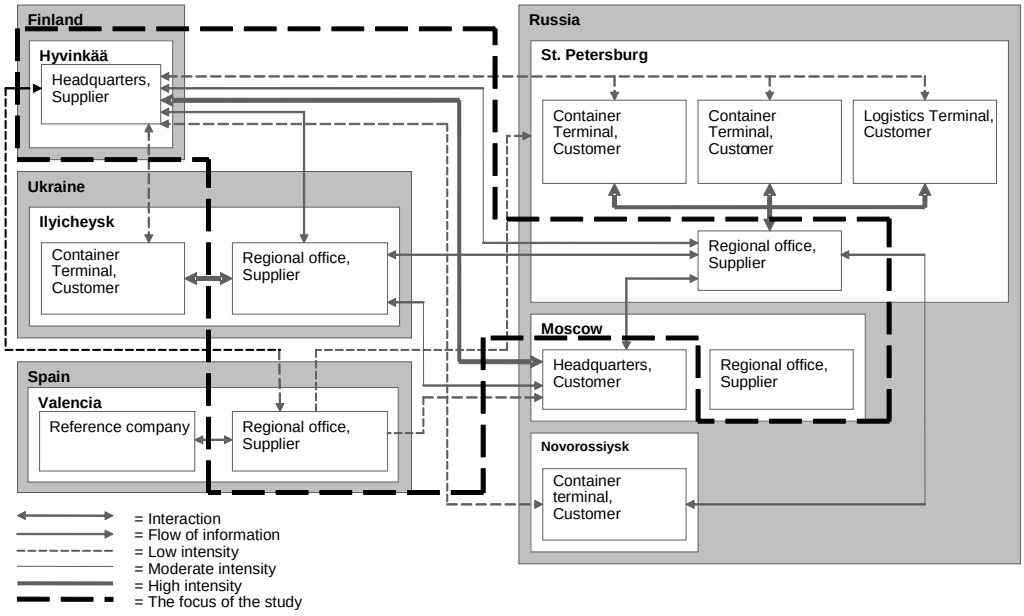

Figure 2. The studied project sales process case set-up

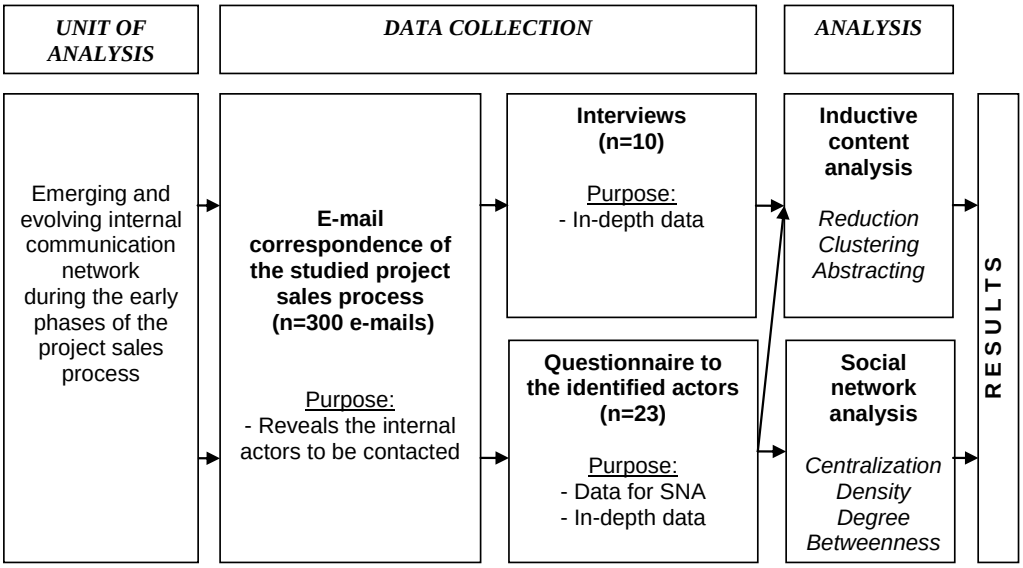

Figure 3. The research process

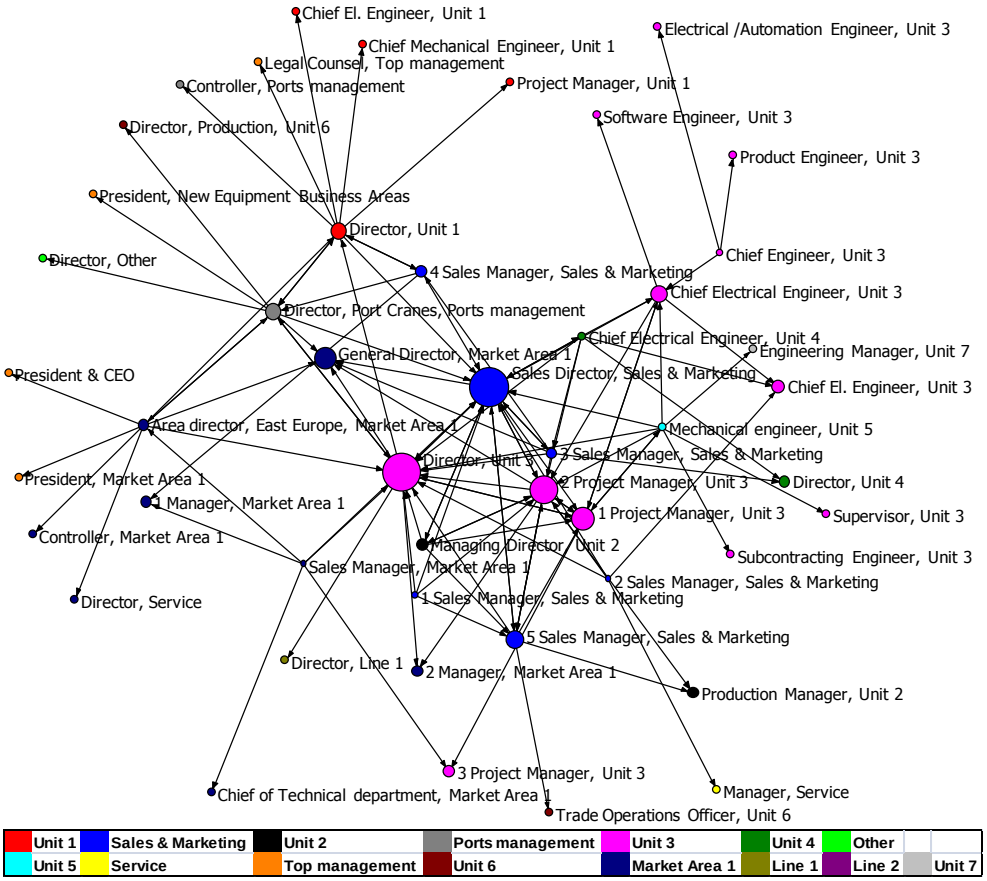

Figure 4. The internal communication network in the studied project sales process.

Table 1. Social network analysis measures employed in the present study

Network Level Measures			
Measure	*Definition*	*Purpose*	*Data form used*
Network Centralization	"…centralization measure is an expression of how tightly the graph is organized around its most central point" (Scott, 2007, p. 89).	To indicate the degree to which communication is centralized around a single person or small group. More centralized groups tend to be more hierarchical in nature.	Directed and valuated
Network Density	"The density of a directed graph is equal to the proportion of arcs present in the digraph." (Wesserman and Faust, 2007, p. 129).	To reveal group cohesion and network "knittedness" and complement.	Directed and unvaluated
Personal Level Measures			
Measure	*Definition*	*Purpose*	*Data form used*
Centrality, InDegree and OutDegree	"…number of other points to which a point is adjacent" (Scott, 2007, p. 83).	To indicate the level of extroversion (OutDegree) and the stress of communication (InDegree). Higher numbers indicate more connectivity.	Directed and valuated
Centrality, Freeman Betweenness	"The extent to which a particular point lies 'between' the various other points in the graph" (Scott, 2007, p. 86).	To indicate the extent to which a person is "in the middle" of information flow. People high in this measure often influence what flows in the network, and often serve as gatekeepers and brokers of information.	Directed and valuated

Table 2. Values of the selected measures.

Network Level Measures		
Measure	*Value*	*Interpretation*
Network Centralization	By InDegree: 0.103 By OutDegree: 0.145 By Betweenness: 0.096	The overall centralization of communication is rather low Communication is centralized more towards persons that communicate to others than persons who are communicated to The stress of communication is not particularly centralized and thus the power relations are fairly well distributed
Network Density	0.045	The overall knittedness of the directed communication network is adequate
Personal Level Measures		
Measure	*Value*	*Interpretation*
Centrality, InDegree and OutDegree	<u>InDegree:</u> 1. Sales Director, Sales and Marketing: 33.0 2. Director of Unit 3: 33.0 3. Project manager, Unit 3: 18.0 <u>OutDegree:</u> 1. Sales Director, Sales and Marketing: 25.0 2. Director of Unit 1: 23.0 3. Director of Unit 3: 22.0	Although the network level measures suggest moderate centralization of the communication network, the personal level measures indicate that a small group of key persons can be identified During the project sales process, a group of persons stands out in the internal communication network

	The mean InDegree and OutDegree: 5.2	
Centrality, Freeman Betweenness	1. Director of Unit 3: 242.9 2. Sales Director, Sales and Marketing: 156.4 3. Director of Port Cranes: 132.8 The mean Betweenness: 21.7	There is a small group of persons playing a substantial role in the communication network The key group of persons exert substantial power in the network through the communication flow, since their potential to control the communication flow is extensive

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A paucity of person's perceived power within industrial project sales

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Abstract: A person's mental structures are found to be the root of a person's actions, and are thus linked to the higher performance outcomes of the organisation. This paper focuses on increasing the understanding of the person's perceived power in the early phases of the project sales process, examining persons' perceived power in a single case in which a large international company is selling a project. The study contributes to the research on project business by illustrating a person's perceived power within industrial project sales. We suggest that during the early phases of the project sales process, the persons involved in the sales process perceive their own power to be lesser than that of others, although their interest in the project is equal to that of the others. In addition, we claim that the exiguity of perceived power during project sales impacts the person's decision making and communication.

Keywords: power; network pictures; mental models; project business; project sales; project management; case study; Russia; empirical research; qualitative research.

