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Case Study:
Developing a Framework
for Supply Network Management

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Julkaisun nimike Tapaustutkimus: Toimitusverkoston hallintaan suunnitellun työkalun kehittäminen		
Tiivistelmä <p>Tutkimuksen tavoitteena on analysoida ja kehittää Harland, Zheng, Johnsen & Lamming (2004) mallia ja tuottaa kehitysideoita logistiikan tutkimusprosessiin. Tutkimus on luonteeltaan abduktiivinen tapaustutkimus. Tutkimuksen lähtökohdiana on tutkijan mekaanisen puunjalostus toimitusverkoston kehitystyö, jota on analysoitu kahdesta näkökulmasta. Ensimmäinen kuvaus etenee kronologisesti ja toinen kuvaus pohjautuu Harland ym. mallin käyttöön. Kahden kuvauksen avulla havainnollistetaan mallin lisäarvoa tutkimukselle – malli auttoi tutkijaa luomaan laajemman ja syvällisemmän kuvan tutkittavasta ilmiöstä.</p> <p>Tutkimuksessa löydettiin neljä tapaa miten mallia olisi mahdollista kehittää. Tärkein mallia koskeva kehittämiskohde käsittelee epistemologisten ja ontologisten oletusten määrittelyjen puuttumista. Toinen kehitysehdotus huomioi mallin dynaamisen luonteen aikaansaaman eritystarpeen mallin eri osa-alueiden määrittelyssä. Kolmas kehitysajatus ohjeistaa mallin tutkimusjärjestyksessä – tutki ensin toimitusverkoston konteksti osio ja sen jälkeen aktiviteetit. Neljäs mallin kehitysajatus suosittelee huomioimaan oppimisen tasomallin, kun tutkimuksen lähtökohdiana on konfliktin ratkaiseminen.</p> <p>Tutkimuksessa kuvataan useita logistiikan tutkimuksen kehityskohteita. Logistiikan tutkimuksen tavoitteet eivät ole tasapainossa. Logistiikan tutkimuksen tutkimustavoitteissa on painottunut liikaa uusien mallien/konseptien/tutkimuskehitys keksiminen, kun jo olemassa olevia malleja käsitteleviä ja kehittäviä tutkimuksia on julkaistu suhteellisen vähän. Olemassa olevien mallien kehittelyyn suuntautuvissa logistiikan tutkimuksissa ontologisten ja epistemologisten oletusten määrittelyjen selkeä kuvaaminen on hyvin tärkeä osa-alue, vaikka alkuperäinen mallia käsittelevä artikkeli olisi jättänyt ne huomioimatta. Logistiikan tapaustutkimuksen reliabiliteetti on niin tärkeä tutkimuksen osa-alue että sen kehittämiseen tarvitaan erityinen menetelmä tai tekniikka.</p>		
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Abstract <p>The main purpose of this abductive descriptive case study is to analyse and to develop the model of Harland, Zheng, Johnsen & Lamming (2004) and produce ideas to improve the logistic research process. The starting point of this research is a supply network development project in the Finnish mechanical wood industry. The thesis includes two descriptions of the researcher's work as a supply network development engineer. The first one is a chronological description and the second one is description of the same phenomenon from the Harland et al model point of view. Using the two points of views is one way to demonstrate the contribution of the model.</p> <p>Harland et al.'s model (2004) provided a good basis by which researcher was able to gain more deeper and wider view from the phenomenon. Researcher found four ways to develop the model. The model should include explicit ontological and epistemological statements. The model's dynamic nature is strength, but it also leads to specific requirements. The user of the model has to pay extra attention to how the supplier network context, activities, actual analysis and the researcher's own background are defined or demonstrated. A user of the model should study and analyse the supplier network context before the supplier network activities. "The learning level point of view" -tool was very executable for the researcher during the network activities analyse phase.</p> <p>The research describes several improvement ideas into logistic research process. The balance between the quantity of theory development research and the number of the research, which aims to generate new concepts, does not support the logistic research development. A researcher has to document ontological and epistemological debate in an explicit manner; even though the chosen theoretical model does not contain it. A researcher should use more guidance of literature theories or models to strength the contract validity and the reliability.</p>		
Keywords Supply network management, framework development, abductive approach, mechanical wood industry		

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Oulu, October 2011

Vesa Moilanen

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List of abbreviations and definitions

3-DCE	Three-dimensional concurrent engineering
CPFR	Collaborative planning, forecasting and replenishment
CSCMP	Council of supply chain management professionals
EDI	Electronic data interchange
ICT	Information and communications technology
IMP	Industrial marketing and purchasing
KM	Knowledge management
R&D	Research and development
SCM	Supply chain management
SME	Small and medium sized enterprises
TCE	Transaction cost economics
VMI	Vendor-managed inventory

1 INTRODUCTION

The starting point of this research is a supply network development project. The researcher worked as a development engineer in the project and his tasks were to identify, prioritize and solve Firm's (the identity of the case company cannot be revealed for the sake of confidentiality) supply network challenges. In this study, the supply network project is analysed by one theoretical model and during the analysis researcher faced and solved research challenges, which might be familiar to all logistic scientists. The main purpose of this study is to produce development ideas for logistic research process to help future researchers to gain better understanding of the supply network phenomenon.

There are several ways understand the term network phenomenon, for example Pikka (2007) has demonstrated the different networking approaches (see Figure 1) by plotting them on two dimensions (y-axis: diversity of actors and x-axis: nature of relations).

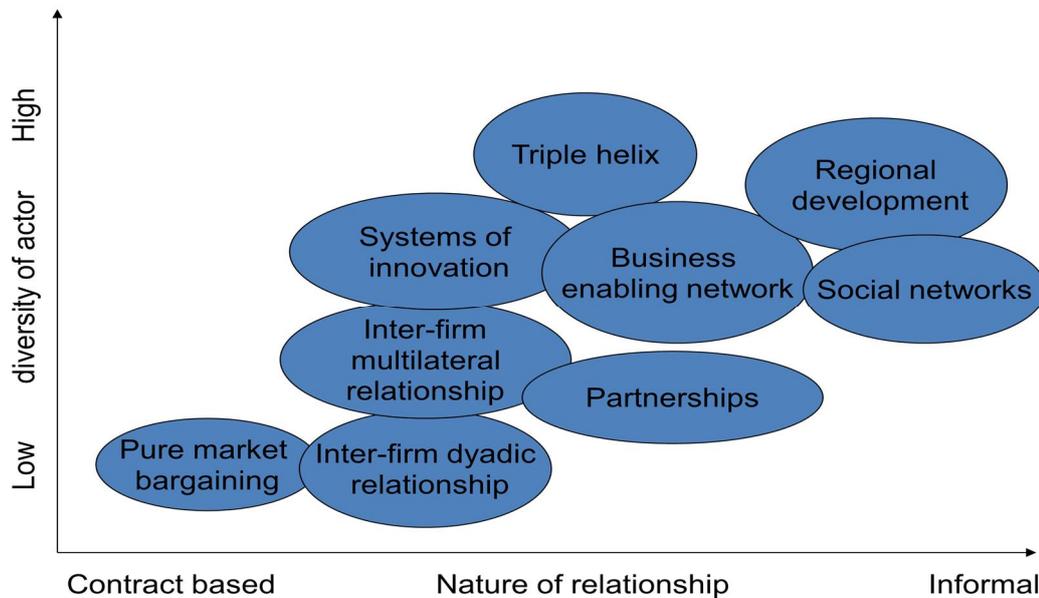


Figure 1. Network approaches (Pikka 2007)

Harland et al. (2004) found five literature areas (supply networks, strategic management, marketing, industrial marketing and purchasing (IMP) and organizational behavior) that appeared relevant to the broader concept of supply and inter-organizational networks research. Diversity of the literature of this area is one reason why there are so many different concepts and models to manage and analyse different kinds of networks. To illustrate this multitude of concepts and approaches, Lambert & Cooper (2000) introduced a conceptual framework of SCM,

Yee & Tan (2004) presented the SNAP tool, Knoppen and Christiaansen (2007) further described a multidisciplinary approach towards supply chain partnering, Samaranayake (2005) documented a conceptual framework for the supply chain, Cigolini et al. (2004) developed a conceptual framework for SCM strategies, Skjoett-Larsen et al. (2003) integrated TCE and network approach to one framework, Tikkanen and Alajoutsijärvi (2002) presented “Three step method to contextual understanding of customer satisfaction in industrial markets” and, finally, Harland et al. (2004) introduced “A conceptual model for researching creation and operation of supply network”. According to the latter, there is not such a thing as “a unified theory of SCM” and, partly for that reason, the authors recommend that the researcher would choose one theory as the dominant explanatory theory, and then complement with one or several other theoretical viewpoints. Maaloe (1997; translated by and referred from Halldorsson et al. 2007) has classified scientific theories into three levels: grand theories (particular area of science with specific concepts), middle-range theories (worked-out connections between a set concepts represented by socio-economic theories, applied in various managerial disciplines) and small-scale theories (limited number of concepts presented as propositions). These variations in deepness of theories and concepts might be one reason why the academic literature of the field includes several literature reviews in which the lack of sophisticated models for analyzing supply networks has been emphasized (see Lambert & Cooper 2000, Holmen et al. 2003, Harland et al. 2004). Stock and Boyer (2009) reviewed 173 definitions of SCM across a multiplicity of journals and books. In the same study they found out that there is a need for a single consensus definition.

This thesis is carried out within the research tradition of Industrial Engineering and Management (IEM) and supply network research. IEM focuses on manufacturing and information-intensive enterprises and it studies the operation of enterprises and networks as a comprehensive process from the perspective of technology, economics and behavioral sciences (Finnish IEM Research School 2007). According to Lamming et al. (2000), incorporation of the term "network" into supply chain management research represents an attempt to make the concept wider and more strategic, by harnessing the resource potential of the network in a more effective manner. It follows that the concept of “supply networks” encompasses not only the upstream network of suppliers but also the downstream network of distributors and customers. The objective of supply network research should be a practicable outcome and the researchers shall thus limit their focus to a set of manageable, operational tasks that meet the order-winning criteria of customer segments. (Lamming et al. 2000) (see more about the term “supply network research” in the Chapter “2.1. A conceptual model for researching creation and operation of supply networks”).

1.1 Background

According to Mentzer & Kahn (1995) “there is little to guide logistics researchers in how to adopt a rigorous research process that manifest theory development“, and therefore they succeeded necessitate the adoption of a theory development approach to research. At that time Mentzer & Kahn (1995) could not found logistics research, which were founded in other than positivist paradigm. According to Kovács & Spens (2005) one possible reason for little logistics theory development research is the predominance of positivist approach to logistics. Mentzer & Flint (1997) pressed the importance of conducting rigorous theory-testing research within the broader scheme of practicing sound of science and they gave some successions how to pursuit more rigorous, relevant logistics research, for example, “future research should explore various methods to facilitate triangulation at all phases of scientific process, but primarily within the testing of logistics theories”. Kovács & Spens (2005) literature review pressed two issues in the logistics discipline: the positivist focus and scarcity of qualitative and interpretative research, and the lack of logistics research focusing on theory development. In the same article Kovács & Spens (2005) introduced a framework for exploring and discussing the use of different research approaches. Later they (Spens & Kovács 2006) used the framework to seek to assess the use of three different approaches, deductive, inductive and abductive in logistic research and they added the forth indicator to the framework:

1. the starting point of the research;
2. the aim of the research;
3. the point in time at which hypothesis or propositions (H/P) are developed and whether they are further applied; and
4. the research methods.

Spens & Kovács (2006) reviewed 378 articles from three major logistics journals by the framework and they did not find any article, which openly claimed to follow the abductive research approach. Although they (Spens & Kovács 2006) categorized six articles, which used the abductive approach in logistics. According to Spens & Kovács (2006) logistics literature knows articles where research approach is not documented in explicit manner. It is difficult to replicate the research and its findings without explicit description of research process (Spens & Kovács 2006). The findings of Spens & Kovács (2006) collaborated the statements of Mentzer & Kahn (1995), logistics research has very hypothetico-deductive nature and survey methods have strong emphasis in logistics research.

Svensson et al. (2008a, 2008b) studied 657 papers from top three logistics management journals and their findings do not concur totally with earlier findings, “Consequently, the findings of the present research of the “top” journals in logistics management indicate that the selected journals provide opportunity for dissemination of quantitative and qualitative research efforts.”(Svensson et al. 2008b). According to Spens & Kovács (2006) the abductive research approach could be deliberate choice to answer the call for more theory building in logistics.

Arlbjorn & Halldorsson (2002) recommended explicating the type of scientific explanation, “i.e. the interrelationship between the object of study and factors that explain it, which, for example, may be causal, functional, intentional or evolutionary.” This recommended type of explanation and its implications requires explicit ontological and epistemological debate (Arlbjorn & Halldorsson 2002).

According to Arbnor and Bjerke (1997) every human being carries around certain ultimate presumptions (unconscious or conscious) about what his or her environment looks like, and about his or her role in this environment. These presumptions control the process of knowledge development and will have a bearing both on how we look at problems and how we look at existing and available sets of techniques and at knowledge in general. (Figure 2)

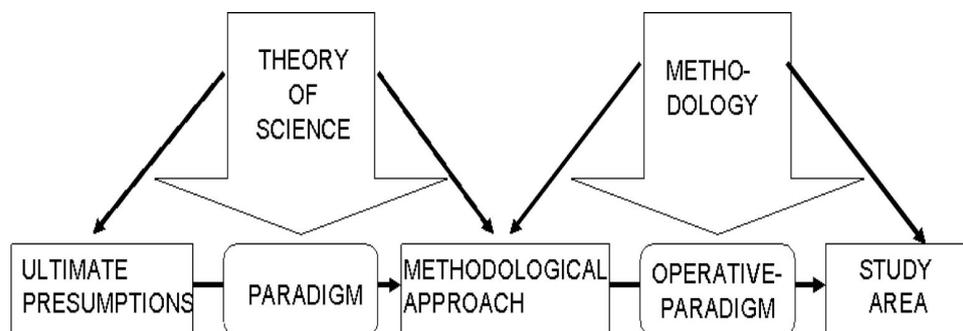


Figure 2. Methodological approach (Arbnor and Bjerke 1997)

A paradigm can be seen as the bridge between the ultimate presumptions and methodological approaches. It consists of a conception of reality, a conception of science, and a scientific ideal, and has an ethical/aesthetical aspect. The concept of reality includes philosophical ideas about how reality is constructed. Conception of science again gives the concepts or beliefs about the objects and subjects of study, for example all of the pre-scientific concepts and models in the subject of study area, such as strategic planning and effectiveness. Scientific ideals tell what researchers want to achieve with investigation. The ethical and aesthetical

aspects describe what researchers claim is morally suitable or unsuitable. (Arbnor and Bjerke 1997)

Arbnor and Bjerke (1997) define methods as guiding principles for the creation of knowledge and methodology as the understanding of how methods are constructed. An operative paradigm relates a methodology approach to the study area and it has two parts, methodical procedure and methods.