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1 Introduction

Project business has been an object of academic interest in recent decades (e.g., Cova and Salle, 2005; Whitley, 2006; Tikkanen et al., 2007; Aaltonen et al., 2008; Kujala et al., 2011). These projects, which have been defined as discontinuous, unique and complex in nature (Cova et al., 1996), are an increasingly common way to conduct business in business-to-business markets. Unique in nature, they are not comparable with any other project, even for the same customer. Thus, projects cannot be grouped with other projects, so the mass consumption marketing approach based on the potential to gather individuals and organisations in homogenous segments is not reasonable (Cova et al., 2002). In contrast, the relationships of actors and their networks become an object of focus (Ford et al., 1986; Håkansson and Johanson, 1992).

The discontinuous and unique nature of projects sets great challenges for resource management in the supplier company (Hadjikhani, 1996; Cova et al., 2002). Typically, project teams are formed of experts with different specialties and the work role of an individual team member may vary over the course of a project and in different project teams (Mintzberg, 1980; Whitley, 2006; Alajoutsijärvi et al., 2012). Thus, project team members are often required to adapt their roles and knowledge to changing circumstances. Especially during the early phases of a project, the perception of a member's own role in the project can fluctuate. Thus, the team members' perceptions, also known as mental models, for example of the project's environment and goal can vary substantially. However, these mental models are the root of a person's actions, and are thus linked to the higher performance outcomes of the organisation (Gary and Wood, 2011).

A research stream based on the understanding of business relationships and networks has developed the concept of network pictures to describe these mental models (Ford et al., 2003; Henneberg et al., 2009; Corsaro et al., 2011; Abrahamsen et al., 2012). Power is one of the eight building blocks of network pictures (Henneberg et al., 2006; Ramos and Ford, 2011). An actor's power affects its opportunities to influence other actors (Dahl, 1957). Since the power block in the network picture is subjective in nature, it may be referred to as perceived power, expressing how actors appraise their level of influence in relation to other actors (Ahituv and Carmi, 2007).

The extant literature discusses power at both the single person level (Roome and Wijen, 2005) and at company level (Ford et al., 2003). There are also studies about power in the context of projects (e.g., Aaltonen et al., 2008; Vaaland and Håkansson, 2003), but

there still seems to be a lack of discussion about the individual actor's perceived power in project business. Understanding lacks especially about the early phases of the project, when the work roles and network pictures are novel and not stabilised. Nonetheless, the role of these early project phases seems to be emphasised in the changing project business (Artto et al., 2008; Jalkala et al., 2010; Kujala et al., 2010). In addition, perceived power is considered to affect the actor's decision making (Henneberg et al., 2006) and networking (Ford and Redwood, 2005). Thus, there would seem to be a gap in our understanding that needs to be addressed. The purpose of this explorative study is to increase understanding about the person's perceived power in the early phases of the project sales process. We have devised the following research question to approach this purpose: *How does a person involved in project sales perceive their power in the early phases of the project sales process?*

To answer the above question, the phenomenon is elaborated through a single case study. Perceived personal power is examined in a large international company producing materials handling solutions. The studied case represents a project sales case in which the focal company is negotiating with a customer to deliver materials handling equipment and supporting services. The customer is one of the largest logistics companies in Russia.

The present study contributes to project business research by illustrating a person's perceived power within industrial project sales. We suggest that during the early phases of the project sales process, the persons involved in the sales process perceive their own power to be lesser than that of others, although their interest in the project is equal to that of the others. In addition, we find that the paucity of perceived power during project sales impacts the person's decision making and communication. In doing so, the study extends the research on power in the context of project business (e.g., Aaltonen et al., 2008; Vaaland and Håkansson, 2003) and sheds light on the early phases of the projects from the perspective of perceived power. In addition, the study offers an insight into the person's perceived power within the sales process and introduces a method (the power/interest matrix) to scan the perceived power of the employees.

2 Literature review

2.1 Project business as a research field

Project business has attracted considerable attention among academics and practitioners in recent years (e.g., Turner et al., 1998; Mead, 2001; Artto and Kujala, 2008; Wikström et al., 2010; Sinha et al., 2011). According to Artto and Wikström (2005, p.351), project business can be defined as "the part of business that relates directly or indirectly to projects, with the purpose of achieving objectives of a firm or several firms." The relationships of actors and their networks are the focal point (Ford et al., 1986; Håkansson and Johanson, 1992). The management of a company's relationships to a local network of business and non-business actors, named the 'milieu', is central (Cova and Hoskins, 1997).

Within the academic literature on projects, at least two partly overlapping literature streams can be identified. One is the project management literature stream (e.g., Artto and Kujala, 2008; Sinha et al., 2011), while the other stream targets an understanding of buying and selling projects in the business relationship and network context (e.g., Mattsson, 1973; Cova and Holstius, 1993; Skaates and Tikkanen, 2003; Cova and Salle,

2007). In the present study, these streams are combined to achieve a more comprehensive understanding of the studied phenomenon.

The project sales process is typically long and complex, and may include several sub-processes and activities such as responding to invitations to tender, short listing, and tendering bids. According to Cova and Holstius (1993), the project sales process comprises the search, preparation, bidding, negotiation, implementation, and transition of a project. The integration of project sales and execution in a global project supplier company is found to be challenging (Artto and Kujala, 2008). This derives from the fact that usually the sales organisation is distributed over several local sales offices, whereas the organisation responsible for project delivery is usually more centralised (Dietrich et al., 2007). In addition, the discontinuous and unique nature of project business sets great challenges for resource management in the supplier company (Hadjikhani, 1996; Cova et al., 2002; Bahroun et al., 2007). Typically, experts from different specialties are fused into teams (Mintzberg, 1980). The team's tasks may be unique or repetitive in nature (Lundin and Söderholm, 1995; Kashyap and Sinha, 2011). In addition, according to Mazur and Chen (2011) complex project usually require expertise from various functional departments. The work role of an individual team member may vary over the course of a project and in different project teams (Whitley, 2006).

The project staff is often required to adapt their roles and knowledge to changing circumstances. Especially during the early phases, the perception of one's own role in the project can be in flux. Thus, the team members' perceptions, for example of the project's environment and goal, can vary substantially. However, these mental models impact a person's actions. According to Gary and Wood (2011), the more accurate mental models of the causal relationships in the business environment are linked to higher performance outcomes. Thus, the academics among the business studied and systems engineering seems to be increasingly interested about human cognition and a person's mental structures (e.g., Vicente, 2006; Huff and Eden, 2009; Acharya and Mahanty, 2010; Balasubramanian et al., 2011).

2.2 A person's cognitive mental structures

Research on human cognitive mental structures is extensive. Prior research offers several disciplines in which to study a person's mental model (e.g., Markus and Zajonc, 1985; Weick, 1995; Huff and Eden, 2009; Eysenck and Keane, 2010). These disciplines offer concepts, such as cognitive maps (Fiol and Huff, 1992), schemas (Markus and Zajonc, 1985), mental models (Hodgkinson and Johnson, 1994), heuristics (Eysenck and Keane, 2010), and dominant logic (Bettis and Prahalad, 1995). Generally, these mental structures can be understood as a person's simplified knowledge structures or cognitive representation of how the world works.

Based on an understanding of the business relationships and networks, the network picture concept is developed to describe these managers' mental models (Ford et al., 2003; Henneberg et al., 2006; Corsaro et al., 2011; Abrahamsen et al., 2012). Network pictures are defined as "the different understanding that players have of the business network in which their focal company is operating" [Henneberg et al., (2009), p.95]. According to Henneberg et al. (2006, p.409), these network pictures are produced by "subjective, idiosyncratic sense-making with regard to the main constituting characteristics of the network in which their company is operating." They are not objectively given but socially constructed, a bounded personal interpretation of the

network context, and therefore determined in a purely individual way (Gadde et al., 2003). In addition, the person's network picture is affected by their problems, uncertainties, abilities, and limits to their knowledge and understanding (Ford et al., 2003; Henneberg et al., 2006). However, they are the reality on which these actors will act or react. Thus, these pictures have a significant impact on the actors' networking and their reactions, as well as their decisions (Ford and Redwood, 2005). The actor's ability to achieve a certain desired outcome, especially in a situation characterised by ambiguity and uncertainty, is related to its appropriateness for the network picture (Henneberg et al., 2006; Weick, 1995).

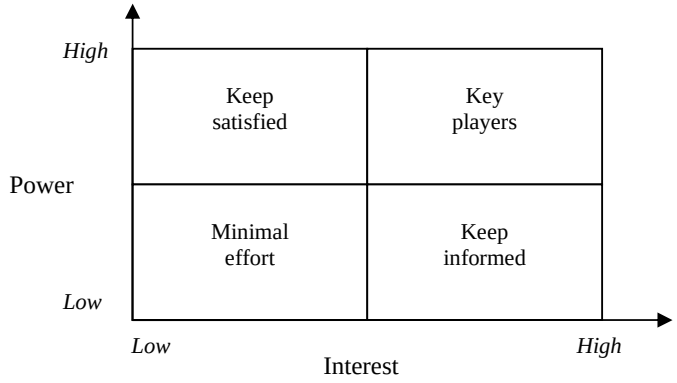
Network pictures are built on the various interrelated dimensions (Henneberg et al., 2006; Ramos and Ford, 2011). In order to study network pictures in an analytical and systematic fashion, some or all of the dimensions should be considered (Henneberg et al., 2006). Power is a pertinent building block of network pictures, indicating the extent of independence and dependence. An actor's power affects its opportunities to impact other actors (Dahl, 1957). Since the power block in the network picture is subjective in nature, it may be referred to as perceived power, a subjective measure expressing how actors appraise their level of influence in relation to other actors (Ahituv and Carmi, 2007).

The extant literature discusses power at the single person level (Roome and Wijen, 2005) and also at company level (Ford et al., 2003). In addition, there is discussion on power in the context of projects (e.g., Aaltonen et al., 2008; Vaaland and Håkansson, 2003). However, there still seems to be a lack of discussion on the individual actor's perceived power in project business, especially during the early phases of the project, when the work roles and network pictures are novel and not stabilised. In providing some empirical evidence, we shed light on persons' perceived power during the early phases of a project. We focus on the project sales phase and limit our study to the person's perceived power in the supplier company over the other persons involved in the sales process.

3 The power/interest matrix

A variety of methods and techniques exists to classify actors in the context of business studies (Gregory, 2007). Mitchell et al. (1997) divide actors into classes using the attributes of power, legitimacy, and urgency. Mendelow (1981) has introduced a model of environmental scanning, where the actors are classified under two dimensions, the dynamism of the environment, and the power of the stakeholder relative to the organisation. Johnson et al. (2006) have adapted Mendelow's (1981) model and modified the dimension of dynamism to the measure of interest. The power/interest matrix classifies actors in relation to the power they hold and the extent to which they are likely to show interest (see Figure 1). Thus, the power/interest matrix offers a way to group actors and manage them for practitioners as well academicians. In addition, the matrix can be used to identify the potential key blockers and facilitators of a strategy (Johnson et al., 2006).

Figure 1 The power/interest matrix to group and manage actors



Source: Olander and Landin (2005)

Many successful studies have been conducted on the utilisation of the power/interest matrix (Dutta and Burgess, 2003; Olander and Landin, 2005; Johnson et al., 2006; Gregory, 2007; Aaltonen et al., 2008). For example, Olander and Landin (2005) have employed the power/interest matrix along with a method of stakeholder mapping in the context of project management, to identify actors and their influence on studied projects. Dutta and Burgess (2003) have employed the matrix to identify and classify actors in the context of an information systems project. In the present study, the power/interest matrix is employed to learn how persons perceive their power over the other persons involved in project sales, and what their level of interest is towards the project. The matrix is found suitable for the present study since it rates perceived power of an individual to the relation of interest that the individual have towards the project. Simply measuring the perceived power could show distorted result if the interest towards the project is low. In addition, the matrix represents a tool that has been used in several former academic studies. To understand the matrix more thoroughly, the concepts of power and interest are introduced in the following.

3.1 Concept of power

The concept of power is multidimensional and complex (Zimmerling, 2005). One of its early researchers, Dahl (1957), defines the concept as the determination of the behaviour of one social unit by another. Simply put, the idea is that A has power over B to the extent that he can get B to do something that B would not otherwise do. Later, it has been specified that the actor has to have an object over which it has power (Emerson, 1962). Lasswell and Kaplan (1952) specify the concept further by adding "in such and such particulars (the scope of power)". Power is a multidimensional concept, and the sources of power are multiple as well (Kutschker, 1982; Johnson et al., 2006; Van Den Bulte and Wuyts, 2007). Ahituv and Carmi (2007) divide power into three levels: participation power, position power, and perceived power. The concept of perceived power is a subjective measure expressing how actors appraise their level of influence in relation to other actors (Ahituv and Carmi, 2007). There are various thorough studies on the concept (e.g., Kutschker, 1982; Roome and Wijen, 2005). In addition, it has to be noted that there

are extensive discussions about the concept of power in a wide range of science, such as in the fields of management, political science, social psychology, and sociology (e.g., Langer and Keltner, 2007; Anderson and Galinsky, 2006).

3.2 Concept of interest

Interest is a context dependent concept. Johnson et al. (2006) define the level of interest as how interested each actor is in impressing his expectations on the organisation's purposes and choice of strategies. In other words, the extent to which an actor expresses his interest in supporting or opposing a particular strategy. Gregory (2007) simply defines the level of interest as the interest an actor may have in an object. In this present study, interest means an actor's interest on the purposes and choices of strategies of the studied project.

4 Research design

This article presents an in-depth single case study combining qualitative and quantitative data. The case study strategy (Miles and Huberman, 1994; Yin, 2008) was selected as the main research approach for the present study because there is only limited prior knowledge on persons' perceived power within industrial project sales. In addition, according to Yin (2008), the need to understand complex social phenomena, such as perceived power, also supports the choice of case methodology. The selection of the studied project sales case was made by means of theoretical sampling (Eisenhardt and Graebner, 2007; Yin, 2008). The emphasis was placed on the representativeness of a typical large scale project sales case and the accessibility of reliable information concerning persons' perceived power during the case. In addition, access to data from the top management of the studied project was emphasised in the sampling.

4.1 Focal company

The focal company represents a relatively large project oriented company operating on the international stage with a complex offering involving services and products. The company produces cranes, and other materials handling equipment for logistics operators, such as ports, harbours, shipyards, and the offshore industry. Besides developing innovative technologies, the company places a strong emphasis on delivering qualified and consistent service to its customers. Net sales in 2011 amounted to 1.9 billion Euros with 11,000 employees at the end of the 2011. The sales process in the focal company can take from somewhat over a year to several years. The focal company divides its sales process into five phases: pre-phase, tendering/negotiation, delivery, warranty period, and 'normal working'. In the present study, the project sales case includes the pre-phase and tendering/negotiation phase.

4.2 Case project description

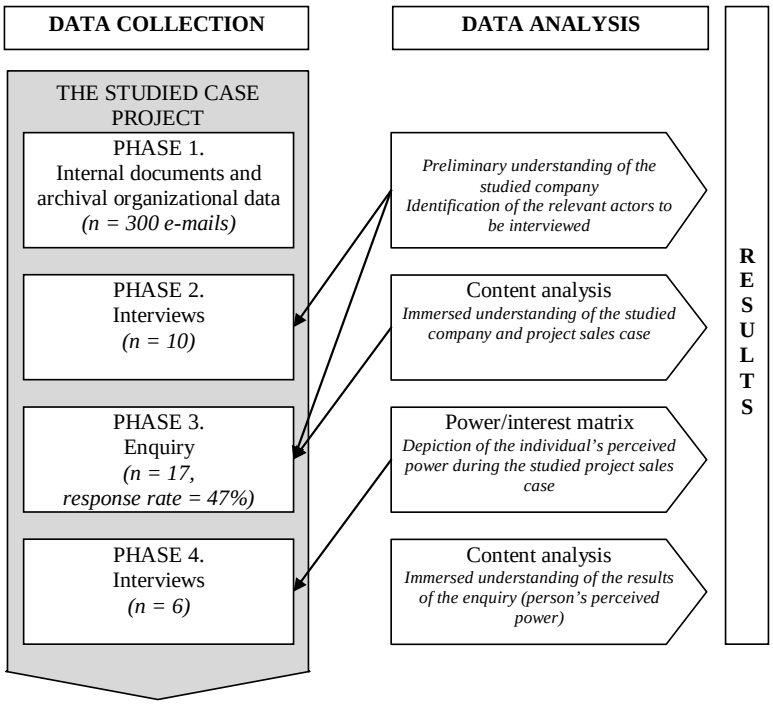
In the studied case, the focal company is negotiating with a customer to deliver materials handling equipment and supporting services. The customer is one of the largest logistics

companies in Russia, with which the project supplier company has a long-term relationship established in the 1980s. However, there had been no transactions during the past few years. The project sales case covers the early phases of the project sales process, and the duration of the studied process is a ten-month period. In the studied project sales process, the supplier's offer included materials handling devices (e.g., container cranes), information systems (e.g., automatic control systems), and service contracts. The offer comprised products and services to be delivered to the customer's four container terminal sites and one logistics terminal site. The logistics terminal and three container terminals are located in Russia (St. Petersburg and Novorossiysk), and one container terminal is located in the Ukraine (Ilyicheysk). In addition, the customer's headquarters are located in Moscow. The focal supplier company's headquarters are located in Finland, and the supplier's regional sales offices involved in the project sales process are in Russia (St. Petersburg and Moscow) and the Ukraine (Ilyicheysk). During the case, there was also a reference visit to another of the focal supplier company's customers, in Spain (Valencia). The estimated value of the offer was substantial from the supplier company's perspective. Thus, the desire and efforts made to win the bid were substantial.

4.3 Research approach

The research process included the data collection and the data analysis stages that partially overlapped. Further, these stages are divided into four phases. Finally, the results of the study are derived from the research process. Figure 2 depicts the research process.

Figure 2 The research process



The first phase of the research process included achieving a preliminary understanding of the studied company and case, as well as the identification of the relevant persons to be interviewed. The data included, among others, archival data, company press releases, and annual reports. The archival data included correspondence involving some 300 e-mails concerning the project sales case and sent during it. The e-mails exposed 39 of the focal company's personnel. Thus, the phase one revealed the focal company's persons involved in the studied project sales process and offered preliminary understanding of the studied case as well the case company.

At *the second phase*, based on the number of e-mails received, and the person's hierarchical status in the focal project supplier company, the decision was taken to interview the ten most focal persons (n = 10) to obtain an in-depth understanding of the studied company and project sales case. The open-ended research interviews (Silverman, 2006) covered the themes of the project business in the company at a general level, the organisation culture, and the studied industrial project sales process. The duration of the interviews was on average one hour and they were recorded and transcribed.

The third phase of the study was directed to depict the individual's perceived power during the studied project sales case. The objective was approached with an enquiry, sent to the focal company's 36 persons identified earlier for involvement in the project sales process study. The enquiry was sent using online survey software. Of the 36 persons, 17 answered the enquiry, yielding a response rate of 47% (n = 17). The enquiry contained three phases. *Firstly*, the respondents were asked to name eight persons in the focal company with whom they had interacted most during the studied case sales project. *Secondly*, the respondents were asked to intuitively position all of the named persons in the power/interest matrix. It has to be noted that all respondents did not name, and thus position, eight persons. *Finally*, respondents were asked to position themselves as well to the matrix. To ensure that respondents understood what was meant by the dimensions in this case, the dimensions of the matrix were thoroughly explained in the enquiry, before answering the matrix question. From the answers to the power/interest matrix, the average answer was formed. For example the average placement of the first named person (Person 1) was defined based on the all placements of the firstly named person to the matrix, and so on. In addition, the average position of the respondents themselves was located based on the information as to where the respondents were themselves positioned. These average answers could be calculated exactly, since the used online survey tool offered specific coordinate data of the individual answers. The range of the both coordination axels were from 0 to 500. After the calculation, the average responds were placed to coordinates (Figure 3).

Finally, at *the fourth phase* of the research process, six interviews were conducted (n = 6) to increase validity and in-depth understanding. The respondents for this last phase were selected based on the previous results. The focal position in the studied project sales process was emphasised in the selection. The open-ended research interviews (Silverman, 2006) covered the themes of the concept of power at general level, a person's power in the context of project sales, and a person's perceived power in the context of project sales. In addition, the results of the power/interest matrix (Phase 3) were discussed. The duration of the interviews was on average an hour and those were recorded and transcribed.