“The most important mission for methodology, then, is to clarify how different methodologies, problem formulations, study plans, methods, techniques, and study areas make up the parts of integrated whole.” (Abjorn and Bjerke 1997) Methods must fit both the problem under consideration and ultimate presumptions held by the researcher. These three parts, presumptions, problem, and methods seem to depend on each other, but ultimate presumptions seldom change, and when they do only through slow and reluctant modifications. (Abjorn and Bjerke, 1997)

Two central themes can be drawn from the short methodological discussion above. First, there is a clear need for theory development research in logistics (Mentzer & Kahn 1995, Mentzer & Flint 1997, Garver & Mentzer 1999, Arlbjorn & Halldorsson 2002, Aastrup & Halldorsson 2008, Kovács & Spens 2005, Spens & Kovács 2006) and secondly, when theory development research is concerned, it has to be done with explicit and careful ontological and epistemological debate (Mentzer & Kahn 1995, Spens & Kovács 2006). The second theme presses the role of “the most important mission for methodology” by Abjorn and Bjerke (1997). The explicit and careful ontological and epistemological debate is especially important when a research is not using a dominant research approach of logistics.

1.2 The main purpose of the research

The main purpose or global/general target of this study is to produce development ideas for logistic research process to help future researchers to gain better understanding of the supply network phenomenon. These development ideas are produced through local and pragmatic goals and through conceptual model.

The previous Chapter “1.1. Background” demonstrated the need for new knowledge “how to adopt a rigorous research process that manifest theory development”, and this research aims to answer to this need. Next subchapter presents how the research chronologically proceeded and how the pragmatic/local goals and conceptual model were interacting.

1.2.1 *The research questions*

The research contains three levels of research questions. The first or the lowest level is pragmatic and local research questions, for example “ why researcher failed or was successful during the work as a development engineer”. The second level discusses the chosen model and the third level deals with the development of a logistic research process in general (see Figure 3).

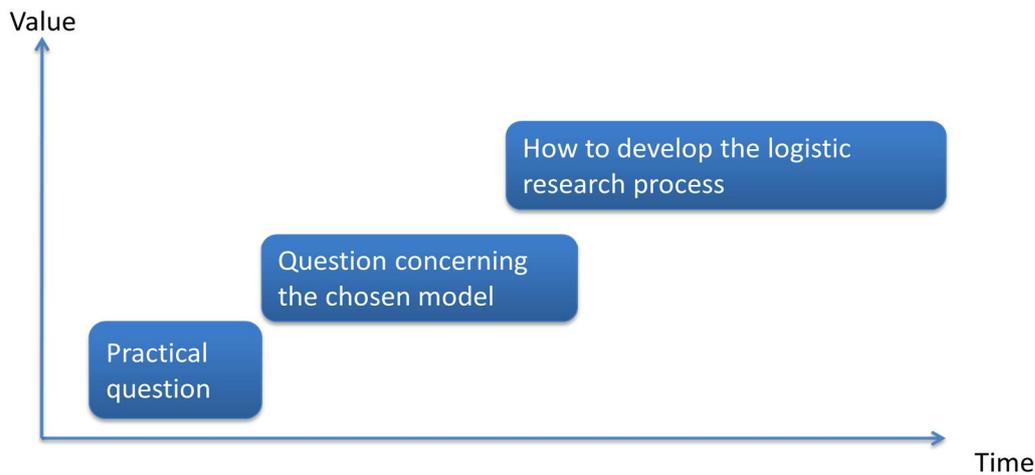


Figure 3. Three research questions levels

The value of the local/pragmatic findings of this research can be questioned, because the empirical framework is rather old. The theoretical findings (the second and third levels), however, are not ageing at the same speed as the pragmatic findings, and therefore they can be valuable to the academic society.

The second level: research questions concerning the model Harland et al. (2004)

The research questions concerning the model can be proposed by two research questions.

Q(1): How useful is the model of Harland et al. (2004) to increase our understanding of the supply network phenomenon?

This study uses two points of view to demonstrate what kind of contributions the Harland et al. (2004) model can produce for research. Chapters 3.1. The preliminary research and 3.2. The research, depict chronologically how the researcher saw Firm’s supply network before the model, and in the Chapter 3.3. A conceptual model for researching creation and operation of a supply network, the same

phenomenon is described from the Harland et al (2004) model point of view. Chapter 4.1.1. The Usefulness of Harland et al (2004) model includes the answer to the first research question. See Figure 4.

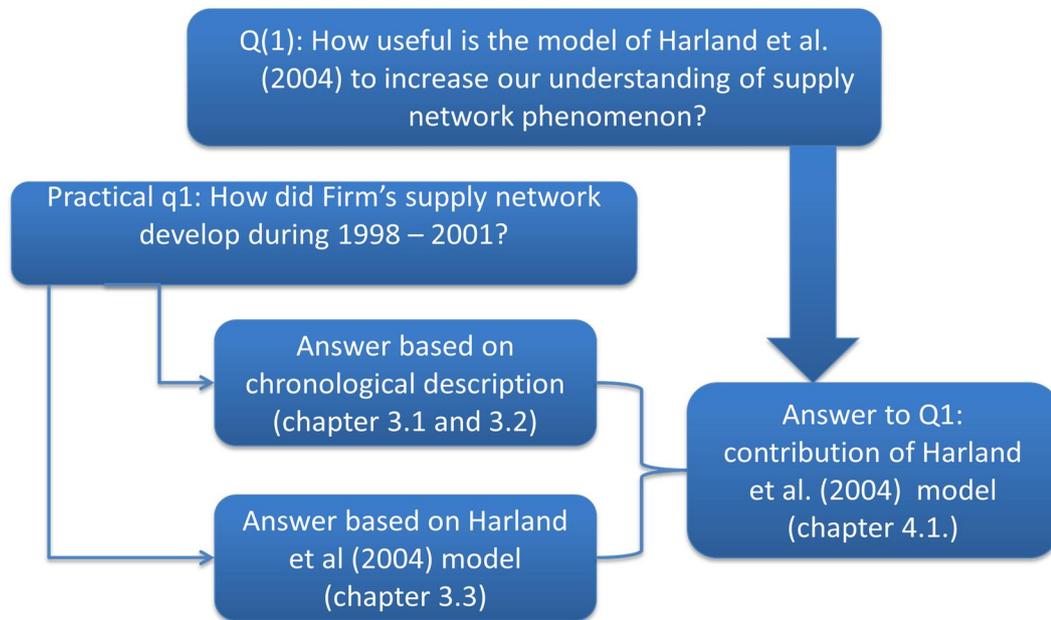


Figure 4. Research question 1

The second research question is presented as follows:

Q(2): How can we develop the Harland et al. (2004) model to gain a better understanding of the supply network phenomenon?

The answer to the second question is based on the experiences of the answering process of the first question. The answer to the second question is in Chapter 4.1.2 The development ideas of the Harland et al (2004) model.

The third level: how to develop the logistic research process

The main purpose of the research is to produce development ideas for logistic research to help future researchers to gain better understating of the supply network phenomenon. The third research questions is presented as follows:

Q(3): What kind of a development ideas did the research produce to develop a logistic research process?

1.3 Research approach

”Give me somewhere to stand and I will move the Earth.” (Archimedes 287–212 B.C.)

The next chapter represents how the study proceeded. The chronological description provides a background and a basis to the methodological discussion, which is introduced in the Chapter “1.3.2 Research methods for this study.”

1.3.1 The research project

This research started in fall 1999, when the researcher was hired to work as a development engineer/researcher. His tasks were to identify, prioritize and solve Firm’s (the identity of the case company cannot be revealed for the sake of confidentiality) supply network challenges. In this study, a term “development action” means all those events what were done to solve identified challenge.

The work as development engineer/researcher was a part of the larger research project, which aims to study supply networks in the different business areas. This project was mainly funded by Tekes (the Finnish Funding Agency for Technology and Innovation). Two things influenced the documentation of the work as development engineer. First, the proper documentation was needed, because Tekes required written documentation, how the development projects were done and secondly, researcher’s foreman was academically experienced researcher who recognised the value of detailed documentation. Experiences from the work as a development engineer are the empirical world of this research. The work ended in 2001. (Empirical world is a term used by Dupois & Gadde (2002). It means all empirical knowledge researcher achieved during the development work. Term case describes the documentation, what and how the empirical world is presented in this thesis.)

After the work as development engineer, researcher had an opportunity to analyse what was done and especially the researcher was interested in to find out why some of the development actions were successful and some of those were not. Researcher studied academic network literature, where several approaches (see Figure 1, page 7) and literature areas are developing the ways to increase our understanding of networking (Pikka 2007, Harland et al. 2004). The researcher searched a point of view, which fit to development actions and by which researcher could understand why some of the development actions were successful and some of were not. In 2006 researcher found a model “A conceptual model for researching creation and operation of supply network written by Harland et al.

(2004), which gave a rich new view to the case. Writing process is based to this model.

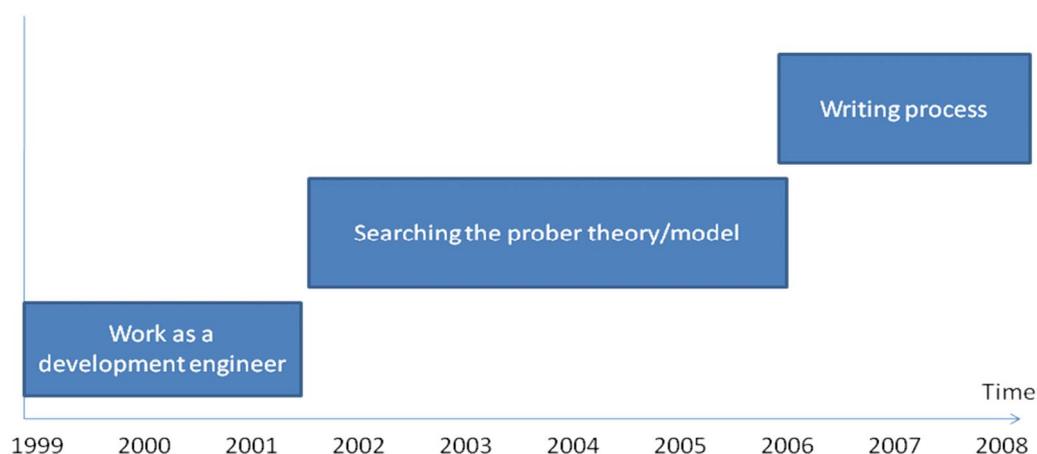


Figure 5. Research project

Terms like theory (for example transaction cost theory (Coase 1937), framework (for example a conceptual framework of SCM (Lambert & Cooper 2000)), model (for example a conceptual model for researching creation and operation of supply network (Harland et al. 2004)) and method (for example three step method to contextual understanding of customer relationship (Tikkanen & Alajoutsijärvi 2002)) can be found in the scientific literature. Generally, they (theories, frameworks, models, methods, concepts) all aimed to increase our understating of company/companies. Larson & Halldorsson (2002) presented a good example how central terms like logistics and purchasing can have four different conceptual perspectives. According to Lambert et al. (2008) some researchers use logistics and supply chain management as synonyms, but according to (CSCMP 2009) supply chain management includes more than logistics. Mentzer & Flint (1997) saw SCM as a part of logistics “ This issue of rigor is speciality important to logistics as the issues considered part of logistics expand (relationship management, logistics customer service, information technology, and supply chain management, to name a few)”. The lack of a widely accepted definition for supply chain management has been extensively known challenge (Mentzer et al. 2001, Min & Mentzer 2004, Lambert et al. 2008), by which has caused certain problems. For example, according to Lambert & Pohlen (2001) it has made the development of supply chain metrics difficult. Wide variation of the terms and definitions of terms is a big challenge to a researcher. Terms are context related; and therefore this study uses the terms as they have been used in the original source.

The phase “writing process” can be described as a discussion between the chosen model and the work as a development engineer during 1999–2001 (see Figure 6).

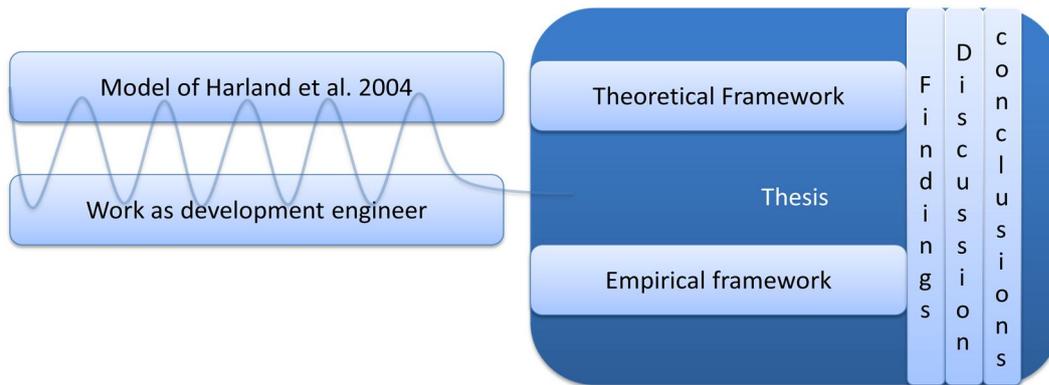


Figure 6. Writing process 2006–2008

The writing process is based to discussion between “work as a development engineer” and the model of Harland et al. (2004). This thesis is a result of mentioned discussion. The model guided what and how “work as development engineer” should be transformed to form of empirical framework. On the other hand, the theoretical framework should be valid to answer why “work as development engineer” was sometimes successful in solving the network challenges and sometimes not.

1.3.2 *Research methods for this study*

How to correspond to Abjorn and Bjerke’s “the most important mission for methodology” (see Chapter background 1.1 page 10)?

Dupois & Gadde (2002) introduced an approach based on “systematic combining” being a process where theoretical framework, empirical fieldwork, and case analysis evolve simultaneously” (see Figure 7).

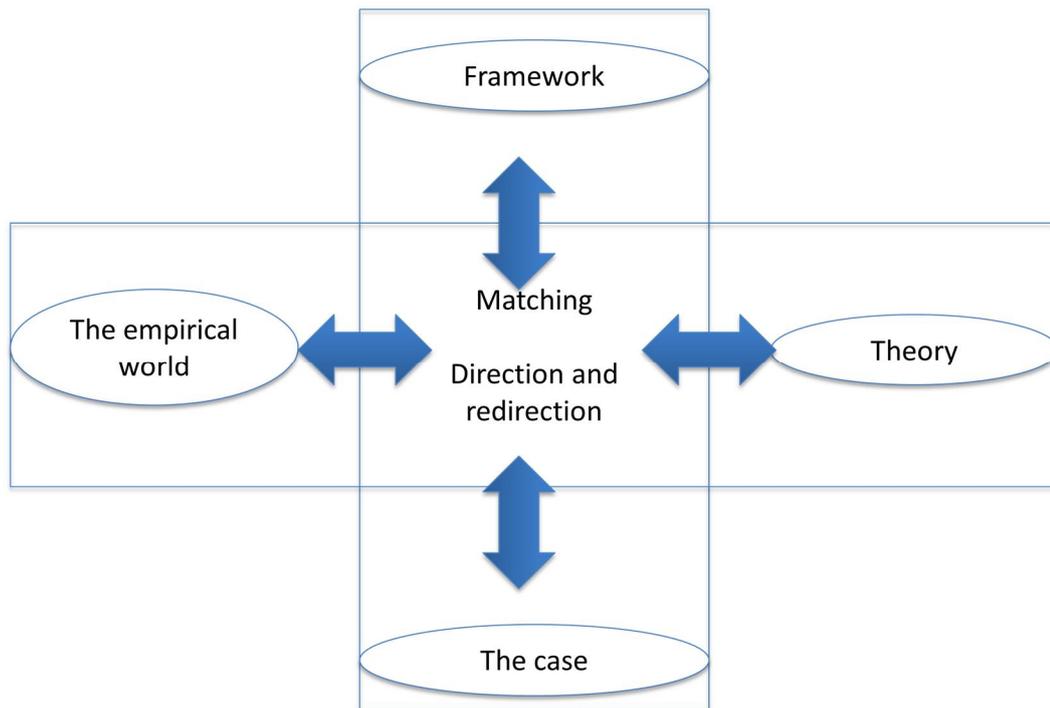


Figure 7. Systematic combining (Dupois & Gadde 2002)

Dupois & Gadde (2002)'s one main standpoint is that, most textbooks on research methodology fail to take account of opportunities offered by intertwined research process. According to Dupois & Gadde (2002) the main objective of any research is to confront theory with the empirical world, and another point of view, theory cannot be understood without empirical observation and vice versa. These ideas stem with Arbnor and Bjerke (1997)'s statement of the most important mission for methodology.

During the first phase of this study, "work as a development engineer" (see Figure 3) researcher gained experiences about Firm's empirical world. Researcher had no time or resources to study theoretical world. Empirical world has two forms, first the documented explicit knowledge and unwritten tacit knowledge. In the second phase, "searching the proper theory/model" researcher was combining development engineer experiences to theory; to find out why some of the development actions were successful and others were not. In third phase, writing process, researcher was using the Harland et al. (2004) model as a lens (see Figure 8).

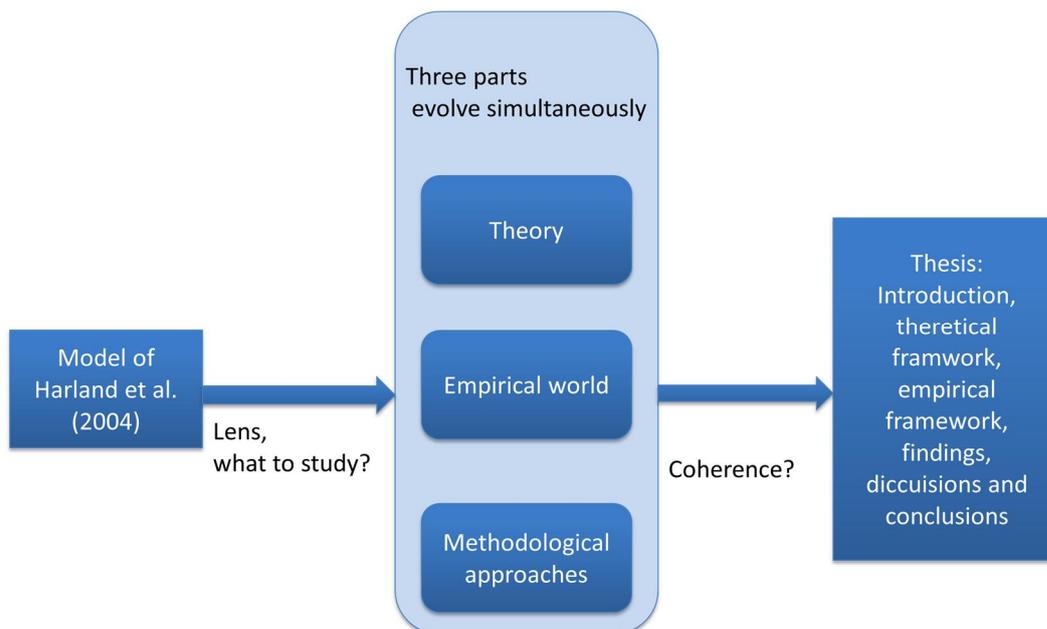


Figure 8. The role of Harland et al. (2004) model

Model of Harland et al. (2004) has a role of a framework in terms of Dupois and Gadde (2002). Researcher's methodological knowledge was not in the very high level during the first phase, and he had not got the resources to gain it at that time. Researcher studied methodological approaches intensively during the writing process, when he studied how to communicate with academic community. The use of the model helped researcher to translate the unwritten tactic knowledge to explicit written form. The model was a lens, which guided the research to understand why some of development actions succeed in their aims and some were failures. During 2001–2005, researcher was "lost" without of the model, and was not able to understand/describe why he failed in some development actions during the work as development engineer.

The content analysis of research approaches in this research

The content analysis of research approaches in this research is done by the framework of Kovács & Spens (2005), and later developed by the same researchers (Spens & Kovács 2006). As said earlier, the framework has four indicators to seek to assess the use of three different approaches, deductive, inductive and abductive.

1. The starting point of the research

This research started with real-life observations. Researcher/development engineer's task was to identify, prioritize and solve Firm's supply network challenges.

This research follows the abductive research approach process, which is seldom reported in logistics research (Mentzer & Kahn 1995, Spens & Kovács 2006). This fact presses the meaning of research approach debate of this research. In general two classifications of empirical research approach have been used in Finnish IEM research, Arbnor & Bjerke (1997) and Neilimo & Näsi (1980) (Iskanius 2006). The research approach debate in this research is discussed first based on to the model of Neilimo & Näsi (1980) and after that the “perspective” of Arlbjorn & Halldorsson (2002) has been used to summarize the research approach choices made.

4. Research methods indicator

According to Spens & Kovács (2006) the data analysis technique indicates, whether a research is quantitative or qualitative. In this research data analysis is mostly based to qualitative methods.

Research approach debate of this research

The ultimate presumptions and assumptions cast their reflection on the research problem and the way the researcher is trying to solve that problem. When ultimate presumptions are seen from “the nomothetical approach – the action oriented approach” distinction (see Pihlanto 1994), this research has definitely adopted an action-oriented research approach.

Human nature, ontology and epistemology

The starting point of this study was in the new challenges facing the supply network. One reason for these challenges, or problems, was the way the suppliers were acting. They had a possibility to do what they wanted to do; for example, one of Firm’s factories had serious difficulties, because its component supplier did not supply the promised components at the right time. The supplier’s general manager decided to start his summer vacation just when the components needed to be produced. On the other hand, Firm’s manager and other employees had a full right to make their own decisions. For example, the line manager of Firm did not order any components from mentioned supplier after the unexpected difficulties. From this point of view, this research has adopted voluntarism as an assumption about human nature. From Firm’s point of view, the main purpose of this research is to develop the operations of the supply network.

The members of Firm’s supplier network understood the complaints in many different ways, and suppliers consistently responded to their claims in many different ways. Therefore, the research has adopted the nominal ontological assump-

tion, while the epistemological assumption adopted in this research is anti-positivism. The terminology in Pihlanto (1994) and Arbnor & Bjerke (1997) varies, but the logic is basically the same – the foundation of the research is in the assumptions, or the ultimate presumptions, and these assumptions guide the way the research problem and methods are selected.

Methods

This dissertation has adopted a case study method. There are several different definitions of ways to conduct a case study (Pihlanto 1994, Yin 2003). In general, case study strategy is suitable, when “how” or “why” questions are posed, when the investigator has little control over events, or when the focus is on contemporary phenomena with real-life context (Yin 2003). The aim of the researcher was to be a change agent in Firm’s supply network, to develop Firm’s supply network towards a defined direction. Firm’s supply network is very complex and it is difficult to say what are the actual results of development actions of this researcher. According to Yin (2003) and Eisenhardt (1989), case study research method is used when phenomena and context do not have exact boundaries. The lack of visibility of researchers actions’ consequences is the main reason why this research has adopted the case study research strategy instead of the action research method.

The conceptual chapter that follows is based on a model of Harland et al. (2004) “A conceptual model for researching the creation and operation of supply network”.

A conceptual model for researching the creation and operation of supply networks

Harland et al. (2004) have presented a conceptual model for creation and operation of supply networks. The model is based on a broad literature review, exploratory survey, in-depth cases and finally another survey. The literature review analyses the existing conceptual models in strategic management, channel management, industrial marketing and purchasing, organizational behavior, and supply chain management.

Harland et al. (2004) do not describe the assumptions or ultimate presumptions of the resulting model directly. They use the term “understanding” as a one of the ways to describe how the model informs further research. “Investigating the set of networks provides a rich and structured understanding of what occurs in supply networks between network members.” The term “understanding” is normally linked to anti-positivism, which is one main presumption of the action-oriented

approach. According to Pihlanto (1994) the definitions of term "case study method" can be divided into two groups, which differ in an important respect: definitions based on a positivist approach assumptions and definitions, which are based on action-oriented approach assumptions. The Harland et al. model is based on eight in-depth case studies and the term "in-depth" is typically appended to action-oriented assumptions (see for example Gummesson 2000).

The "perspective" of Arlbjorn & Halldorsson (2002)

The "perspective" of Arlbjorn & Halldorsson (2002) is used as a summary of the Chapter 1.2 Research approach. Arlbjorn & Halldorsson's (2002) perspective has three levels of abstractions, which are practical level, discipline level and meta level. They pressed the meaning of a dynamic knowledge creation process that cuts all three levels. The meta level includes issues related to philosophy of science for example ontological and epistemological explicit statement. Discipline level deals with issues related to topics within the area of business science, where researchers seek to theorize about certain aspect of the practice level trough reflection on theories and scientific methods. The practice level relates for example to the view on storage, reclamations, information flows in Firm – what is actually going on in Firm and its supply network. (Arlbjorn & Halldorsson 2002) Figure 10 summarizes the Chapter Research approach.

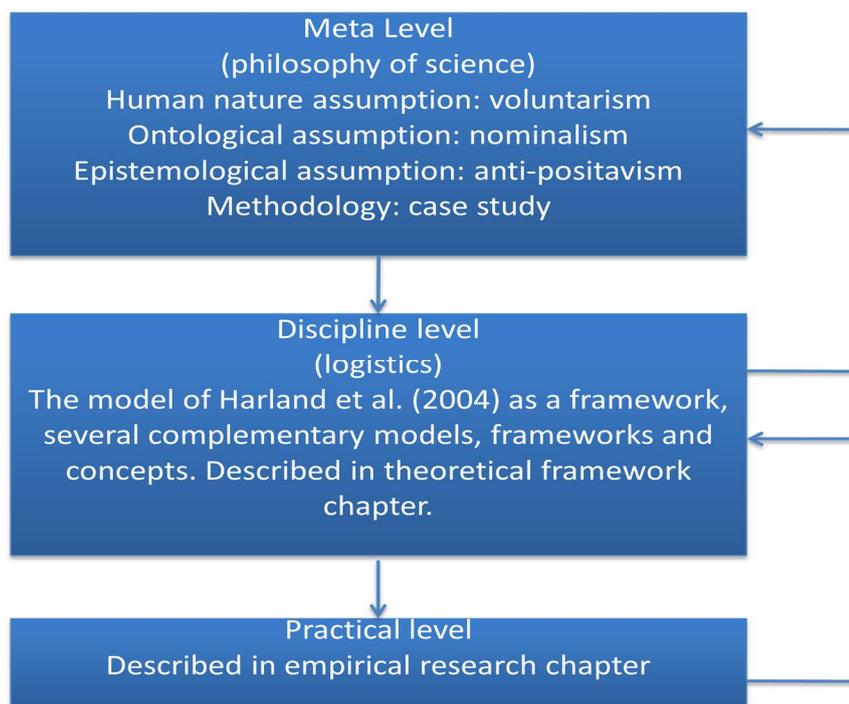


Figure 10. The presumptions, disciplines and practical level

Discipline level and practical level are discussed in the next Chapter 1.3 Structure of the thesis in the more detailed manner.

1.4 Structure of the thesis

The predominant nature of the positivism in logistics research (Mentzer & Kahn 1995, Spens & Kovács 2006), has its effect into logistics dissertations structures in Finland. The structure of logistics dissertation normally has its bases in the deductive research process (see Figure 7), first there is an introduction, which is followed by a theoretical framework, and after that, there is an empirical framework, which follows, findings, conclusions and discussions. This “positivistic” structure does not describe a research process in abductive approach, where theoretical framework and empirical framework evolve simultaneously. However, even this process follows the abductive approach, the structure of this dissertation has the traditional logic, separated chapters for theoretical and empirical frameworks. A structure, which integrates theoretical and empirical framework, could describe the process of the research better than traditional logistics research structure, but it could jeopardise the readability of the research. The integrated structure of research is not familiar for the researcher and he was not ready to test a new kind of structure of logistics dissertation, even he recognised the justification for the integrated framework. The structure of non-positivistic research dissertation should be under the academic discussion, and by it, there could be some instruction how new structure could be accomplished.

This thesis is divided into 6 chapters (see Figure 11). Chapter 1 introduces the motivation for the research, presents the research problem and questions, defines the research approach, and briefly explains the research material used. Chapter 2 presents the theoretical background and Chapter 3 describes the empirical analysis of the network. Chapter 4 responds to the research problem and answers the research questions on the basis of the analysis, Chapter 5 presents a discussion of thesis and the reliability and validity of the findings, and Chapter 6 provides the final conclusions of the study in brief.

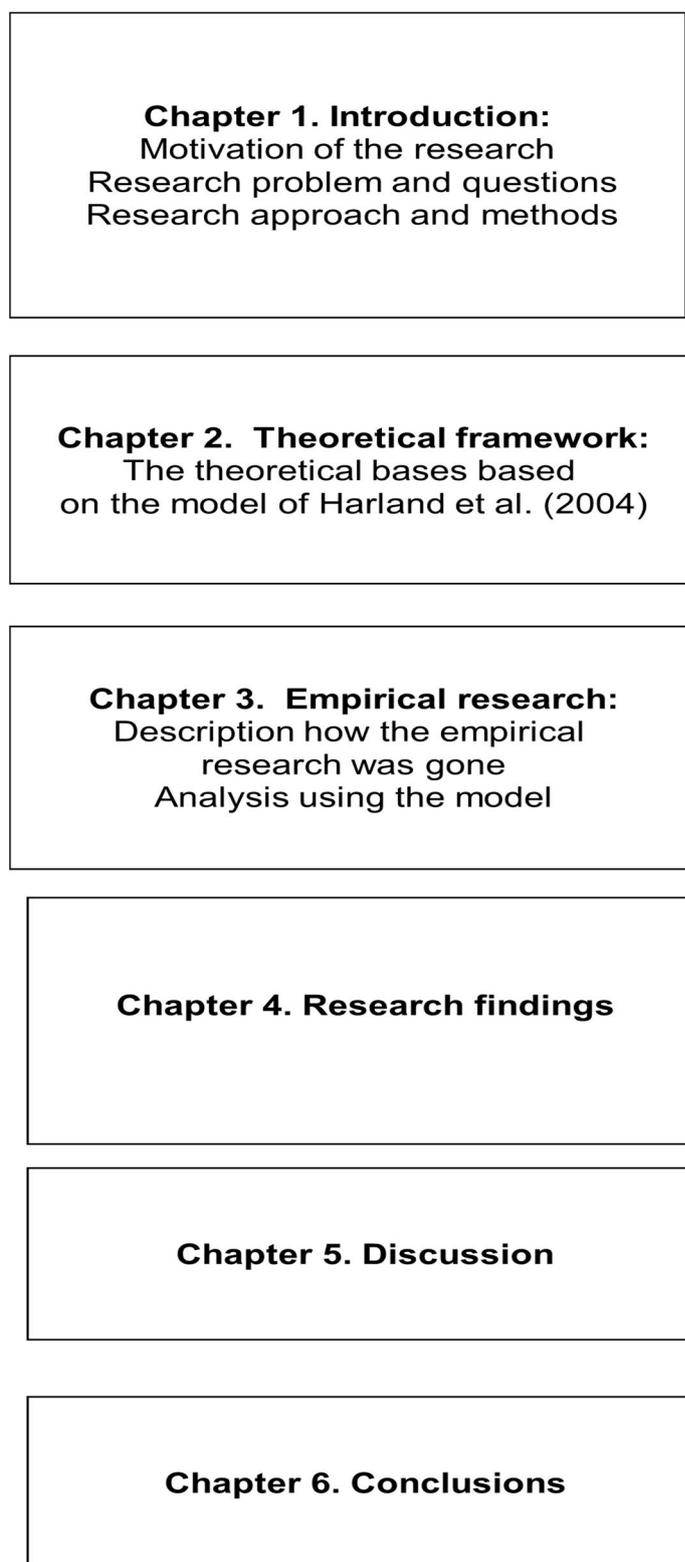


Figure 11. Structure of the thesis

There can be found three bibliographic resources that affected the most to this research. The article of Harland et al. (2004) is quite obvious. For example The second level research questions and the structure of next chapter, theoretical framework, is based to this article. When I was at the early phase of my own research, I was privileged to follow two dissertations processes quite nearly, Lehtinen (2001) and Jokinen (2004). Both of these dissertations had a great effect on this study.