The data analysis from the all interviews (n = 16) employed three steps of inductive content analysis: data reduction, data clustering, and data abstraction (Miles and

Huberman, 1994). In *the data reduction phase*, respondents' expressions relating to persons' perceived power during the studied project sales process were separated out from the data. Expressions concerning issues such as

1 a person's power in project sales

2 perceived power in project sales

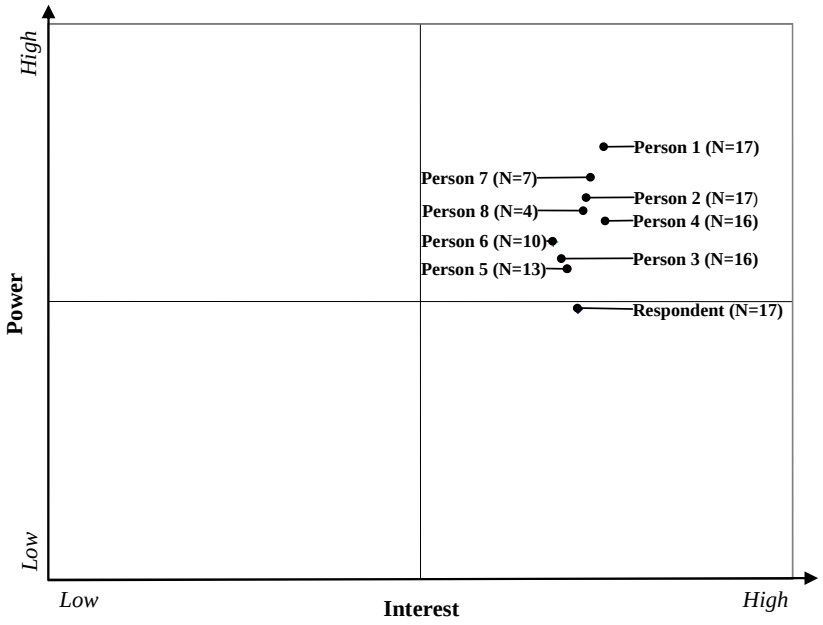
3 the effects of perceived power on project sales, were taken into account.

In *the data clustering phase*, the expressions were categorised according to core consistencies and meanings. The categories were formed based on the research question and its goals. In *the abstraction phase*, the categories were abstracted to themes that comprised the descriptions of the person's perceived power within the project sales process, and thus also increased understanding of the results from the enquiry. Two main themes could be identified from the data. At the following the results are discussed.

5 Discussion

The results suggest that the respondents perceive their own power during project sales to be less than that of others, despite their interest in the project being equal to that of others. Figure 3 depicts the average response in the power/interest matrix, where *N* refers to the number of answers in the enquiry. However, since all of the respondents didn't name eight persons with whom they had interacted most during the studied case sales project, the number of answers (*N*) is lower in the cases of persons 7 and 8 than in the case of persons 1 and 2 who are the firstly named persons.

Figure 3 Average respond of all 17 answers to the power/interest matrix



The 17 respondents comprised 6 informants at top management level, 8 at managerial level, and 3 chief engineers. Thus, the respondents were at a high level in the hierarchy, so that factor does not explain why persons perceived their power to be weaker than that of other actors involved in the project sales process. In addition, the average interest level of the respondents and their named persons is high and at the same level. Thus, the respondents to the enquiry and their named persons seem to be valid concerning the particular case project.

Based on the interview analysis, the low perceived level of power may have a variety of effects on a person's actions. Two main themes regarding the effects of perceived power emerged from the interview data (Phase 4):

1 decision making

2 communication.

First, a low perceived level of power is found to affect decision making in terms of the time taken to make the decision, the quality of decisions, and risk taking. The time taken was found to grow where there is a low perceived power level, since persons are expending more effort to find support for their decision or even in attempting to find a person with a high power level to make the decision on their behalf. In addition, decision quality was found to be jeopardised by a low perceived power level. Although the person might know a better solution to a problem, he may be satisfied with another solution, if he believes his power is insufficient to have effect. According to the persons interviewed, responsibility is considered to come with power, and thus the person with high perceived power and responsibility is perceived to consider his decisions more carefully. Under such circumstances, risk taking with high perceived power and responsibility is considered to be more difficult.

The second main theme regarding the effects of perceived power is communication. According to the interviews, communication methods are considered to vary depending on the person's perceived power level. A person with a high perceived power level is likely to prefer more intimate communication methods, such as face-to-face or phone. A person with low power is perceived to prefer easier methods such as e-mail, although the need for communication is then considered to be greater. The respondents reported that high perceived power is considered to make it easier to communicate negative issues, such as an unsuccessful negotiation with a customer. Additionally, communication is considered to be more persuasive by nature when the perceived power is low, since persons are found to avoid making decision by themselves. On the other hand, when the perceived power is high, communication is considered to be more influential and confident. Furthermore, high perceived power is considered to have an impact on the need to explain the choices made.

The findings from the matrix and the analysis of the qualitative data are of interest, since a person's subjective perceptions are linked to decision making, networking and even to the higher organisational performance outcomes (Ford and Redwood, 2005; Henneberg et al., 2006; Gary and Wood, 2011). During the project sales process, a perceived lack of power may lead to inefficiencies, since decisions are not made or are delayed. In addition, several studies have recognised that communication plays a pivotal role in the selling and execution of projects (e.g., Cova and Salle, 2007; Kujala et al., 2007; Jalkala et al., 2010). Thus, insufficient communication originating from low perceived power may lead to difficulties in project sales. On the other hand, the findings

could be anticipated from the extant literature, since the work roles are not established during the early phases of the project and thus uncertainty is high (Whitley, 2006). In addition, the person's subjective perception of the surrounding network (network picture) is not yet validated, again because the project is still in its early stages (Weick, 1995; Henneberg et al., 2006)

6 Conclusions

The aim of the present study was to increase understanding of the person's perceived power in the early phase of the project sales process. The study contributes to the research on project business by illustrating a person's perceived power within industrial project sales. According to results, at the early phases of the project, when uncertainty is high, the work roles are un-established (Whitley, 2006) and the network pictures are not validated (Ford and Redwood, 2005), the persons involved in the sales process perceive their own power during project sales to be lesser than the other persons' power, although their interest in the project was equal to that of the others. In addition, the study suggests that the paucity of perceived power during project sales affects the person's decision making and communication. In doing so, the study extends the research on power in the context of projects (e.g., Aaltonen et al., 2008; Vaaland and Håkansson, 2003) and sheds light on the early phases of projects from the perspective of perceived power in a unique way. In the present study, an understanding of the person's perceived power in project sales is generated by combining research on project management and project marketing, as well as research on a person's cognitive mental structures. This exploratory study combines qualitative and quantitative data to gain in-depth understanding of the complex social concept of perceived power. According to the findings of the study, the evolvement of a person's network picture in the early phases of project sales needs to be supported, since it may affect the success of project sales through the decisions made and communication. Thus, companies operating in project business should observe, support, and build their employees' perceived power level in the early phase of the sales process.

For managers, the study offers an insight into the person's perceived power within the sales process. Although perceived power is not easy to measure in organisations, the study introduces a method (the power/interest matrix) to scan the employees' perceived power. One way to observe and support, as well as build perceived power, is to use superior-subordinate discussions in which the employee can express his perceived power. On the other hand, perceived power can be a sensitive issue for discussion, in which case parallel methods should be developed to measure and support the perceived power of an individual actor.

The proposed conclusions must be viewed with care, as they are based on a single case study involving a specific company with specific market characteristics. Thus, the results are more relevant to companies operating in comparable market conditions and with comparable characteristics. In addition, it must be noted that the number of respondents to the enquiry and of interviewed respondents was relatively low. However, the multi-stage research process with mixed methods and the combination of qualitative and quantitative data delivered an in-depth understanding. Under these circumstances, companies with the same market conditions and characteristics can share in the findings and conclusions of the present study.

The study opens up avenues for future research. The first future direction would naturally be to find more evidence for persons' low perceived power in the early phases of the project sales process. Perceived individual power in project sales should be studied in other companies with divergent market characteristics. Secondly, the present study focused only on the early phases of the sales process, and thus the individual actor's own perceived power should be studied more longitudinally, extending the focus also to later project phases.

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Understanding the Revisioning of Network Pictures – Insights from an Agent Based Modeling Approach

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ABSTRACT

Industrial marketing research has recently focused on managers' "network pictures". Network pictures are a manager's subjective mental representations of their relevant business environment. However, longitudinal research on changes in network pictures is scarce, although the concept is found at the core of networking and thus impacts network outcomes. Constant change in a network places a high emphasis on a manager's ability to make sense of network changes and revise the network picture. This study contributes to the discussion on the relation between network pictures, networking, and network outcomes by researching a manager's ability to revise the network picture in differing business environments. The issue is approached through simulation, and more specifically using agent based modeling. We propose that a manager who can revise the network picture faster benefits more in a dynamic business environment than one who can only do so slowly. However, in a business environment with a greater trend for change, the gap between the fast and slow reviser narrows. In addition, the combination effects of the variables of interval time and trend indicate the business environments in which a slow reviser of network pictures gains on the fast reviser. That occurs in cases where the interval time of changes is either extremely low or high, or when the trend of changes rises.

Keywords – Network Pictures, Business Networks, Simulation, Agent Based Modeling

INTRODUCTION

In today's world, business is increasingly networked. The ability to understand business networks and relationships in the business-to-business context has become an important part of everyday business life, which has in turn during past decades resulted in an extensive body of academic literature on the topic (e.g. Ford, 1980; Gadde, Huemer, and Håkansson, 2003). The Industrial Marketing and Purchasing (IMP) research group has led this discussion. Actors in a network are not considered to exist in isolation but as interdependently interacting actors forming the network. Operating in these business networks is fundamentally based on a person's subjective perceptions of the network. Thus, all persons in the network have their own different, subjective "picture" of the network (Ford, Gadde, Håkansson, and Snehota, 2003). These pictures, formed of the person's perceptions, experiences and presumptions, are in essence mental structures that act as the foundation for managers' understanding of relationships, interaction and interdependencies, and thus are also fundamental to the actor's decision making process (Henneberg, Mouzas, and Naudé, 2006). According to Gary and Wood (2011), the more accurate mental models of the causal relationships in the business environment are linked to higher performance outcomes. These subjective mental structures are therefore a concept central to managing networks and in that sense a relevant issue for study. This perspective has attracted growing interest in the academic literature (e.g. Fiol and Huff, 1992, Ford, Gadde, Håkansson, and Snehota, 2003; Henneberg, Mouzas, and Naudé, 2006; Colville and Pye, 2010; Gary, and Wood, 2011).