2 THEORETICAL FRAMEWORK

There is nothing as practical as good theory (Lewin 1945)

Theoretical framework starts with short description of how researcher decided to use chosen the structure of theoretical framework.

According to Gummesson (2000), a researcher's second big challenge is pre-understanding and understanding. Pre-understanding refers to things such as the knowledge, insights and experience of the researcher before he/she is engaged in the research, while understanding refers to their improved insight that emerges during the study. At the beginning of this study this researcher had gained only one year of research experience and wasn't familiar with the wood processing industry, and also his general understanding of science was not at very high level. From a development engineer's and researcher's point of view this lack of pre-understanding has both negative and positive effects. A lack of pre-understanding causes the researcher to spend a considerable time gathering basic information. The term "blocking pre-understanding" describes the potential negative effect of the very strong research pre-understanding; the term refers to knowledge and approaches that have been uncritically selected because they are closely associated with a specific paradigm that the researcher holds as a part of his/her pre-understanding, and the theories, models, and procedures that emanate from this paradigm. (Gummesson 2000)

This researcher had a privilege to work in a research group where other colleagues had quite similar research projects but in different fields of industry. The possibility to do a certain amount of teamwork, and especially the experienced research project leader, helped to avoid the problems caused by a too narrow pre-understanding in this research.

During the consulting or research material gathering the researcher was quite occupied and did not have time to gain scientific understanding broad enough to keep up the discussion with the rest of the scientific society. The needs of Firm were the number one priority for the research task and reporting the scientific contributions was not such an urgent task. After the intensive consulting and material gathering, this researcher faced other kinds of work challenges (first work as lecturer and later as a planning officer) and the scientific contributions of the research were still left to their own without proper allocation of resources. This lack of resources led to a longer-than-usual writing process. The long writing time again has had both negative and positive effects. The memories about the non-documented actions were weakening, but at the same time the theoretical literature was developing quite fast. For example, just within University of Oulu, De-

partment of Industrial Engineering and Management, five dissertations were finished (Lehtinen 2001, Maunu 2003, Iskanius 2006, Wang 2007, Pikka 2007, Uusipaavalniemi 2009 and Sillanpää 2010) in this field. There are several other recent networking research dissertations in the field of industrial engineering and management in Finland, which have influenced this thesis at hand; these include Kulmala (2003), Kleemola (2005), Kaski (2002), Kasvi (2003), Feller (2004), Collin (2003), Småros (2005), Appelquist (2005), Auramo (2006) and Kristiant (2009).

The structure of theoretical framework in this study is based on the model of Harland et al (2004). The theoretical framework is a part of intertwined research process; where the model defines what to search, and practical experience guided what part of theoretical literature give valuable insight to the phenomenon.

As stated in the introduction chapter the model contains ultimate presumptions that fit well to this research, and also emphasize the importance of a comprehensive view to network phenomena. The model is based on a broad literature review, exploratory survey, in-depth cases, and a survey. The literature review analyzes conceptual models in strategic management, channel management, industrial marketing and purchasing, organizational behavior, and supply chain management, and from that basis develops the recommended research method.

2.1 A conceptual model for researching creation and operation of supply networks

According to Lamming et al. (2000) and Lehtinen (2001), “supply networks” is relatively a new term, largely evolved from the fields of supply chain management, logistics, and lean supply/enterprise. The model of Harland et al. (2004) has adopted the definition of the term “supply network” from Harland et al. (1999): “In today’s competitive, global, business environment ... firms have sought to integrate individual operational functions, and externalize the focus of their management operations beyond the firm boundary, upstream into their suppliers, into suppliers’ suppliers, and downstream into their customer and customers’ customer; here these extended webs of operational relationships are termed “supply networks”.

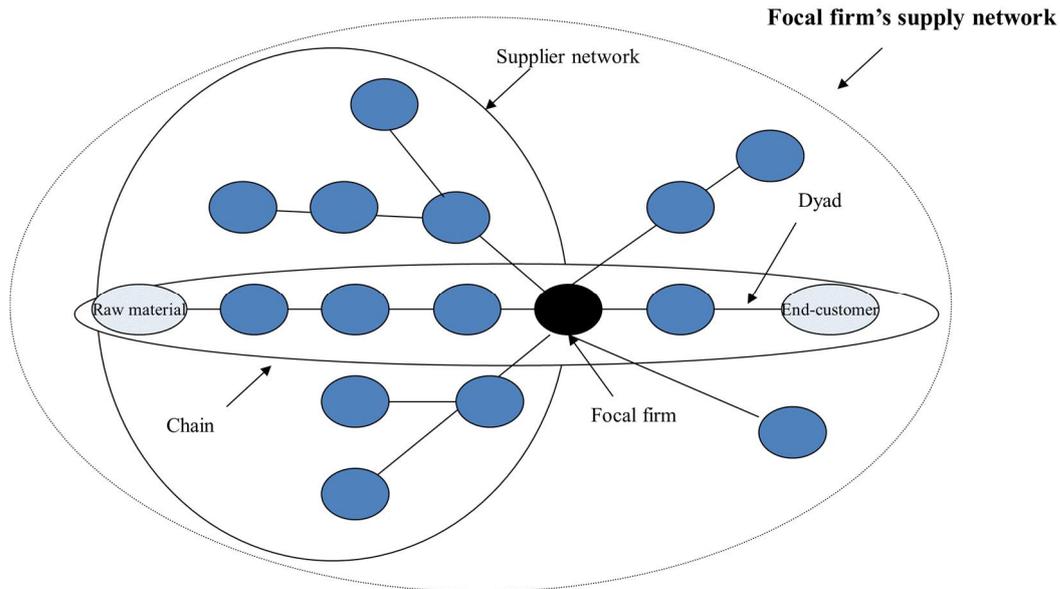


Figure 12. The concepts of focal firm, supply chain, supplier network, focal firm's supply network and a dyad (Lehtinen 2001, modified from Zheng et al. 1999)

According to Lamming et al. (2000), incorporation of the term "network" into supply chain management research represents an attempt to make the concept wider and more strategic, by harnessing the resource potential of the network in a more effective manner. It follows that the concept of "supply networks" encompasses not only the upstream network of suppliers but also the downstream network of distributors and customers. (Lamming et al. 2000).

The boundary of a supply network can be determined from an analytical point of view, depending on the focus of the investigation (Harland et al. 2004). According to Zheng et al. (1999) the supply network studies are based on focal firm perspective, which is a relevant viewpoint in order to provide managerial guidance and tools. Again, according to Lamming et al. (2000), the objective of supply network research should be a practicable outcome and the researchers shall thus limit their focus to a set of manageable, operational tasks that meet the order-winning criteria of customer segments.

The model discussed here is a result of Project ION, which had the primary objective to select or develop a conceptual model that would enable the investigation of networking activities in various network circumstances. Harland et al. (2004) did not find the final model to be entirely appropriate to the research objectives of the Project ION, and they consequently developed a model of their own based on a broad literature review, exploratory survey, in-depth cases, and a survey. Their literature review analyzes conceptual models in strategic management, channel

management, industrial marketing and purchasing, organizational behavior and supply chain management. (Harland et al. 2004)

They found five key principles from the literature:

1. Taking an operations management perspective, the supply network actors and resources can be considered 'inputs' to the process of 'operating a network'.
2. Operating a network involves transforming resources into goods and services, which are 'outputs' of the supply network.
3. This operation of a supply network involves a range of tangible and less tangible activities.
4. Supply networks operate in different network contexts.
5. Networking activities should be appropriate to the network context.

From the exploratory survey Harland et al. (2004) found that a conceptual model should be modified to highlight supply network creation as a process separated from supply network operation; however, both of these include same activities that should be studied:

- Resource integration;
- Information processing;
- Knowledge capture;
- Social coordination;
- Risk and benefit sharing;
- Decision making;
- Conflict resolution;
- Motivation.

The Partner selection action is, furthermore, appropriate to include to the analysis when product/service supply networks are being created or recreated.

Harland et al. (2004) also found factors that appeared to influence the creation and operation of supply networks under different contextual situations. Market

environment, supply strategy, network structure, operational processes, and product/service packages appeared to affect these different sets of networking activities. Figure 13 presents the conceptual model for researching the creation and operation of supply networks.

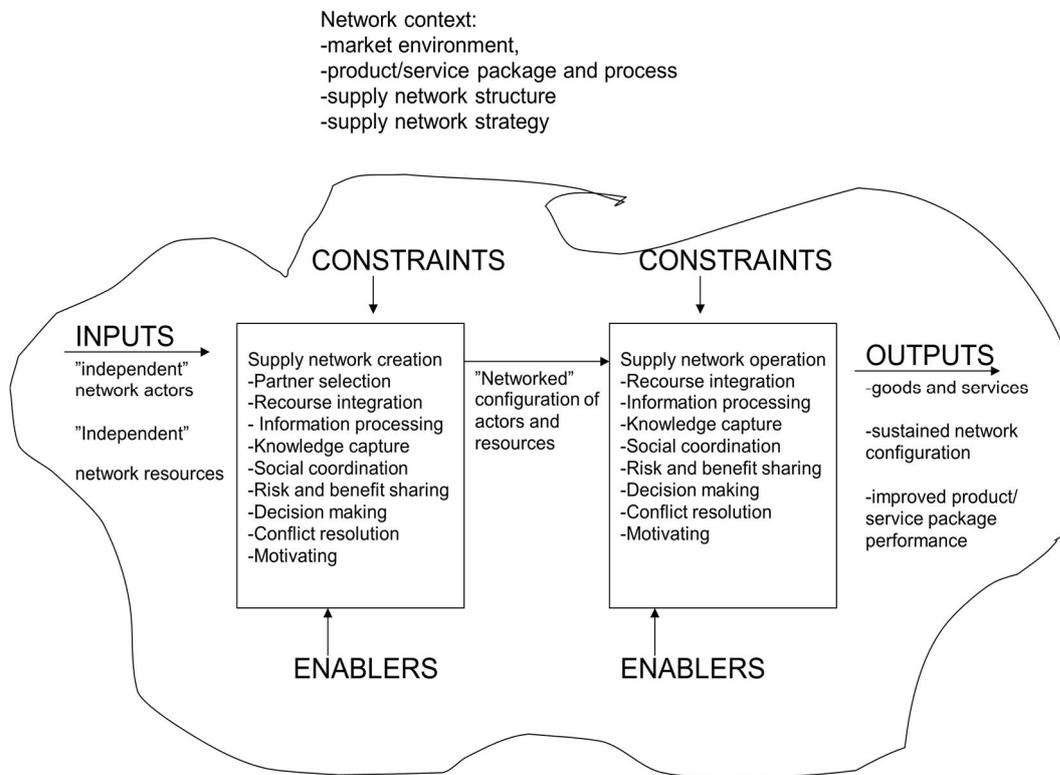


Figure 13. Conceptual model for researching the creation and operation of supply networks (Harland et al. 2004)

In the next subchapters the network activities and the network context are further described, based on the literature review. The literature search was conducted by using ABI/Inform and Econlit databases.

2.2.1 *Network activities*

Partner selection activity

Partner selection activity is found to be a central activity in the network creation process. The term is used not only to include the selection of individual players to be involved in the value creation process of a particular product/service package, but also for deciding on the strategy and the structure of the overall supply network. (Harland et al. 2004)

According to Harland et al. (2004) there are three key issues related to the partner selection:

- Which individual partners to select,
- How many players to involve in the value creation process of a particular product/service package, and
- What type of relationship to pursue with different types of players.

The importance of the both upstream and downstream partner selection is highlighted in the literature. For example, the customer portfolio has been an important issue in marketing literature (see, for example, Johnson & Selnes 2004; 2005, Ang & Taylor 2005, Sanchez & Sanchez 2005 and York & Droussiotis 1994). There are many types of customer portfolios, each designed for their own specific purpose. Ang & Taylor (2005), Sanchez & Sanchez (2005), Turnbull & Zolkiewski (1997), and York & Droussiotis (1994) have through literature reviews studied different kinds of portfolios, while the other three articles listed above have introduced their own models to manage the customer relationships by using portfolio thinking. The literature area highlighting upstream partner selection is typically called “supply base” literature. According to Holmen et al.’s (2007) literature review, the supply base literature studies the size and shape of the supply network. Ogden’s (2006) supply base literature review emphasizes especially the number of the suppliers utilized for production of a given product or service.

Partner selection includes also a possibility to supply or customer base reduction. Relationship dissolution as a topic has become more central because relationship exits can be expensive (Alajoutsijärvi et al. 2000, Gadde & Snehota 2000, and Handfield & Nichols 2004). The recent supply base studies have shown that reduction of the supply base is a general trend, and there thus also is growing interest in relationship dissolution (Liliecreutz 1998, Calabrese 2000, Cousins 1999, McGinnis & McCarty 1998).

According to Pidduck (2006) the partner selection literature is very limited and focused on the criteria for choosing partners rather than on the process of partner selection. There are several mathematical approaches to partner selection in existence (see for example Sha & Che 2006, Garg et al. 2006, and Wang et al. 2001). Pidduck (2006), however, pointed out many elements that were incorrect in, or missing from, many academic partner selection models. In particular, the following assumptions of existing models could be better described:

- Existing work assumes a straight-line start to finish selection process; the “straight-line partner selection process” was more likely a cycle.
- Existing literature did not differentiate among partners, other than perhaps the suggestion of an alliance “driver”.
- Existing models did not differentiate between informal personal negotiation (deal making) among a small number of people and formal organizational documentation.
- There was no mention of organizational approval, negotiation, or involvement.
- Choice of partners is often not a simple rational decision. Social network, reputation and other factors could be key indicators of choice.

The omission of many of these elements could be understandable because these studies have different ultimate presumptions; Pidduck’s study is based on qualitative presumptions while the mathematical models are based to quantitative presumptions and a reductionist drive to simplify the events.