Authors in the IMP group have developed the network picture concept to describe these mental models, which is defined as "the different understanding that players have of the business network in which their focal company is operating" (Henneberg, Mouzas, and Naudé, 2009, p. 95). Network pictures are found to be the product of subjective and ongoing sense-making, constituting characteristics of the network in which the actor operates (Henneberg, Mouzas, and Naudé, 2006). The existing literature on the network picture concept focuses on defining the dimensions of the network picture (e.g. Henneberg, Mouzas, and Naudé, 2006; Leek and Mason, 2010), discussing its nature (e.g. Colville and Pye, 2010; Geiger and Finch 2010), and creating a model to study network pictures from both the academic and managerial perspectives (Leek and Mason, 2009; Leek and Mason, 2010; Ramos and Ford, 2011). The network picture discussion has thus far addressed the development of the concept at the theoretical level, offering some empirical evidence (Henneberg, Mouzas and Naudé, 2006; Öberg, Henneberg, and Mouzas, 2007; Leek and Mason, 2009; Leek and Mason, 2010).

There still seems to be a dearth of longitudinal studies on network picture changes, albeit with some exceptions (e.g. Ford and Redwood, 2005; Öberg, Henneberg, and Mouzas, 2007). The constantly changing network emphasizes an actor's ability to make sense of changes and revise the network picture. Thus, understanding the dynamic nature of the network picture is essential in constructing theory around it (Colville and Pye, 2010). The purpose of this study is to increase understanding of the dynamic nature of network pictures, and is approached through a longitudinal examination of the relation between a change in the network and a person's ability to revise the network picture. The research question is phrased *How does a manager's ability to revise the network picture affect the quality of decisions in a dynamic business environment?* It is presupposed that if the network picture corresponds broadly to the network conditions at a given point in time, decision quality is high. And vice versa, if the network picture does not correspond to the network conditions at a given point in

time, decision quality is poor. High quality decisions are supposed to lead to positive network outcomes.

The research question is approached by means of simulation, a form that has been used since the 1950s to understand dynamic behavior (Forrester, 1958). Recent papers have recognized simulation as a suitable tool for management research (Warren, 2005; Gary, Kunc, Morecroft, and Rockard, 2008; Gary and Wood, 2011), B2B marketing research (Watkins and Hill, 2009), and for modeling industrial networks (Folgesvold and Prenkert, 2009). In addition, simulation has attracted growing interest among the IMP group researchers (Wilkinson and Young, 2011). The form's particular strength is that simple models can be employed to support research on abstract phenomena that are hard to study quantitatively using traditional research methods, and especially when a longitudinal research approach is needed. Both factors are central to our research focus, since we are interested in the effect of revising the network picture on decision making quality. First, the network picture concept is inherently abstract, making its measurement empirically challenging. Second, the interest in the change process requires a longitudinal approach, as change occurs over time. Since the research focuses on individual entities, agent based modeling was perceived to be a good approach to modeling the problem (Schelling, 1969; Macal and North, 2006; Gilbert, 2008). Agent based modeling concentrates on individual decision makers, who employ local information and make local decisions to reach their desired goal (Wooldridge and Jennings 1995).

We develop a simulation model of a changing network between firms and the perceived network picture of a variety of decision makers who are assumed to have different abilities in renewing their picture. The primary test variables are endogenous and control the process of change; variables such as interval time, amplitude, or trend intensity of change. The simulation is executed using agent based modeling, which enables the creation of freely forming and developing network structures. The developed model describes how the relationships in a network created by firms at three different levels develop over time, and how managers with different aptitudes to revise network pictures perform in trying to make sense of that network. The selected test variables are shown to control the value of being able to be a fast network picture reviser.

COGNITIVE PERSPECTIVE ON THE RESEARCH OF BUSINESS NETWORKS

Network research has a long tradition, being the object of interest in several disciplines (e.g. sociology, social-psychology, computer sciences, business studies). A collective feature of these disciplines is that an actor is perceived to be related to a theoretically unlimited number of other actors forming a network, wherein individual actors' actions are perceived to affect other actors and their actions. Thus, the object of interest is usually the network itself rather than a single actor. In the business studies domain, networks are discussed in several forms (e.g. supply networks, communication networks, relationship networks). A study on business networks can be grounded on several perspectives, such as organizational networks (Wasserman and Faust, 1994), social networks (Laumann, Galaskiewicz, and Marsden, 1978), and egocentric organizational networks (Gulati, 1998). In addition, among Industrial Marketing and Purchasing (IMP) group researchers, the network perspective has evolved (Ford, 1980; Ford, Håkansson and Johanson, 1986; Håkansson and Johanson, 1992). That perspective is based on the ontological view that markets are interconnected webs of dependent exchange relationships (Anderson, Håkansson and Johansson, 1994; Easton and

Håkansson, 1996). Furthermore, according to the IMP perspective, a core requirement in understanding networks is to understand the interactions of the parties within that network (Ford and Håkansson, 2006). These networks are perceived as relativistic in nature and it is said that there is no single, objective network. A network is not owned by any company, nor can it be centrally managed, although all firms try to manage in it. Also, no company is the hub of the network as there is no "center", although many companies may believe that they are at the center. (Ford, Gadde, Håkansson, and Snehota, 2003).

The interactions in the network take many forms and one of the main challenges for a manager in business-to-business markets is to understand these multiform interactions. In recent years, the academic interest in business studies has emphasized the manager's ability to operate in the network environment. In addressing one aspect of this issue, research examining the role of managerial cognition has shown that understanding managers' cognitive mental structures is focal in studying successful network operations (Simon, 1991; Henneberg, Naudé and Mouzas, 2010; Gary and Wood, 2011). Research on a person's cognitive mental structures is not a novel area. The prior research offers several disciplines in which to study a person's mental model, such as managerial and organizational cognition (Huff, 1992; Huff and Eden, 2009), the sense-making literature (Louis, 1980; Weick, 1995), psychology including social psychology (Markus and Zajonc, 1985; Markus, 2005), and cognitive psychology (Eysenck and Keane, 2010; Manktelow, 2008). These disciplines offer concepts, such as cognitive maps (Ring and Rands, 1989; Fiol and Huff, 1992), schemas (Markus and Zajonc, 1985; Harris, 1994), mental models (Hodgkinson and Johnson, 1994; Osborne, Stubbart and Ramaprasad, 2001), heuristics (Eysenck and Keane, 2010), dominant logic (Bettis and Prahalad, 1995), and belief systems (Rokeach, 1968; Grube, Mayton and Ball-Rokeach, 1994). Generally, the mental structures can be understood as a person's simplified knowledge structures or cognitive representation of how the business environment works. The focus in these concepts typically lies in the entire business environment, including for example human resource policies, earning logics, and existing business relationships. However, the IMP research group's focus remains trained on the interaction of the parties in the network. In addition, dissimilar ontological assumptions or alternative viewpoints to sense-making differentiate the IMP perspective from that of the existing literature (Henneberg, Naudé and Mouzas, 2010). Thus, a dissenting stream of discussion concerning cognitive mental structures has evolved among the IMP research group.

Building on the concept of network theories, a notion has developed that all persons in the network have their own different, subjective "picture" of the network (Johanson and Mattson, 1992; Ford, Gadde, Håkansson, and Snehota, 2003). These pictures are based on the person's perceptions, experiences and presumptions. Nevertheless, these mental structures are the foundation for managers' understanding of relationships, interaction and interdependencies, and thus are also fundamental to the actor's decision making process (Henneberg, Mouzas, and Naudé, 2006). Therefore, these subjective mental representations of the surrounding network are a central concept to managing in networks, and thus a relevant issue for study. IMP group research has proposed that the network picture concept describes "the different understanding that players have of the business network in which their focal company is operating." (Henneberg, Mouzas, and Naudé, 2009, p. 95). These network pictures are argued to be the result of the "subjective, idiosyncratic sense-making with regard to the main constituting characteristics of the network in which their company is operating." (Henneberg, Mouzas, and Naudé, 2006, p. 409). Thus, the network pictures are retrospective in nature, constructed of past events. However, the pictures form a basis for prospective decisions and thus shape organizations' future options (Weick, 1979).

The network pictures are an individual's interpretation of the surrounding network, and thus the foundation for decision making (Ford, Gadde, Håkansson, and Snehota, 2003; Henneberg, Mouzas, and Naudé, 2006; Colville and Pye, 2010). The relation between network pictures and operations in the network is therefore evident. Ford, Gadde, Håkansson, and Snehota (2003) have suggested a model that grasps the composition, one of managing in networks. The model comprises the interconnected elements of network pictures, networking, and network outcomes. The networking element comprises all the interactions of a company or an individual. Networking is an ongoing process in which all actors are networking simultaneously. The essential feature is that networking is affected by the network pictures (Ford, Gadde, Håkansson, and Snehota, 2003; Corsaro, Ramos, Henneberg, and Naudé, 2011). This linkage of managerial cognition and managerial behavior is found also in other research streams (Thomas, Clark, and Gioia, 1993; Gioia and Chittipeddi, 1991). Ultimately, the network pictures impact the network outcomes (Ford, Gadde, Håkansson, and Snehota, 2003). Conversely, the network outcomes affect the actor's network pictures and thus also networking. If the network outcomes are in line with the present network picture, the outcomes validate the picture. On the other hand, if the outcomes are not in line with the network picture, it will most likely be revised (Ford, Gadde, Håkansson, and Snehota, 2003). Thus, these three elements are at the heart of an ongoing process, in which an actor's network picture is revised by the network outcomes as well as by networking itself.