Pidduck (2006) further found the term “partner selection decision process” irrational and she rather used the term negotiation than selection: “Depending on alliance and the various goal of each party, it may not be a simple task to just select a desirable partner”. The term “negotiation” assumes mutual information exchange, and the process then is negotiation between the principal negotiation partners, starting from a tentative deal, until the deal is finalized or called off. According to Håkansson & Ford (2002) the first network paradox is that companies within a network are not free to act according to their own aims, or to react to circumstances as they arise. Each company’s considerations and actions can only be fully understood within a structure of individually significant counterparts and relationships (Håkansson & Ford 2002). The Partner Negotiation Model (Pidduck 2006) describes a group of three cyclical negotiation processes: a deal making cycle, an organizational cycle, and a partner selection cycle. The result of these processes can be the selection of any number of appropriate partners.

Collin (2003) studied how to select the most appropriate supply chain nodes for a customer task under different circumstances but especially in the project and high tech business. According to Collin (2003), three entities should determine the business conditions for the supply chain selection: 1) customer and markets, 2) supplier, product, and deliveries 3) customer–supplier relationship.

Resource integration

There is no commonly agreed definition in the academic literature for the term resource integration. The common feature to the alternative definitions in network settings seems to be the value-adding over company boundaries. Actually, “lean production” thinking is based on the integration of different value adding organizations within the value stream to ensure excellence in final products and services. Hines (1996) and Lambert & Cooper (2000) state that successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. Resource integration activities come in many forms, for example psychological resource integration, where the supplier or customer is buying or suggesting manufacturing equipment to another firm to ensure the supply or demand. Interfirm teaching/coaching and exchanging/borrowing the staff are examples of human resource integration.

Vendor managed inventory (VMI) is an integrated approach for customer–supplier co-ordination, where the supplier decides on the appropriate inventory levels and the inventory policies to maintain these levels. Supplier delivery plans are decided on the basis of information communicated by customers and, as a consequence, a fundamental requisite to successfully implement the VMI is an adequate information exchange between the suppliers and the customers. (Danese 2006)

VMI has been undergoing many studies of Helsinki University of technology, the department of industrial engineering and management (see for example Holmström 1998, Småros & Holmström 2000 and Småros 2005). Småros & Holmström (2000) studied VMI in the e-grocery business and they found advantages for both the customer and the vendor. For the vendor, VMI increases customer loyalty, stabilizes demand, and also the relationship between the customer and the grocer becomes deeper.

Danese (2006) found the following stated advantages of VMI in the literature:

- Reduction in customer demand uncertainty;
- Reduction of inventory level;
- Reduction of stock-out occurrence and frequency;
- More flexibility in production planning and distribution; and
- Improvement of customer service.

Many of these advantages can be achieved simultaneously, because adopting VMI can have positive impacts also on the bullwhip problem in the supply chains (Disney & Towill 2003).

Information processing

The exchange and processing of information between suppliers and buyers is critical to successful supply networks; for example it is a key activity for managing the impact of the bullwhip/Forrester effect. EDI, e-mail, and intranets may have great potential for improving the information exchange (Harland et al. 2004, Sahin & Robinson 2002, Mabert et al. 2003, Lancioni et al. 2003, McIvor & Humbrey 2004, Gunasekaran & Ngai 2004, Seggie et al. 2006). The importance of information flow and processing has been also increasing with the advent of vertical disintegration and globalization of markets (Paulraj & Chen 2007).

Frequent, genuine, and involving personal interaction is the characteristic feature of effective interfirm communication (Carr & Pearson 1999, Krause 1999, Kocabasoglu & Suresh 2006). Effective interfirm communication between buyers and suppliers improves the quality of the products, customer response time, diminishes the costs of protecting against opportunistic behavior, and enables cost savings through greater product design and operational efficiencies (Carr & Pearson 1999, Kotabe et al. 2003, Giunipero et al. 2006).

According to a review by Kim et al. (2005) there have been contradictory findings in the literature regarding the impact of information technology on firm productivity, the debate known as "IT paradox". Harland et al. (2007) studied the barriers to adoption of eBusiness technologies and therefore also barriers to achievement of integrated information flow in supply chains. As a background work to their examination they conducted a literature review that focused on examining barriers to supply chain information integration, and especially, possible reasons for why adoption of eBusiness technologies varies between firms within the supply chains and between different supply chains. Harland et al. (2007) found disparity between existing and planned use of eBusiness solutions by large downstream customers, compared to upstream small to medium sized enterprises (SMEs). The downstream larger businesses are forging ahead with eBusiness, while the SMEs are only planning to invest in eBusiness if dominant downstream customers force them to do it. The downstream larger businesses are not providing the required supply chain leadership, and this is creating "eLands with SMEs adrift of them".

Knowledge capture

There are numerous definitions of knowledge in the literature (Venzin et al. 1998, Blacker et al. 1998). For example, McGee & Thomas (2007) studied four different perspectives of the concept of knowledge: knowledge assets, knowledge through innovation, knowledge embedded in routines, and knowledge through

learning. Rahe & Morales (2005) classified the theoretical knowledge research streams into three groups: organizational learning theory, resource-based theory of the firm, and knowledge creation theory. Spekman et al. (2002) defined knowledge as follows: "One can report a fact, analyze it and determine its validity and the degree to which the finding can be generalized. Knowledge takes that information and combines it with experience and expert judgment to render an opinion, an interpretation, of the situation that might not be clear to others." Supply chain management (SCM) can be seen as decision making process, making the correct and many times rapid decisions from the whole supply chain network point of view. Then knowledge is an important basis for well-grounded and reasonable decision-making, and that is one reason why knowledge capture is a critical action for successful supply network performance.

Knowledge capture is not a widely used term compared to knowledge management (KM). The term KM is, like SCM, very often used among the scientific society, but in neither case there is not a common, generally accepted view of the term. The knowledge management research work has usually concerned one firm's knowledge issues, while the knowledge capture research interests are in the wider context, among others in studying supply network knowledge issues. According to Lytras & Pouloudis (2006), learning has been an underpresented and underestimated dimension in the Knowledge management (KM) literature. According to Corelick & Tantawy-Monsou (2005) KM is a framework for applying structures and processes at individual, group, team, and organizational level so that the organization can learn from what it knows, in order to create value for its customers and communities. According to Rahe & Morales (2005), the academic discussion has traditionally mainly dealt with organizational details, and the management problems resulting from individual behavior have not been included into KM.

The KM framework integrates people, processes, and technology to ensure performance and learning for sustainable growth. According to Paliszkievicz (2011) KM has given solution to many issues like: fewer mistakes, quicker problem solving, better decision making, reduced R&D costs, increased worker independence, enhanced customer relations, improved services. Corelick & Tantawy-Monsou (2005) state that the development of KM can be segmented into four phases. They adopted from Snowden (2000a, b, c) the first three phases and then added to their model a fourth phase (see also McElroy 2003):

Phase 1. The first phase of KM emphasized technology and information flow to support decision makers.

Phase 2. The second phase moved the focus to tacit and explicit knowledge, content management, supporting collaboration through groupware and collaborative technologies. The emphasis was on conversion of tacit to explicit knowledge, in order to translate individual knowledge into public or collective knowledge.

Phase 3. The third phase recognized the need to go beyond codified information by using stories in the form of narrative representation. This approach focuses on the management of the ecology of knowledge and processes (flow), as opposed to the management of knowledge as an entity (a stock) that can be identified and catalogued (e.g. for Snowden stories narratives are an example of flow). As a stock, knowledge can be seen more as enhanced information – but static.

Phase 4. Phase four integrates the previous three, describing a KM system for the purpose of increasing performance through learning in an organization's internal culture within a specific external environment.

According to the literature review by Bessant et al. (2003), most of the discussion about learning in the literature has been on intra-firm processes, but there is a growing interest also in the inter-firm applications. Bessant et al. (2003) constructed a matrix (see Figure 14) highlighting the different modalities under which different forms of supply chain learning (SCL) might be used.

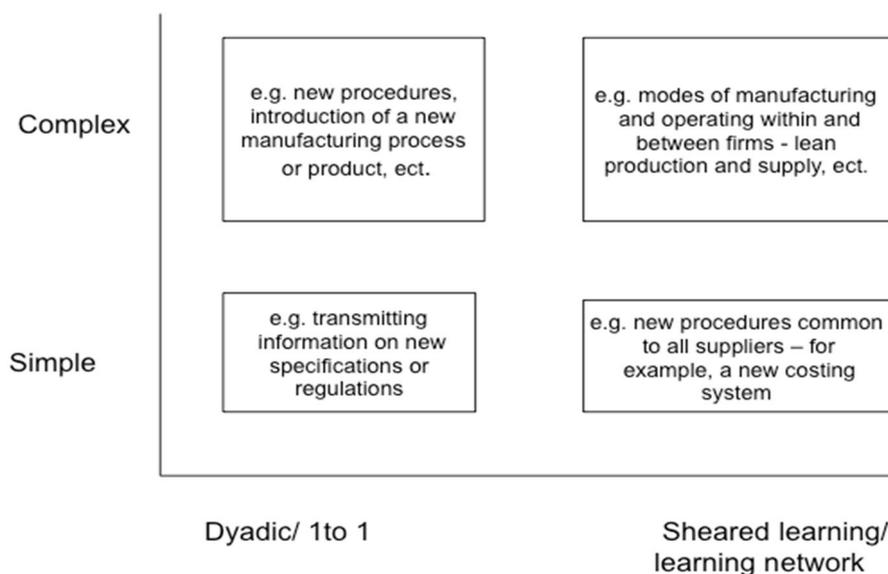


Figure 14. Different learning types and models of supply chains (Bessant et al. 2003)

In Figure 14 the y-axis describes the contents of learning, whether it is simple or complex, and the x-axis represents how many players are involved with the learning.

Nonaka & Takeuchi (1995) introduced a new theory of organizational knowledge creation. It became soon a convenient analytical framework on knowledge in business organizations (Li & Gao 2003). In Finland the framework has been used in many dissertations (see for example Pikka (2007), Haapalainen (2007), Klemola (2005) and Feller (2004)). The basis assumption in their theory is that knowledge is a dynamic human process of justifying personal belief. The theory has its own epistemology and it is based on classification of knowledge into two categories: explicit and tacit knowledge. Explicit knowledge can be articulated in formal language in forms such as grammatical statements, mathematical expressions, specification manuals, and so forth. Tacit knowledge is hard to articulate with formal language while it is personal knowledge embedded in individual experiences and involves intangible factors like personal beliefs, perspectives, and the value systems. In Table 1 these two types of knowledge are described in a more detailed manner. (Nonaka & Takeuchi 1995)

Table 1. Two types of knowledge (Nonaka & Takeuchi 1995)

Tacit knowledge (subjective)	Explicit knowledge (Objective)
Knowledge of experience (body)	Knowledge of rationality (mind)
Simultaneous knowledge (here and now)	Sequential knowledge (there and then)
Analog knowledge (practice)	Digital knowledge (theory)

Nonaka & Takeuchi (1995) assumed that knowledge is created through the integration between these two types of knowledge, and they postulated four different modes of knowledge conversion that are shown in Figure 15. The integration of explicit and tacit knowledge is the key of dynamic knowledge creation in the business organization.

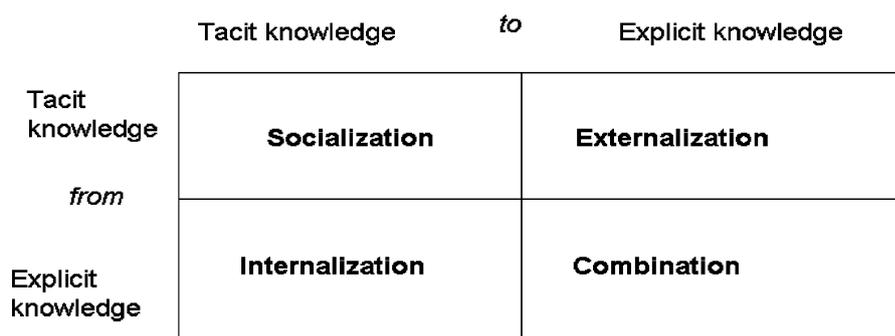


Figure 15. Four modes of knowledge conversion (Nonaka & Takeuchi 1995)

Nonaka & Takeuchi's theory has its own ontology, concerning the four levels of entities where the knowledge is created: the individual, the group, the organization, and the inter-organizational; only individuals create knowledge, while or-

organizations provide the context for them to create knowledge. Therefore they introduced a two-dimensional knowledge creation model, where the epistemological dimension shows the level of tacit or explicit knowledge and the ontological dimension shows the levels where knowledge is being created. Organizational knowledge creation is a spiral process, which starts at individual level and moves up through expanding communities of interaction, eventually also crossing the departmental, divisional and organizational boundaries. Figure 16 describes the spiral of organizational knowledge creation.

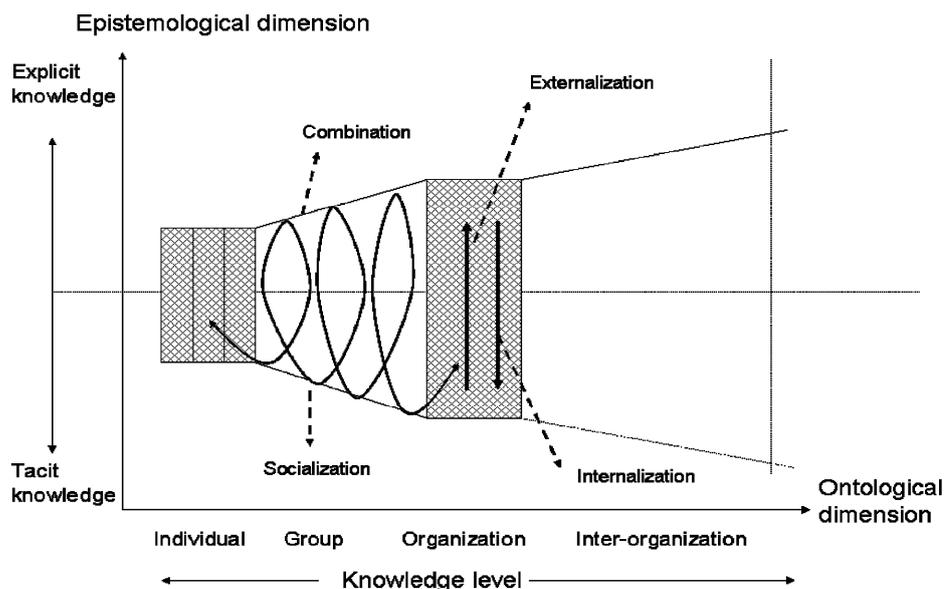


Figure 16. Spiral of organizational knowledge creation (Nonaka & Takeuchi 1995)

Knowledge creation is a continuous process. The form of the knowledge limits the starting point of organizational knowledge creation, socialization, because without explicit form of knowledge it is not easy to leverage individual knowledge by the organization as a whole. The second mode, efficient externalization, requires dialogue or collective reflection using tools such as metaphors and analogies to find hidden tacit knowledge that is otherwise hard to communicate. The third mode, combination, integrates existing and newly created knowledge to a new product or a managerial system, and, finally, explicit knowledge is internalized into individuals' tacit knowledge base in the form of shared mental models or technical know-how. This new tacit knowledge base is the starting point of individual innovations, and, therefore, further cycles of socialization, externalization, combination, and internalization. (Nonaka & Takeuchi 1995)

Organizational learning occurs when new routines and actions are conceived and adopted in an organization (Kasvi 2003). These routines and actions are conducted by individuals (Senge 1990). Kleemola (2005) suggested that in order to understand how organizations learn, the starting point should be to understand the learning of human beings.