As a person's mental structures have various bases in the literature, change in a mental structure has been an object of interest in various research streams. Since network pictures are found to be a result of the ongoing sense-making process (Henneberg, Mouzas, and Naudé, 2006), the change of a network picture is closely related to the process of cognitive sense-making. According to Weick, Sutcliffe, and Obstfeld (2005), sense-making involves the ongoing retrospective development of plausible images that rationalize what people are doing. The organizational learning literature based on organizational theory has also focused on the change of mental models through individual learning (Kim, 1993; Bontis, Crossan, and Hulland, 2002). The literature explains the nature of learning ability through the concept of absorptive capacity, which refers to the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends." (Cohen and Levinthal, 1990, p. 128). Zahra and George (2002, p. 186) redefine the concepts at the firm level as "a set of organizational routines and processes by which firms acquire, assimilate, transforms and exploit knowledge to produce a dynamic organizational capability." The nature of absorptive capacity is found to be cumulative, meaning that prior related knowledge confers an ability to recognize the value of new information (Cohen and Levinthal, 1990). Dyer and Singh (1998) and Lane and Lubatkin (1998) further develop the conception of absorptive capacity by finding that the ability to learn is jointly determined by the relative characteristics of the parties. Furthermore, Peters and Johnston (2009) extends the research on absorptive capacity from dyadic level to network level.

The existing literature on the network picture concept focuses on defining the dimensions of the network picture (e.g. Henneberg, Mouzas, and Naudé, 2006; Leek and Mason, 2010), discussing its nature (e.g. Colville and Pye, 2010; Geiger and Finch 2010), and creating a model to study network pictures from both the academic and managerial perspectives (Leek and Mason, 2009; Leek and Mason, 2010; Ramos and Ford, 2011). The network picture discussion has thus far addressed the development of the concept at the theoretical level, offering some empirical evidence (Henneberg, Mouzas and Naudé, 2006; Öberg, Henneberg, and Mouzas, 2007; Kragh and Andersen, 2009; Leek and Mason, 2009;

Leek and Mason, 2010). Meanwhile, Henneberg, Naudé and Mouzas (2010) note that research on the relation between networking and revising network pictures remains sparse, although the impact on the outcomes and positioning in the network has been recognized (Ford, Gadde, Håkansson, and Snehota, 2003; Corsaro, Ramos, Henneberg, and Naudé, 2011). In addition, there still seems to be a dearth of longitudinal studies on network picture changes, with some exceptions adopting a well framed perspective (e.g. Ford and Redwood, 2005; Öberg, Henneberg, and Mouzas, 2007). However, the constantly changing network emphasizes an actor's ability to make sense of changes and revise the network picture. Thus, understanding the dynamic nature of network pictures is essential in constructing theory around it (Colville and Pye, 2010). The present study aims to address these gaps in the network pictures research.

SIMULATION MODEL

Simulation has been put forward as a suitable tool for management research (Warren, 2005; Gary, 2005), B2B marketing research (Watkins and Hill, 2009), and to model industrial networks (Folgesvold and Prenkert, 2009). In addition, simulation has attracted growing interest from the IMP group (Wilkinson and Young, 2011). Its particular strength is that simple models can be used to support research on abstract topics that are hard to study quantitatively using traditional research methods, especially when a longitudinal research approach is needed. Both of these elements are central to the research focus here, given our interest in the effect of revising network pictures on decision making quality. The network picture concept is inherently abstract so its measurement is empirically challenging, and research on the change process requires a longitudinal view as change happens over time. Simulation was therefore selected as the research approach for this paper.

More specifically we selected agent based modeling, which utilizes a bottom-up approach where the behavior of the system emerges through the interaction of the agents (North and Macal 2007). Agents have the same basic properties. According to Wooldridge and Jennings (1995) these are: autonomy, social ability, reactivity, and pro-activeness. The agents are located in an environment where they collect local information and make decisions, which impacts other agents or modifies the environment (Wooldridge and Jennings 1995). Usually the models contain stochastic elements (North and Macal 2007). Agent based modeling is an especially powerful tool in the simulation of different types of network, as all models based on this method are essentially a network built on agents. Although agent based models allow for the dynamic restructuring of the network (e.g. in this case the addition or removal of firms in the business environment), we decided to simplify the model and simulate a structurally static business environment.

MODEL STRUCTURE

The objective for the agent based model is to simulate two distinctively different tasks. First, to create the simulated business network environment and the necessary dynamism in the relationships between the firms operating in the network. Second, the managerial perspective that aims to model how different managers can cope in this environment.

The objective for the simulation model is to create a life-like business environment. The model is constructed to represent a situation where a company is selecting the appropriate partners from the firm's external environment with whom to co-operate. Thus,

the model needs to simulate an environment describing different types of firm and their relationships. The simulation is then used to simulate the dynamic relationships between firms, which emulates a dynamic and constantly changing dynamic business environment in the model.

The model's second purpose is to simulate decision making executed by managers with different attributes. These managers collect local information and make decisions of their own based on that information, and thus are the agents in the model. Each manager is assumed to be identical in every other dimension, but their initial network picture is different and each possesses different abilities to revise their network picture. As the focus of our research is on network pictures, we focus the simulation at the managerial level on each manager's individual network picture. The network picture represents a single manager's understanding of the network formed by the external companies. This picture changes over time as the manager makes sense of the business environment. The model highlights the disparity between the simulated business environment and the manager's network picture.

The performance of each manager is assessed through the quality of their decisions, which is determined by the manager's ability to find the most efficient combination of firms as calculated from the business environment simulation. The managers will always make the best possible decision facilitated by their network picture. However, decision quality is likely to differ just as the manager's network picture differs in the simulated status of the network. This kind of structure leads to a situation where the manager with the best network picture, in this case the minimum of error in the picture at any given time, will make the best decisions. As the network is assumed to be dynamic, the manager's ability to learn, or revise their network picture, becomes significant. Decision quality is also affected by changing costs, which are realized when a manager decides to reselect the combination of firms. The changing costs are realized as the diminishing performance of that new combination of firms. In the model changing costs are implemented with diminished performance to 75% from previous. After the change the performance increases with linear manner and achieves the full performance in 10 simulation rounds. In practice the changing costs occur, for example, when new partners have to learn to work with each other. The following section provides a more thorough description of how the parts of the model were executed and combined.

Business environment

The business environment is simulated as a network comprising three different types of company (A, B, C). Each company describes a layer in a supply chain and all three layers are needed in order to produce a service. The simulated network describes how effectively firms from one level of the supply chain are able to work those from another, simplified so that only connections between companies on levels A to B and on levels B to C are simulated (Figure 1). The structure of the simulated network is presumed to be static, but the value of each link is dynamic. In practice, this means that the number of firms at different levels does not change, but a firm's ability to work with other companies in different supply chain levels in a network changes over time.

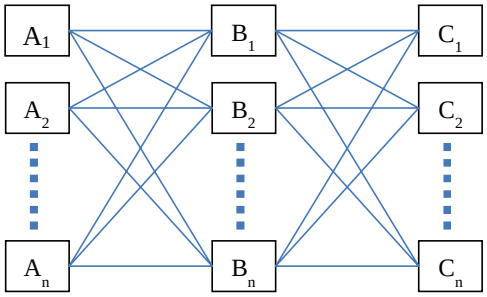

Figure 1. Structure of the network.

The dynamics of the companies' co-operation linkages are controlled for by a set of variables which describe environmental dynamism (Dess and Beard, 1984) that refers to the rate of change, instability, absence of pattern and unpredictability (Dess and Beard, 1984; Priem, Rasheed, and Kotulic, 1995; Hough and White, 2004; Street, Street, and Lamont, 2010). In the present study, we operationalize three variables; interval time, amplitude, and trend. The first, interval time of changes, refers to the instability of the environment (Street, Street, and Lamont, 2010). The network change is implemented as a discrete event causing the co-operation connections to change between static intervals. The control for the length of this interval is interval time. The second variable is amplitude, which refers to the rate of change (Dess and Beard, 1984; Priem, Rasheed, and Kotulic, 1995) and controls the average size of a change in the co-operation network, but the actual size is implemented randomly. The final variable of change is trend, referring to the unpredictability and absence of patterns of environmental change (Dess and Beard, 1984; Hough and White, 2004; Street, Street, and Lamont, 2010). The trend variable controls for the randomness of change. When the trend is high, the co-operation change is more likely to develop in a similar direction to that during previous change. If the trend is low, both the change and the development of the network are more random.

The actual change in the model is implemented with random functions that define how much each of the firm linkages will change. The values of the random functions are dependent on the model parameters. The amplitude parameter controls for the size of change. The interval time describes how often the random change occurs in the model. The third variable, trend, controls for the likelihood of the change continuing in the same direction as during previous change. A high trend value implies that the change of linkages between firms becomes more predictable.

Manager's network picture

The manager's network picture is implemented as a simple system dynamic model. The model contains system dynamic stocks that describe the manager's current vision of the quality of connections between different companies. When the manager's view is compared to the simulated network, a gap can be calculated which represents the discrepancy in the manager's network picture. The gap also represents how much more accurate the manager's network picture could be. Revision is implemented as a continuous change for which the control is the size of the gap, the manager's absorptive capacity, and the manager's ability to revise the network picture; this is used to separate the revisers with different capabilities for revision; the faster reviser will revise a higher relational share of the gap than the slow

reviser. The cumulative nature of the absorptive capacity (Cohen and Levinthal, 1990) dimension implies that if the manager's view is highly erroneous, it is challenging for them to revise their network picture. Once the manager's knowledge and understanding of the situation improves, the change becomes easier. The selected implementation method results that the numerical behavior of manager's network picture closes asymptomatic the simulated network, but it can never be exactly right.

The manager's network decision is also implemented using the system dynamic model, the selection enacted through brute force. The function travels through the whole network in each simulation round, searching for the best possible connections between the firms. This kind of approach provides an accurate optimization algorithm, but from a technical perspective makes the model difficult to simulate. The presupposition is that if the network picture corresponds broadly to the network conditions at a certain point in time, decision quality is high, and vice versa. High quality decisions are supposed to lead to positive network outcomes. The presupposition is supported by the extant literature which claims that an appropriate network picture helps actors achieve desired outcomes, especially when the specific occasion demonstrates high ambiguity and uncertainty (Weick, 1995; Henneberg, Mouzas and Naudé, 2006). In addition, it is presupposed that the revision of the network picture is always enacted towards the existing network conditions at a certain point in time.

SETTING UP THE SIMULATION

The simulation model was tested with parameter variation. Table 1 below shows each variable and the range of values used in the simulation. As the model is based on random functions, the results were also analyzed using Monte Carlo methodology. The Monte Carlo Method was first presented to analyze physical problems (Metropolis and Ulam 1949), but it is also frequently used with simulation models. Monte Carlo random variables are assigned different values according to predefined probability distributions, and the results are expressed as a set of probability distributions (North and Macal 2007). Effectively, the employment of Monte Carlo analysis leads to many simulation rounds with the same parameter settings, which we analyzed in our results by taking the average value from each repetition. The selected number of repetitions in the Monte Carlo analysis was 100. The simulation time step was one week and total simulation time 520 rounds, implying that the simulation time represents 10 years. Anylogic software is applied for the simulation.

Table 1. Parameter variation in the simulation model.

Variable	Description	Values	Increment
Interval time	Interval time of changes	10 – 100	10
Amplitude	Average size of change in the real network	0 – 0.2	0 – 0.04
Trend	Trend dependency in development	0 – 100	10

The true link values change according to interval time, amplitude, and trend. Interval time represents the change interval; the lower the value, the more frequent the changes. At an interval time of ten, the true link values change every tenth time step. Amplitude indicates the maximum size of change, uniformly distributed with a minimum value of 0% and a maximum amplitude value. If amplitude is 0.1, the largest possible change is 10%. Trend represents the impact of previous change on current change; with the value set to 0, each change has a 50% chance of increasing or decreasing, while at 1 the change depends totally

on the previous value. The only exception is when the link has reached a value of 0 or 1, at which point trend has no impact on chance.

The individual managers revise their network picture according to their own, specific revision efficiency. Learning speed depends on the relative correctness of the network picture. If the picture is nearly complete, learning is very slow. On the other hand, if the view is totally erroneous, learning is also slow. As such, learning is fastest in the "middle ground". Figure 2 represents the learning curve utilized in the study.

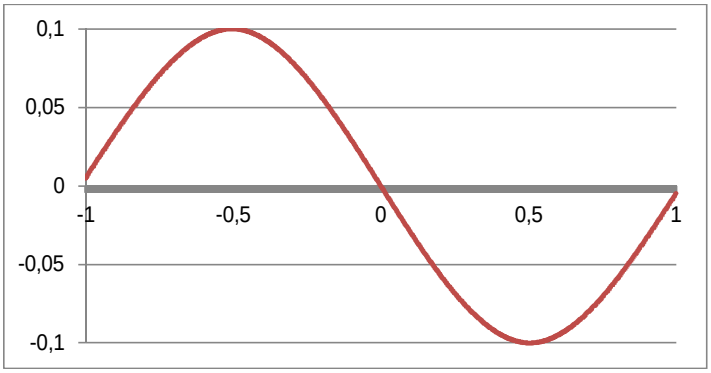

Figure 2. Learning curve.

The relative "gap" between the simulated and perceived value is shown on the x–axis. If the value is 0, the perceived value equals the simulated value. If the values are -1 or 1, the perceived value is either 0 or 1, while the simulated value differs from these. As such, if there are no changes in the network, learning follows an S-curve. The actual learning at the coordinator level is the value from the table function multiplied by learning efficiency.

SIMULATION RESULTS

The simulation model was analyzed both visually and statistically. We first present the visual results, which chart individual coordinators against specific environmental factors. Thereafter we present the regression models, which are used to estimate the impact of the interactions between the environmental factors. The first variable to study is the impact of interval times, presented in Figure 3.

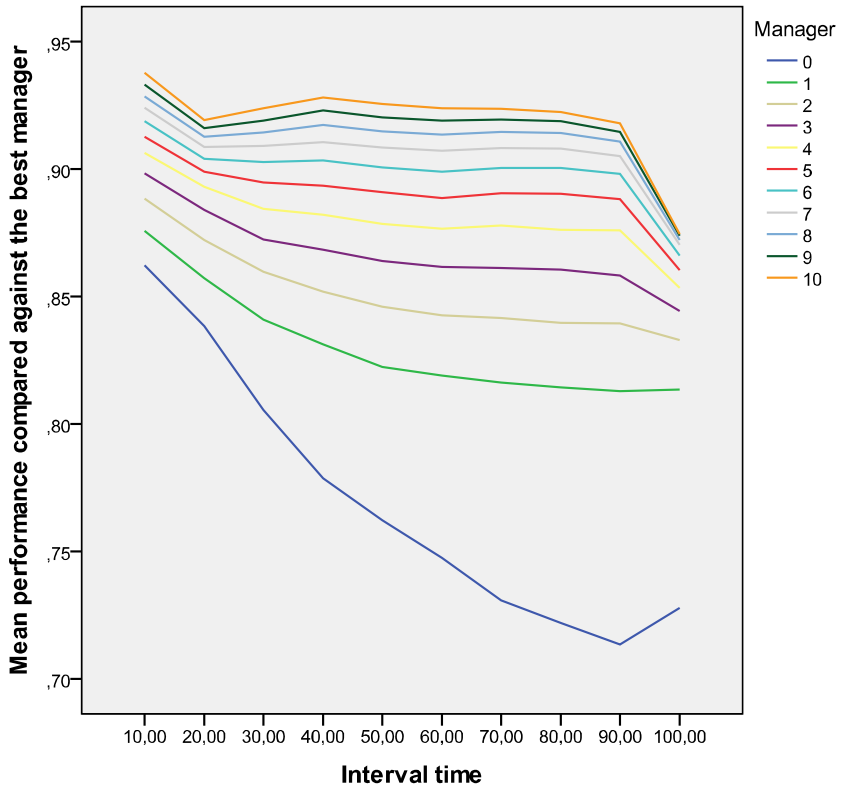

Figure 3. Impact of interval time.

As can be seen in Figure 3, the fast reviser always outperforms the slower revisers, no matter what the interval time. There is a sharp drop in the values when interval time is set to 100. This is most likely due to the simulation run time. When the network changes during the 500th time step, the faster revisers change their chosen connection more quickly and thus incur the penalty for the rest of the simulation run. The results reach a relatively stable plateau for the faster than average revisers (coordinators 5 through 10). The slower revisers suffer diminishing returns as the interval time increases. The results are similar to the amplitude of change, presented in Figure 4. The faster revisers achieve better profits than the slower revisers.

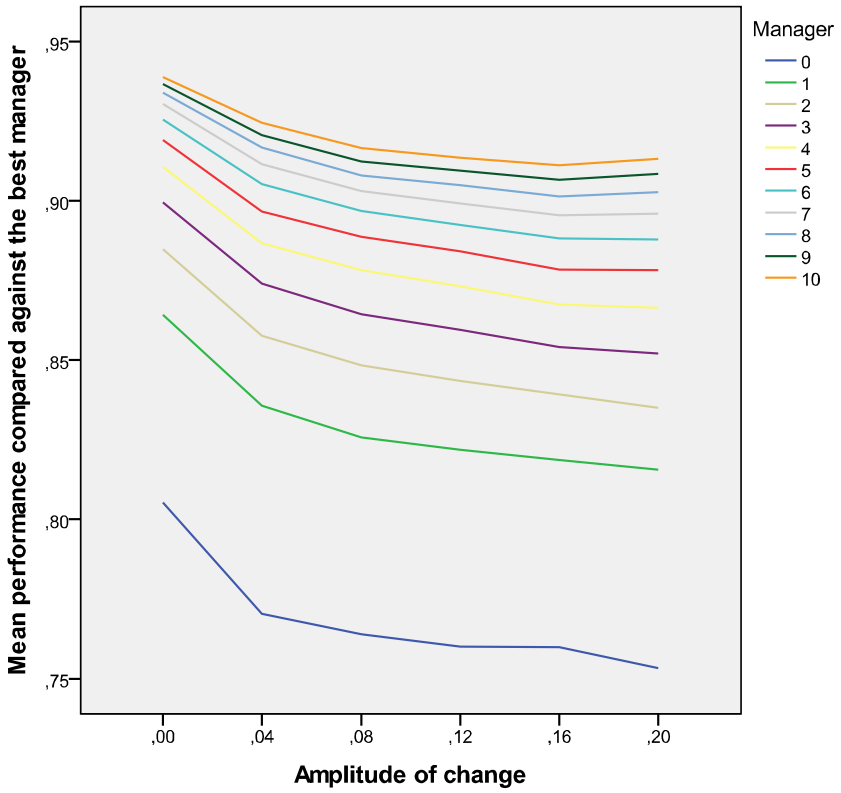

Figure 4. Impact of amplitude of change.

The final environmental variable, trend of change, has more interesting dynamics, as presented in Figure 5. At most values (all those above 0), there is little impact on the performance of individual revisers. As the trend change value increases, the difference between the coordinators decreases. However, when trend is set to 0, there is a large spread in the results. In a totally chaotic environment, faster learning speed is highly significant. On the other hand, if changes are systematic (trend in the direction of change), a faster learning speed still produces greater benefits, but the relative difference is smaller.

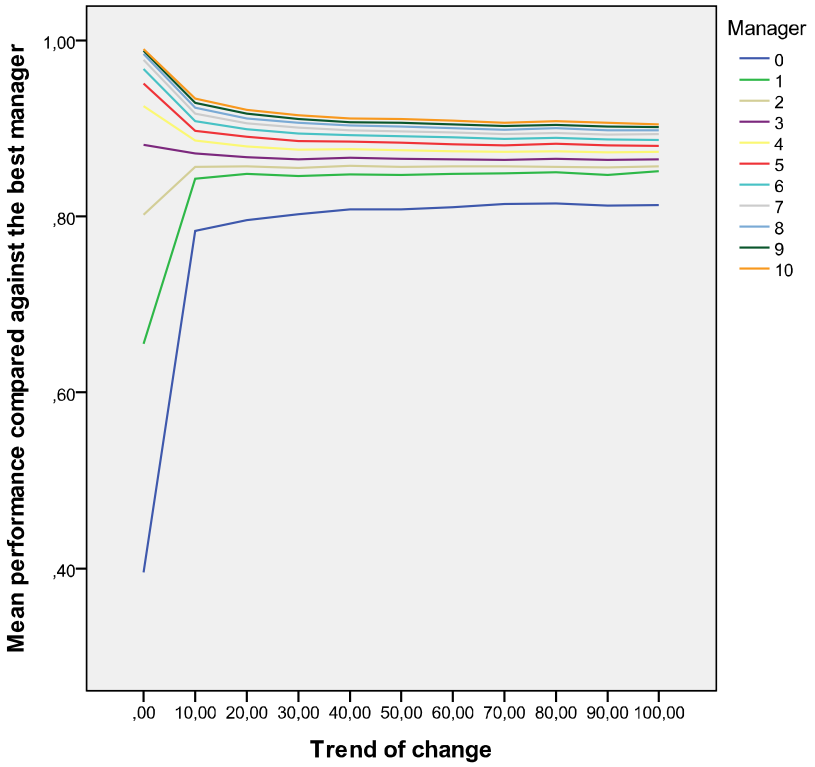

Figure 5. Impact of trend of change.