In late 1940's and 1950's American researchers developed a complete taxonomy of educational objectives. The complete taxonomy has three major parts – cognitive, affective and psycho-motoric domains. Bloom et al. (1956) introduced the cognitive domain (also known as Bloom's taxonomy) that includes objectives to recall or recognition of knowledge and to the development of intellectual abilities and skills. The taxonomy is designed to be a classification of student behaviors, which represent the intended outcomes of education process. The domain is a hierarchic taxonomy, which has six major classes: knowledge, comprehension, application, analysis, synthesis, and evaluation, and several subclasses. Knowledge involves the recall of the specifics and universals, the recall of methods and process, or the recall of a pattern, structure or setting. Knowledge consists of facts, conventions, definitions, jargon, technical terms, classifications, categories, and criteria. Comprehension represents the lowest level of understanding. Comprehension is the ability to understand the meaning of material, but not necessarily to solve problems or relate it to other material. Application is the use of abstract ideas in particular concrete situations. Analysis usually consists of breaking down a complex problem into parts. Synthesis involves taking many pieces and putting them together to make a new whole. Evaluation, finally, is a judgment about a solution, process, design, report, material, and so forth. The judgment can be based on internal criteria. Anderson et al. (2001) wrote a revision of Bloom's taxonomy, in which they renamed the cognitive process dimension and added four knowledge dimensions to the existing table (see Table 2).

Table 2. Cognitive process dimension and the knowledge dimension (Anderson et al. 2001)

Knowledge dimension	Cognitive Processes Dimension					
	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual						
Conceptual						
Procedural						
Meta-cognitive						

Anderson et al. (2001) place “to create” as the highest level of cognition; it is about individuals arranging and rearranging elements to form a coherent or functional entity, or reorganizing elements into a new pattern or structure.

The affective domain concerns the behaviors and objectives that are emotional and/or deal with feelings, and it has five main levels: receiving, responding, valuing, organization, and characterization by a value complex. (Krathwohl et al. 1964) Figure 17 demonstrates the affective domain.

5.0 Characterizations by a value complex	4.0 Organization	3.0 Valuing	2.0 Responding	1.0 Receiving
5.2 Characterization	4.1 Conceptualization of value	3.1 Acceptance of a value	2.1 Acquiescence in responding	1.1 Awareness
5.1 Generalized set	Organization of a value system	3.2 Preference for a value	2.2 Willingness to response	1.2 willing to receive
		3.3 Commitment	2.3 Satisfaction in response	1.3 Controlled or selected attention

Figure 17. Affective domain (Krathwohl et al. 1964)

Cognitive and affective domains are widely used for example, according to Wankat & Oreovicz (1993), in the engineering education, and more recent models are often based on them; for example, according to Jokinen (2004) Nokia Mobile Phones is using five levels (knowing, understanding, acting, coaching and innova-

tion) of practical definitions of skills. Jokinen (2004) also integrated the cognitive and affective domains to the same matrix to describe the differences of basic and high levels of learning (see Figure 18).

Characterization					Higher levels	
Organisation					of learning	
Valuing						
Responding	Basic learning					
Receiving						
	Knowledge	Comprehensio	Appllication	Analysis	Synthesis	Evaluation

Figure 18. Matrix of cognitive and affective domains of learning (Jokinen 2004)

The nature of desirable knowledge capture can also have some kind of specific features, which is shown in the Figure 18. Basic and higher knowledge capture, or different learning objectives, require different kinds of learning processes (Jokinen 2004, Lytras & Pouloudi 2006, Lytras et al. 2002, Robinson & Bawden 2002, Alvarstein & Johannesen 2001, Ford 2004, Zgodavová et al. 2001)

Even if knowledge capture may be seen as a separate activity, it is linked closely to other activities; for example in many studies, knowledge capture is linked to information processing and specially to eBusiness (see for example Warkentin et al. 2001, Ford 2004, Maguire et al. 2007). Another example is partner selection. Organizations are redesigning their internal structure and external relationships for creating knowledge networks, in order to facilitate improved communication of data, information, and knowledge, while improving coordination, decision making, and planning (Warkentin et al. 2001). Spekman et al. (2002) found that the decision-making style is one preconditioning factor to supply chain learning.

Social coordination

Supply networks, like any other form of networks, consist of interpersonal relationships. According to Håkansson & Snehota (1995), machine-like relationships do not exist. Despite business relationships being essentially about business-specific behaviors – subjective values – the personal bonds and convictions that are always present play an important role in formation of a relationship. Despite the relevance of the behavioural issues, there is only a little research published in logistics and SCM journal focuses on developing knowledge concerning human behaviour (Tokar 2010). According to Uzzi (1997) socially embedded relationships have three important features: trust, fine-grained information transfer, and joint problem solving arrangements.

Social coordination is closely linked to knowledge capture networking activity. Socialization is the starting point in Nonaka & Takeuchi's (1995) model and social coordination also has an important role when individual's target is set at achieving higher levels of learning (see Figure 18).

The context of social coordination defines the roles and limitations of how social coordination can be managed. Academic literature includes many studies studying the cross-cultural dissimilarities in organizations (see for example Rajagopal & Rajagopal 2006, Trim & Lee 2006, Vance & Paik 2005).

Risk and benefit sharing

Skjoett-Larsen et al. (2003) have introduced a theoretical framework demonstrating the role of risk and benefit sharing in the interorganizational collaboration. The framework is designed for analyzing interorganizational collaboration and it integrates two theoretical points of view: Collaborative Planning, Forecasting and Replenishment (CPFR) and transaction cost economics (TCE). The framework further divides CPFR into three levels depending on the integration and extent of the collaboration. A basic level of CPFR involves only few business processes and a limited integration with the trading partners. At the second level, the developed CPFR collaboration is characterized by integration in several collaboration areas. The highest level of collaboration, advanced CPFR, differs from developed CPFR by taking collaboration a little further than mere data exchange. Three levels of CPFR are illustrated in Figure 19 and in Table 3 (more information about the concept of CPFR can be found at www.CPFR.org).

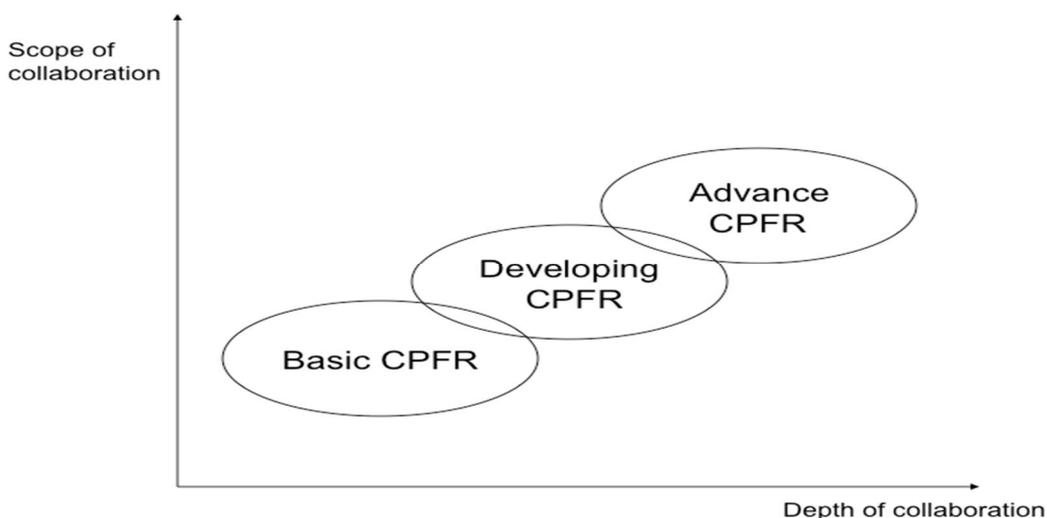


Figure 19. Levels of CPFR (Skjoett-Larsen et al. 2003)

The y-axis in Figure 19 demonstrates the number of business processes in collaboration and the x-axis indicates the depth of collaboration.

Table 3. Different levels of CPFR (Skjoett-Larsen et al. 2003)

Dimensions	Basis CPFR	Developed CPFR	Advanced CPFR
<i>Shared information</i>	Sales orders and confirmation,	Demand data	Demand data
	Inventory data	Order planning data Promotion data Production data	Order planning data Promotion data Production data
<i>Degree of discussion</i>	No	Some	Frequently
<i>Co-operation/synchronization</i>	No	Some	All activities
<i>Competence development</i>	No	No	Knowledge
<i>Evaluation</i>	No	No	Experience
<i>Type of relationship</i>	Transactional	Information sharing	Mutual learning
<i>Theoretical explanation</i>	TCA	Network	Resource and competence based

There are three kinds of transaction costs in the model: (1) the cost from establishing contract with a new trade partner, (2) the cost of working out a new contract with the partner, and (3) the cost related to monitoring the partner's fulfillment of the contract. Generally, risk and benefit sharing is related to the problem of securing sufficient levels of cooperation and commitment, whilst at the same time minimizing damaging routines such as opportunistic behavior.

Risks and benefits in the network relations vary in the different levels of CPFR, and the network context is the key variable on how risks and benefits can be shared.

Trust plays a crucial role (or function) for the wellbeing of a business relationship and that is why it has been an important research issue in the recent years. The concept of trust is complex and has many forms (see Figure 20). (Huemer et al. 1998)

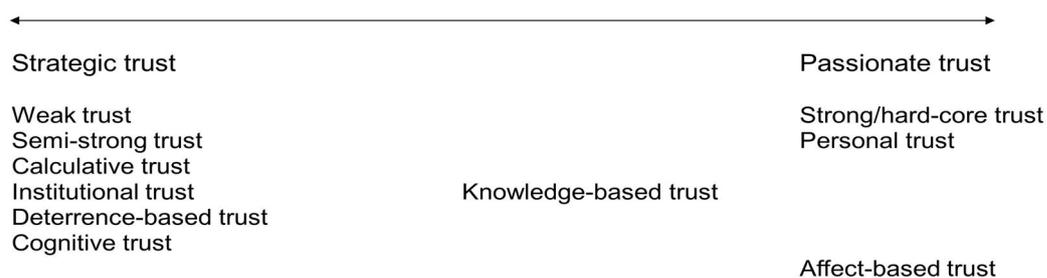


Figure 20. Forms of trust (Huemer et al. 1998)

The idea of trust depends on assumptions that allow for uncertainty and diversity in human behavior. There are two opposite-extreme assumptions, self-interest seeking/opportunism and trustworthiness, which demonstrate the boundaries of the concept. (Huemer et al. 1998)

According to Williamson (1983) there are two views on how to support exchange; credible commitments and credible threats. Credible commitments are undertaken in support of alliances and credible threats appear in context of conflict and rivalry, and the trust can be achieved for example by using hostages.

Gulati (1995) introduced a further distinction between knowledge-based trust and deterrence-based trust. Knowledge-based trust is based on prior contacts and the assumption that firms can learn about each other and develop trust around norms of equity. Deterrence-based trust can be build by sanctions to regulate self-interest seeking. These kinds of actions are common in the building industry, where almost every deal has detailed notions about delivery timetables and sanctions if the builder cannot fulfill the deal.

In the supply chain literature trust is one basic issue for selection of suppliers as long – term partners, as well as a factor affecting organizational learning (Kleemola 2005) (Sambasivan M & Yen C 2010).

Decision-making

There are several approaches in the literature to demonstrate how systematic management of network does exist. The runner school emphasizes the importance of one leading firm or person within a network, and has its origin in strategic networking, while the quasi-firm school consists of authors primarily oriented toward the development of networks promoting the quasi-firm concept. (Kulmala 2003)

Supply network studies are typically based on focal firm perspectives, which are relevant in order to provide managerial guidance and tools. (Zheng et al. 1999,

Kulmala 2003) Decision-making again is related to network context, on what kind of power each member has in the network.

Conflict resolution

Conflict can be described as differences in perspectives or expectations. Unsolved differences can cause problems to the network, and that is why the conflict resolution mechanisms are important to the supply networks. Solving the differences that exist along with cooperation is therefore important. (Håkansson and Snehota 1995, Harland et al. 2004)

Schein (1992) defines the culture of a group as a pattern of shared assumptions that the group learns as it solves its problems of external adaptation and internal integration, that have worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.

Schein (1992) sees the culture consisting of three different onionlike layers; artifacts, espoused values, and basic underlying assumptions (see Figure 21).

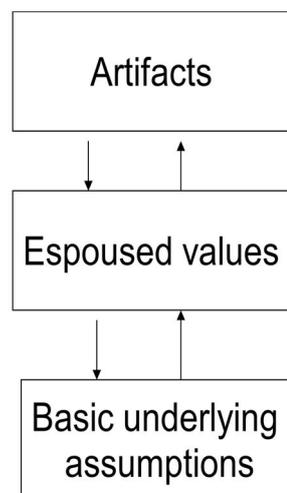


Figure 21. Levels of culture (Schein 1992)

Artifacts include all phenomena that one can see, hear and feel when one encounters a new group of an unfamiliar culture. Visible products of the culture such as the physical environment, language, technology, clothing, manners, and so on are normally easy to observe but difficult to decipher. Espoused values forms the middle level, where a group does not have a common shared experience on how the espoused solutions will work in the real live situations but have an opinion of which alternative feels the best. If a solution to a problem works repeatedly, it can

come to be taken for granted and therefore become basic assumption. (Schein 1992)

According to Argyris & Schön (1978, 1996) human beings hold two types of theories of action: firstly, the one that they espouse, and secondly, the one what they actually use. Espoused theories are expressed in the form of stated beliefs and values. The theory-in-use (Model I) is the design we can find throughout the world. Schein's "basic assumptions" and Argyris & Schön's "theory-in-use" tend to be those we neither confront nor debate and hence these are difficult to change (Schein 1992).

There are also two kinds of organizational learning. The first type occurs when an organization achieves what it intended to, and the second when there is a mismatch between the intention and the outcomes, and the mismatch is identified and it is corrected which further leads into a match. These two learning types are called single-loop and double-loop learning (see Figure 22; Argyris & Schön 1996).

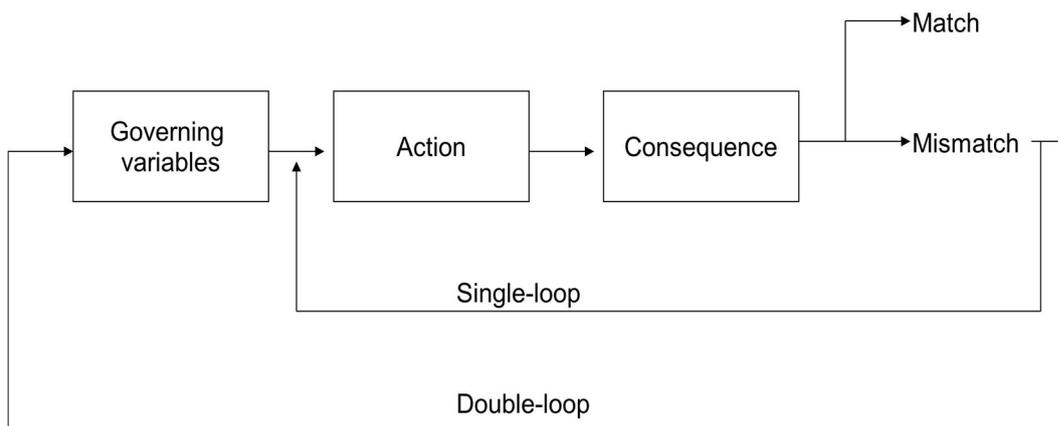


Figure 22. Single-loop and double-loop learning (Argyris & Schön 1996)

Double-loop learning is important from a conflict resolution point of view. It might be very difficult to find a resolution to a conflict, if the individuals or organizations involved in the conflict have different basic assumptions or theory in use, and if they are not able to find their way to a double-loop learning situation.