In addition to analyzing the results visually, linear regression analyses were also conducted. The relative performance between the fastest reviser and second slowest was analyzed using the environmental variables and their interactions as the independent variables. For the environmental variables (trend), a square root was used in the calculation to make the interaction between the variables more linear. Also, in order to analyze the interactions, the environmental variables were first standardized to make the comparison between the models more meaningful. The results are presented in Table 2.

Table 2. Regression model without interaction. The dependent factor is the relative performance of the slow reviser compared with the fast reviser. All of the independent variables are standardized.

Term	Unstandardized Coefficient	t-value	Significance
Constant	1.082	597.106	0.000
Interval time	0.00472	2,602	0.009
Amplitude	0.00891	4.915	0.000
Square root of trend	-0.0414	-22.819	0.000

All the environmental factors have a statistically significant impact on the results. The R square for the regression model is 45.4%. There is also no multicollinearity between the independent factors and the residuals are relatively normally distributed. In the second regression model, the interactions between the environmental factors were included. These are presented in Table 3.

Table 3. Regression model with interaction. The dependent factor is the relative performance of the slow reviser compared with the fast reviser. All of the independent variables are standardized.

Term	Unstandardized Coefficient	t-value	Significance
Constant	1.082	657.714	0.000
Interval time	0.00472	2.866	0.004
Amplitude	0.00891	5.413	0.000
Square root of trend	-0.0414	-25.135	0.000
Interval time and amplitude	0.00262	-1.595	0.111
Interval time and square root of trend	0.0193	11.732	0.000
Amplitude and square root of trend	0.00272	1.654	0.099

The R square of the model increases to 55.0%. However, only the interaction between interval time and trend has a statistically significant value. If that is the only interaction included in the regression, the significance is still 54.8%. The interaction between interval time and trend helps explain the relative difference between different coordinators. The relative performance of the coordinators with different interval times and trend is presented in Figure 6. The only clear interaction can be seen when there is no trend; the line clearly differs from the other possibilities. It could be argued that in the situation where there is constant (interval time is small) and chaotic (no trend) change, the fast reviser performs a lot better than the slower. If even a small trend value is involved, the dynamics between the interacting variables change. The relative performance of the fast reviser decreases significantly when interval time reaches 100.

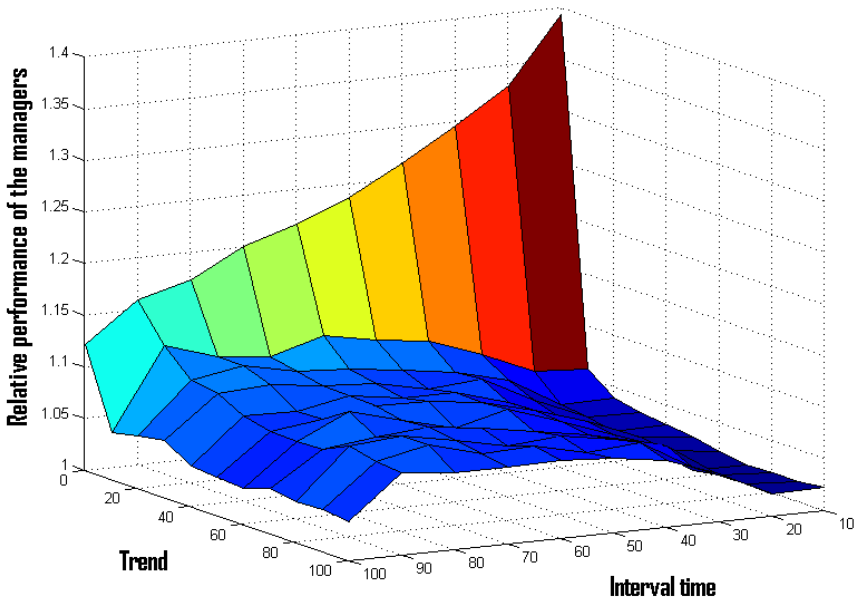

Figure 6. Surface plot between interval time and trend of change in the relative performance of the fast reviser compared to a slower one.

DISCUSSION

The relative performance of the slow compared to the fast reviser depends on a number of environmental factors (trend, amplitude, and interval time of changes) but, overall, revision efficiency has a greater impact. According to the regression analysis, most of the performance was explained by the constant term. Including the interactions between the environmental factors increases the R square from 45.4% to 55.0%. However, only the interaction between interval time and trend is statistically significant. Including the environmental factors in the analysis nevertheless enables better predictions concerning relative performance.

The general finding from the simulation results is that a manager with the ability to revise the network picture faster will make better decisions than one who can only revise more slowly. The presupposition is that decision quality is high if the network picture corresponds broadly to the network conditions at a given point in time. The extant literature implies that the presupposition is justified, since an appropriate network picture is found to help actors achieve desired outcomes (Weick, 1995; Henneberg, Mouzas and Naudé, 2006).

Scrutinizing the behavior of the employed control variables more thoroughly, some interesting notions can be raised. First, it seems that when the interval time of changes in the network increases, fast revisers benefit even more than slow revisers. Our results do however indicate that as interval time increases, the gap between the performance of fast and slow revisers narrows. In general terms it can be concluded that in business environments with a high interval of changes, for example in new markets and those with a large number of actors, investments in fast learning are lucrative. Second, the amplitude of changes in the network seems to exhibit a similar line of behavior. According to the results, fast revisers benefit even more than slow revisers when the amplitude of changes increases. Thus, in a business environment where radical innovations are likely, investments in fast learning seem to be merited. Third, the trend of changes, exhibits more interesting behavior. The results indicate that in a totally chaotic environment with a low trend of changes, faster learning is of truly great importance. However, once the trend of changes decreases, the relative benefit of being a fast reviser begins to diminish. Thus, in stable business environments, for example the paper, metal, and mining industries, investment in revision capability may not be as lucrative as in other business environments. With regard to external parameters, the trend of changes in the network is the most significant individual variable influencing network picture quality.

These results should not be considered surprising as the ability to revise a network picture swiftly is likely to be valuable in a more dynamic business environment. However, an inspection of the combination effects of variables reveals more interesting findings. Only the interaction between interval time and trend is statistically significant; the significance of the regression is 54.8% if only that interaction is included. The interaction offers two findings. First, when both interval of changes and trend are low, the fast reviser seems to perform substantially better than the slow reviser. However, an increase in the trend of changes in the business environment equalizes the performance differences of fast and slow revisers. In addition, an increase in interval time when trend is at its minimum diminishes the relative performance of the fast reviser. Second, the results indicate that when interval time increases, the fast reviser benefits more than the slow reviser; but where the interval time of changes is extremely high, the benefit to the fast reviser diminishes. This phenomenon seems to occur at almost all trend values, and for the lower trend values the change is even greater (excluding the trend value 0).

The findings of the present study suggest that the manager with the ability to revise the network picture faster will make better decisions, although in certain cases the benefit of being a fast reviser diminishes. Also, prior studies have shown that managers do not necessarily need an accurate understanding of the entire business environment (Gary and Wood, 2011). Denrell, Fang, and Levinthal (2004), and Gavetti and Levinthal (2000), have provided evidence that not all partial knowledge is equally valuable. Managers should focus on identifying the essential knowledge rather than trying to make sense of the entire business network (Gary and Wood, 2011). Besides being able to revise the network picture quickly, a manager should be able to discern the essential information.

CONCLUSIONS

The purpose of this paper is to increase understanding of the dynamic nature of network pictures, and to that end a research question was posed: how does a manager's ability to revise the network picture affect the quality of decisions in a dynamic business environment. To answer that question, we have studied the relation between a manager's ability to revise the network picture and decision quality in a dynamic business environment. In approaching this purpose with agent based modeling, we propose that a manager with the ability to revise the network picture faster benefits more in a dynamic business environment than one who can only revise the picture more slowly. However, in a business environment with a higher trend of changes, the gap between the fast and slow reviser narrows. In addition, the combination effects of the variables of interval time and trend indicate business environments in which a slow network picture reviser gains on the fast reviser, namely where the interval time of changes is either extremely low or high, or when the trend of changes increases.

First, the study contributes to the discussion on the relation between network pictures, networking, and network outcomes (Ford, Gadde, Håkansson, and Snehota, 2003; Henneberg, Naudé and Mouzas, 2010; Corsaro, Ramos, Henneberg, and Naudé, 2011), researching the relation between decision quality and an individual's ability to revise the network picture. The findings extend understanding of which kinds of business environment merit a firm's investment in revision ability, for example by enhancing the communication of information in the business environment. Second, the study offers a dynamic and longitudinal perspective on network pictures research, employing simulation and, to be more precise, agent based modeling (Schelling, 1969; Macal and North, 2006; Gilbert, 2008).

LIMITATIONS AND FUTURE DIRECTIONS

Numerical comparisons between managers with differing network picture revision abilities show that the differences are small. It is not possible to state certainty whether or not this holds, but in analyzing the model some potential justifications can be found. The problematic area in the model is the implementation of network picture revision. No clear way could be found as to how revision should be modeled. Changing the implementation method, and especially how the difference between managers' abilities to revise network pictures is realized, would affect also the actual difference between the scenarios. In addition, approaching the phenomenon through simulation requires some simplifications. In the present research, the network picture revisers are modeled in isolation from the network. Furthermore, the number of actors in the business network is taken to be stable, only the relationships change. However, adding complexity would hamper the results.

Modeling has not previously been applied in network picture research. This opens up a new research stream on the topic, and also explicates the problematic areas in the model, as there are no current models against which to benchmark. Future research should verify the model empirically to improve the validity of the results. In addition, the current state of the model should be developed further to increase its accuracy. Questions considering the implementation of difficult issues, such as revision speed and decision quality, can be improved. In the current model, these issues have been resolved correctly from a relational perspective, where a fast reviser is faster than a slow reviser. The most problematic issues are related to whether this difference should be linear or non-linear. Also, the number of external parameters is currently limited. Additional parameters could be included and tested in the model, if relevant parameters and their implications could be defined. The problem in defining new parameters for the model is that each additional parameter complicates it, and making the model harder to understand decreases its value.

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