Motivation

Kulmala (2003) found three groups of motivations and incentives for networking: growth, profitability, and other reasons. Growth can take place in terms of quantitative measurable objectives, such as annual sales, profit, personnel, and so on, or qualitative organizational factors such as development, learning, and better deci-

sion-making process. Feller (2004) studied R&D alliances and found four motivations for developing them; alliances for scope, alliances for scale, alliances in order to learn, and alliances to share the risks and costs associated especially with breakthrough R&D activities. "It must be remembered that all firms are snakes; they are maximizers and satisfiers concerned with their own survival and self-interest" (Cousins 2001).

According to Appelquist (2005) the ultimate goal of companies is to maximize the wealth of their investors, and this can be done either by maximizing the income, minimizing the costs, minimizing the capital deployed, or any combination of these. In the long term, a firm has to be profitable in order to survive, and the basic assumption also adopted in this research is that firms will try to survive. How the future risks and benefits are seen to affect a firm will again affect its behavior, and the ultimate motivation for networking is that a firm will have benefits from it and ensure its survival. How a firm is able to see networking, as a way to maximize the wealth of their investors, is a key point of motivation for networking. According to Auramo (2006) the aim of viability in the supply chain management context is to enable all supply chain members a timely access to all relevant information related to each particular member's own role in the supply chain.

Montgomery et al. (2001) studied trends and issues on supply chain, logistics, and transportation in their article "Visibility: Tactical Solutions, Strategic Implications". They based their study to six drivers of adaptive supply chain excellence: collaboration, optimization, connectivity, execution, speed and visibility. They emphasized the meaning of visibility, because "Through true visibility a business is able to move more quickly in its quest to achieve excellence in the other five drivers."

From an effective and efficient network behavior point of view, the organizational and individual interests and motivations have to be coherent. Rahe & Morales (2005) have introduced thus a new model for KM (see Figure 23). One of the main contributions of the model is the individual behavior point of view.

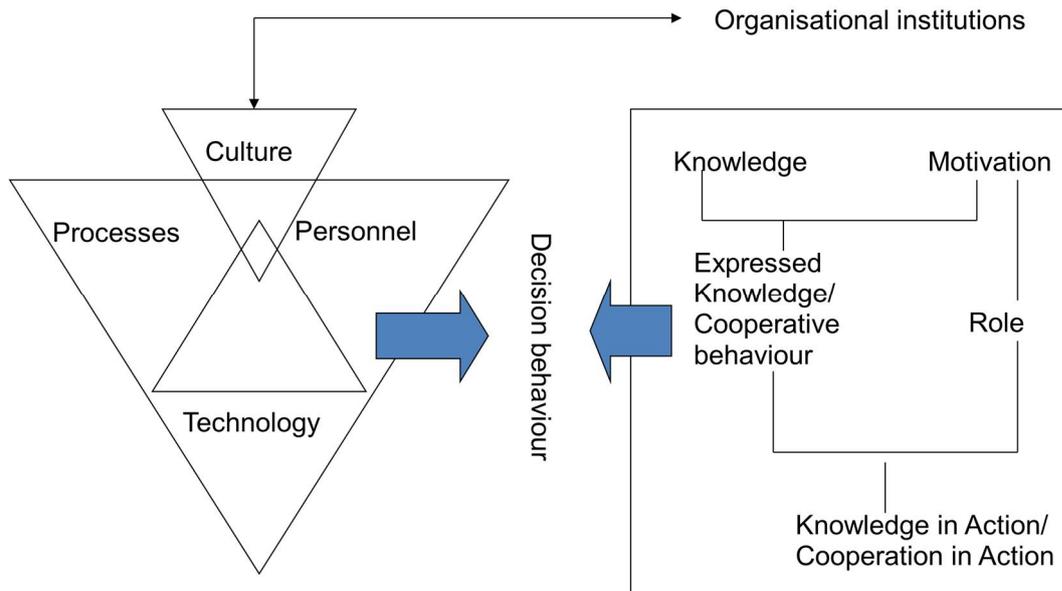


Figure 23. KM model by Rahe & Morales (2005)

The model demonstrates the meaning of the individual motivation. The starting point of the model is economic theory of human behavior and the model raises here three main issues, (1) rationality, (2) evaluation, and (3) maximization. An individual maximizes his or her personal welfare. Organizational institutions then coordinate rules, standards, and norms on how to maximize the personal welfare. (Rahe & Morales 2005) Personal and organizational goals might be impossible to achieve at same time, if the personal and organizational level motives are not coherent.

2.2.2 *Network context*

The concept of a supply network can be seen as a game of maximizing the wealth of firms' investors or as a game of survival. The network context gives limitations and roles for this game. The researcher, like an observer of a game of chess, should thus understand the roles and limitations of game before he/she starts analyzing the actual actions of the game. According to Fisher (1997) the reason why the new technologies and ideas such as quick response, mass customization, and lean manufacturing have failed many times is that "managers lack a framework for deciding which ones are best for their particular company's situation". They do not know how a technology or idea will be working in different network contexts.

Literature contains many ways to explain and understand network context and its development. One well-known way to analyze the business environment is Por-

ter's (1980) method to analyze the organizational environment and the attractiveness of industry. According to Samaranayake (2005), recent economic trends have de-emphasized the benefits of vertical integration and focused on the benefits of being specialized, even if there are situations where vertical integration is taking place as an important trend (see for example Fine (1998, 2000): the double helix). Lehtinen (2001) demonstrates the main supply network variables by a figure (see Figure 24).

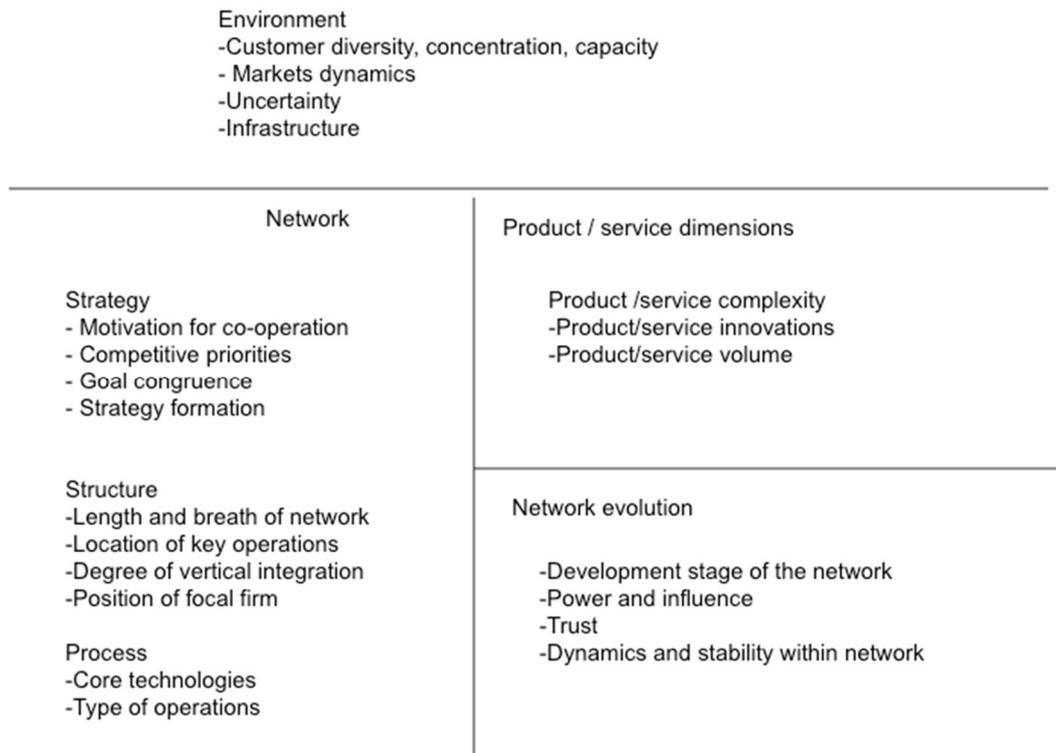


Figure 24. Supply network variables (Lehtinen 2001)

Fine (1998) introduced three-dimensional concurrent engineering (3-DCE) concept, which extends from products and manufacturing to the concurrent design and development of the capabilities of a supply chain. According to Ellram et al.'s (2007) literature review the 3-DCE provides a useful theoretic lens to gain a more systematic view of supply chains and organizational performance, even if it has been not been widely used. Figure 25 shows how product, process, and supply chain are linked together to FAT 3-DCE decision model.

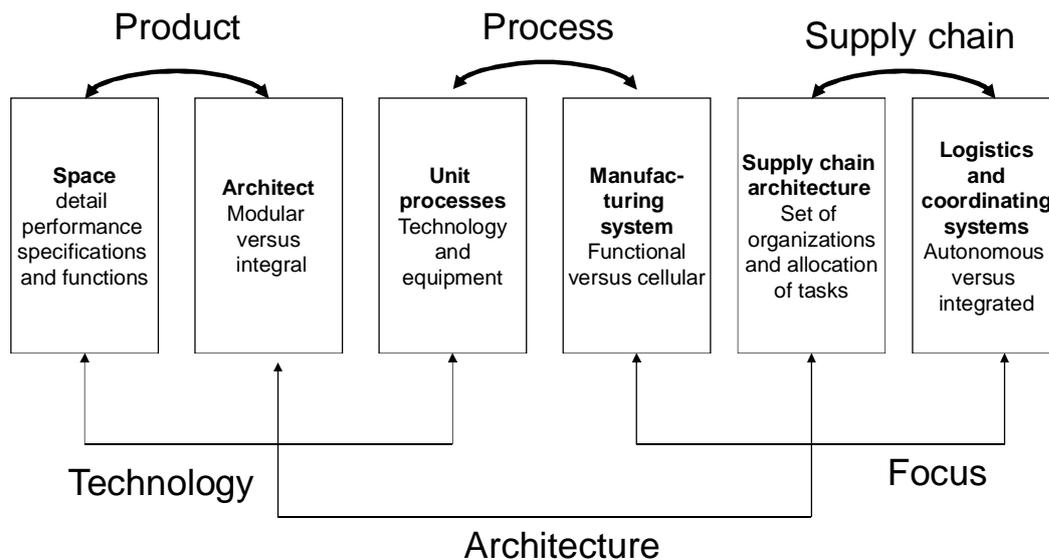


Figure 25. The FAT 3-DCE decision model (Fine 1998)

Harland et al. (2004) saw the network context to include following main variables: market environment, nature of product and manufacturing process, network structure, and focal firm network strategy. Many articles/theories are integrating two variables, the nature of product and manufacturing process and focal firm network strategy, and for that reason these are also here analyzed together. Otherwise, the framework for network context analysis is described by using Harland et al.'s (2004) variables.

Market environment

Harland et al. (2004) found three central themes to market environment; volatility of environmental change and the type of interorganizational relationship, environment diversity and decision-making pattern, and environmental interdependence and type of formal process.

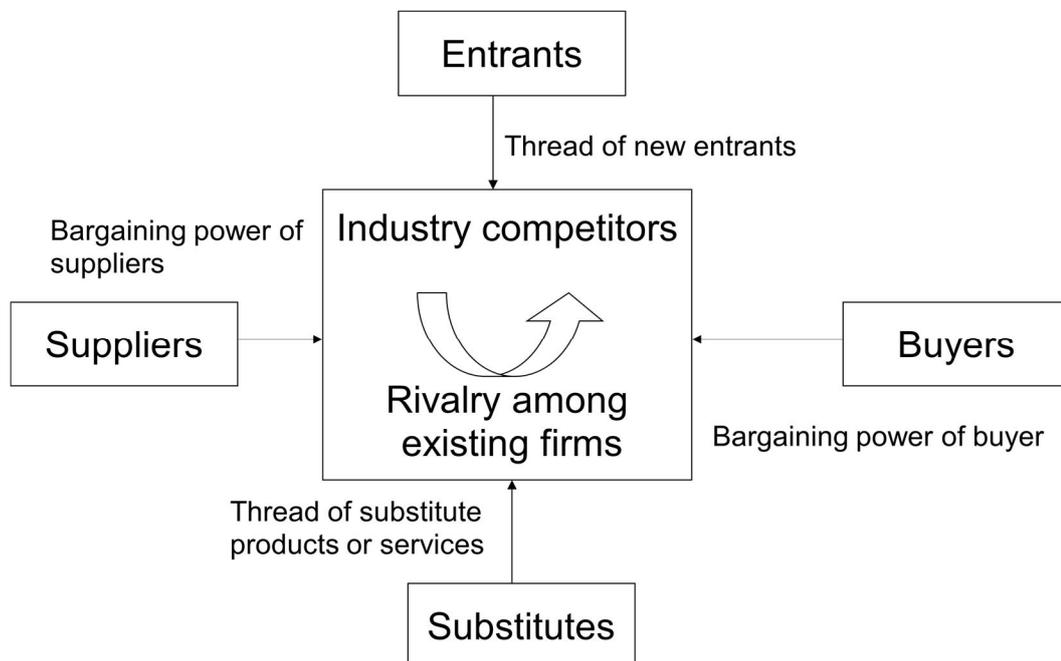
According to Fine (1998) industries have different kinds of clockspeeds. The clockspeed describes how fast or slowly the industry is changing. Clockspeed is not easy to measure. Fine (1998) began to measure clockspeeds by using three submetrics: process clockspeed, product clockspeed, and organization clockspeed. Table 4 shows some examples on how different industries fare on these metrics.

Table 4. Measuring clockspeed – samples industries (Fine 1998)

Industry	Product clockspeed	Process clockspeed	Organization clockspeed
<i><u>Fast-clockspeed industries</u></i>			
Personal computer	< 6 months	2-4 years	2-4 years
Toys and games	6 months	5-15	5-16
<i><u>Medium-clockspeed industries</u></i>			
Bicycles	4-6 years	10-15	20-25
Automobiles	4-6 years	4-6	10-15
<i><u>Slow-clockspeed industries</u></i>			
Comercial aircraft	10-20	5-30	20-30
Steel	20-40	10-20	20-30

Clockspeed of the industry determines many kinds of issues in the industry, for example what kind of knowledge capture is needed in the supply network.

According to Porter (1980) the intensity of competition in industry is neither a matter of coincidence nor bad luck. Rather, the competition within an industry is rooted in its underlying economic structure and goes well beyond the behavior of current competitors. Porter isolated five forces (see Figure 26), which together determine the ultimate profit potential within the given industry.

**Figure 26.** Five forces model (Porter 1980)

The five forces model is widely used and discussion around the model has been going on for over 25 years. There are several views, which are supporting the use

of the model, and there are also some critic findings. According to Karagianopoulos et al. (2005) Porter's five forces model is still valuable, even if the conditions behind the forces have changed during the decades. According to Gulati et al. (2000), Porter's (1980) model and other traditional models of competition have simply focused on strategic variables in order to understand interfirm profitability differences, and the location of firms in interfirm network as an important element of competition is missing in traditional competition approaches.

Nature of product and manufacturing process/Focal Firm's network strategy

Gadde & Snehota (2000) have studied supplier relationships, especially the posture of relationship. They have used three different matrixes, where the posture of relationship was studied from business volume, continuity of relationship, and sourcing policy point of views. By these matrixes they have provided some opinions on how relationships should be managed. Figure 27 demonstrates one of the matrixes used, the posture of relationship, and the volume of business with the supplier.

		Volume of business with the supplier	
		Major	Minor
Posture of relationship	High involvement		
	Low involvement		

Figure 27. Relationship posture and volume of business with supplier (Gadde & Snehota 2000)

The supplier relationships entail costs and benefits to both companies. Some of these consequences are easy to measure while some are more tricky to measure or even to identify, and that is why not all the various costs and benefits related to a supplier relationship can be calculated. Even if the consequences are difficult measure, it is however imperative to try to balance all the various cost and benefits of supplier relationship. "Effective managing in relationships requires careful assessment of the economic consequences of prevailing postures and possible changes in the degree of involvement" (Gadde & Snehota 2000).

Christopher (2000) has studied how a product's variety/variability and volume affect the nature of appropriate supply chain (see Figure 28).

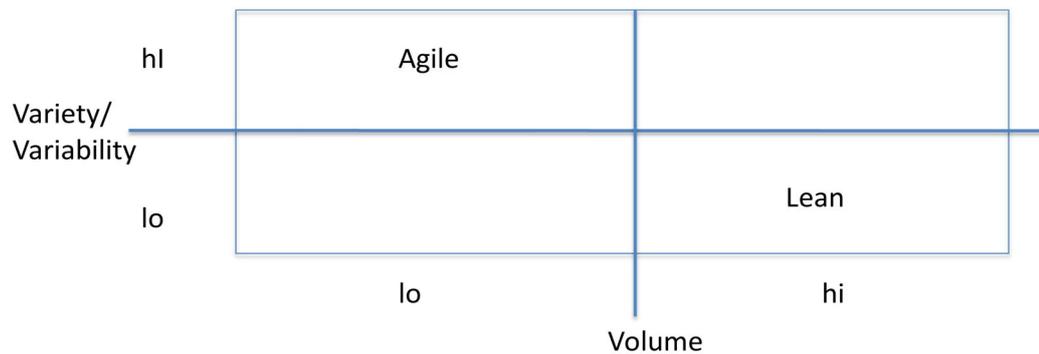


Figure 28. Agile and lean supply chain (Christopher 2000)

Agile supply chain is market sensitive and it is required in less predictable environments where demand of product is volatile and the requirement for variety is high. Lean supply chains work best in high volume/low variety situations and predictable environments. Even while the Figure 28 emphasizes the specific features of agile and lean supply chains, there is also often a situation where a combination of the two may be appropriate. (Christopher 2000)

Fisher (1997) has introduced a framework to help select the right type of supply chain for a company's product. The framework divides products into functional and innovative, and they both have special requirements for a supply chain to satisfy the demand (Fisher 1997). Responsive and effective supply chains are demonstrated in Table 5.

Table 5. Efficient and responsive supply chain (Fisher 1997)

	Efficient supply chain	Responsive supply chain
Primary purpose	Supply predictable demand efficiently for the lowest possible cost	Responding quickly to unpredictable demand in order to minimise stock-outs, forced markdowns and obsolete inventory
Manufacturing focus	Maintain high average utilisation rate	Deploy excess buffer capacity
Inventory strategy	Generate high turnovers and minimise inventory throughout the chain	Deploy significant buffer stocks of parts or finished goods
Lead-time focus	Shorten lead-time as long as it does not increase cost	Invest aggressively in ways to reduce lead-time
Approach to choosing suppliers	Select primary for cost and quality	Select primarily for speed, flexibility and quality
Product-design strategy	Maximise performance and minimise cost	Use modular design in order to postpone product differentiation for as long as possible

Lamming et al. (2000) studied also supply networks from a product point of view and found that “it is not only the level of product innovativeness that determines the appropriate type of supply network but also products uniqueness, and that the two may be used together as a feature of the product.” A year later, the same researchers (Harland et al. 2001) emphasized the meaning of the focal firm supply network influence and found four different kinds of supply networks (see Figure 29).

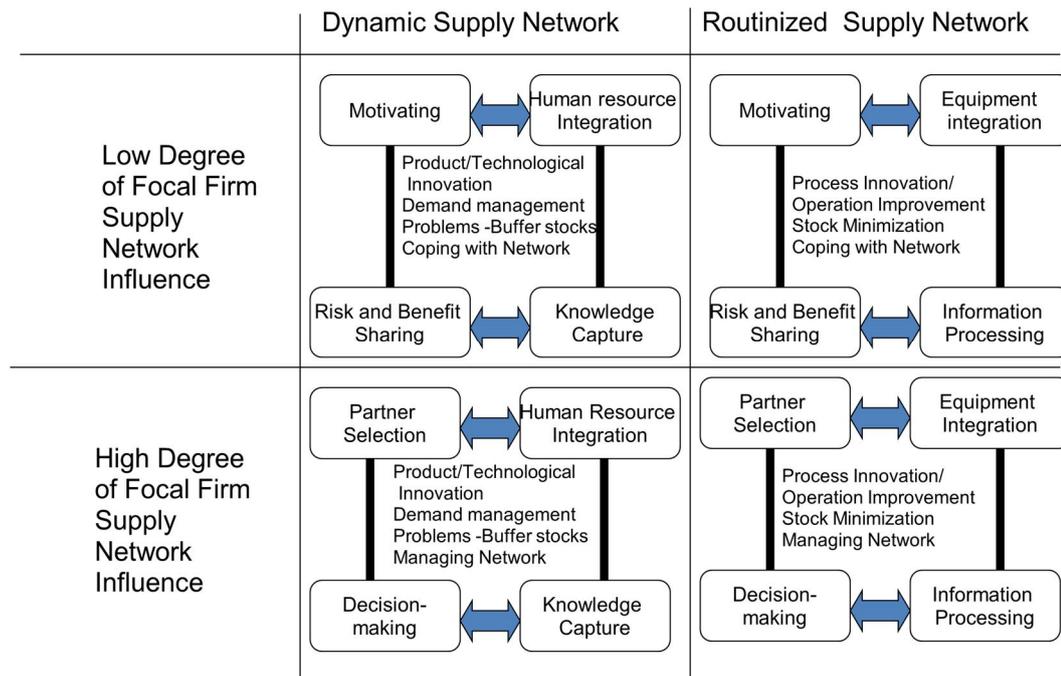


Figure 29. Taxonomy of supply networks (Harland et al. 2001)

Supply networks dynamics have two dimensions; operational process characteristics and market conditions. Operational process dynamics were measured in terms of process variety and volume; market dynamics were measured in terms of frequency of new product launches, number of competitors supplying similar products, and ease to switching suppliers. (Harland et al. 2001)

The focus of the taxonomy of supply networks is on the relationship between types of supply network as well as on supply network creation and operation activities. Each type of supply network has its own respective pattern. It is possible to further identify four distinct network themes and a cluster of important networking activities. (Harland et al. 2001)

Network structure

Lambert & Cooper (2000) have introduced a conceptual framework of SCM, which has three closely interrelated elements, the supply chain network structure, the supply chain process, and the supply chain management components. The network structure has three primary aspects: the members of the supply chain, the structural dimensions of the network, and the different types of process links across the supply chain (Lambert & Cooper 2000). One possible supply chain structure is demonstrated in Figure 30.

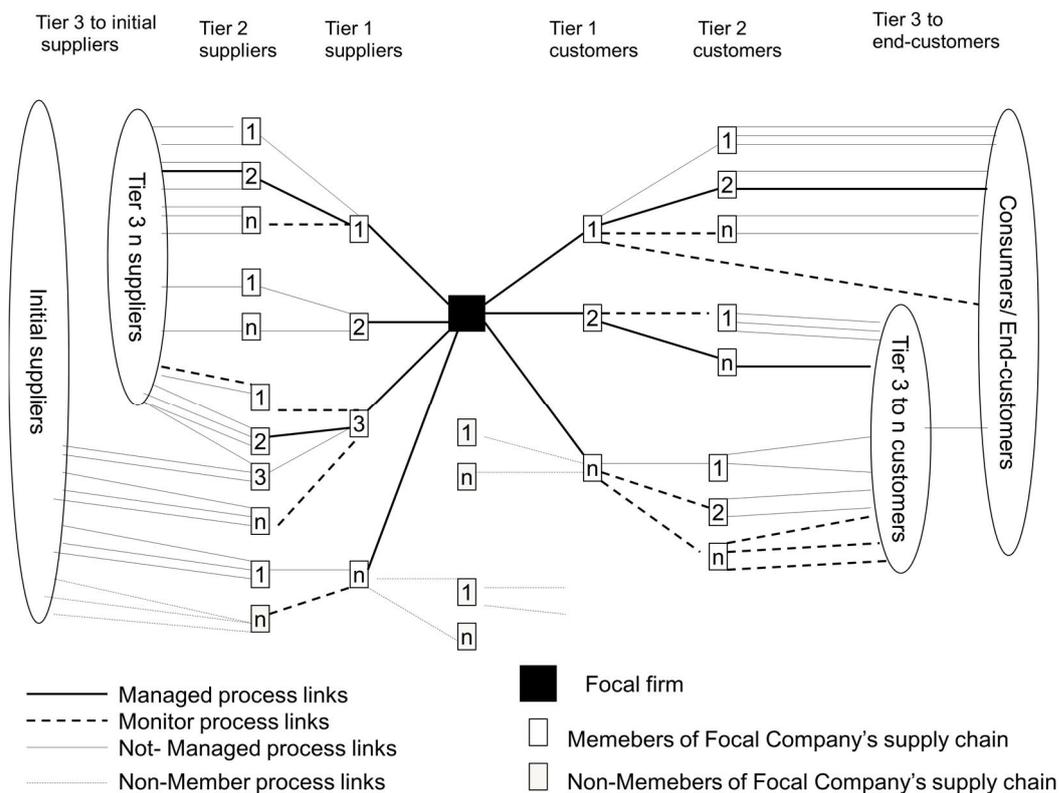


Figure 30. Supply chain structure (Lambert & Cooper 2000)

Lambert & Cooper (2000) divided suppliers to primary suppliers and supporting members. Primary supply chain members are those autonomous companies or strategic business units who carry out value adding activities (operational and/or managerial) in business processes designed to produce a specific output for a particular customer or market. Supporting supply chain members are companies that simply provide resources, knowledge utilities, or assets for primary members of the supply chain. By these definitions it is possible to find the point of origin and the point of consumption in the supply chain.

There are three structural dimensions of a network. The horizontal structure refers to the number of tiers across the supply chain, and the vertical to the number of suppliers/customers represented within each tier. The third structural dimension is the company's horizontal position in the network. (Lambert & Cooper 2000)

According to (Lambert & Cooper 2000) successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. The key supply chain processes are:

- Customer relationship management

- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management
- Procurement
- Product development and commercialization
- Returns.

Lambert & Cooper (2000) found four different business process links between members of the supply chain: managed business links, monitored business links, not-managed business links, and non-member business process links.

Lehtinen (2001) has studied the structural development of subcontracting and has found three distinct stages (Lehtinen defines the term “subcontracting” as “manufacturing and developing ordered goods: semi-products, components and services, whose customized specifications are provided by the prime contractor. Both intra- and outsourcing is considered to be subcontracting”). These stages are introduced in Figure 31.

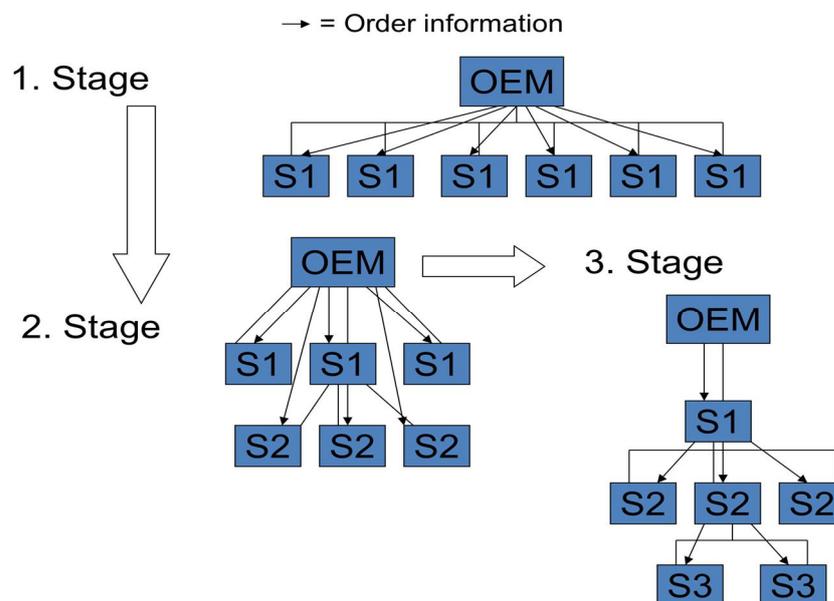


Figure 31. The evolution of the structure of subcontracting (Lehtinen 2001)

The evolution of the structure of subcontracting started in late 1980's. In the first stage, the prime contractors reduced the number of subcontractors. Then they assigned subassemblies to certain subcontractors, which became first-tier subcontractors or system suppliers. Typically, the material flow changed before the contract-based structure emerged. In the third stage, the structure of the supplier chain became more stable, and the subcontractors took a more active role for example in the product development process. (Lehtinen 2001)

The broadness (or width) is a key element of the structure of the network. A broad network is considered to be more capable of coping with environmental changes due to easier switching between parts of the chain, and a narrow network would be more rigid and stronger because of the dense flow of information (Lehtinen 2001). Table 6 shows how Harland (1996) summarized the advantages of broad and narrow networks.

Table 6. The advantages of broad and narrow networks (Harland 1996)

Advantages of broad networks	Advantages of narrow networks
adaptable to change	collaborative innovation
more switching opportunities	rigid and strong
hedge against uncertainty	wider access to knowledge
cost competitive	dense flows of information
	shared destiny
	higher confidentiality

2.2.3 *Summary of the theoretical framework*

The theoretical framework is based on the model of Harland et al. (2004). The model defines what issues should be studied in the name of structural validity. Theoretical framework presses those Harland et al. (2004)'s network activities and context issues, which helped researcher to determine Firm's successful and unsuccessful supply network development actions during 1998–2001. Therefore, the supply network action "knowledge capture" is introduced by 8 pages in this research, while "social coordination" is presented less than one page. It does not mean that "knowledge capture" is generally eight time more important issue than social coordination. It means, that the researcher (who has history as teacher) found valuable new understandings by using the "Knowledge Capture" point of view to this specific case.

Positivism is a dominant research approach in logistics research (Mentzer & Kahn 1995, Spens & Kovács 2006). This dominance has effected in many ways to logistics research. For example, structures of Finnish IEM dissertations are following the positivism tradition, theoretical framework follows introduction chapter and after that there is an empirical analysis, findings, conclusions, and discussion. However, traditional structure might not be the best way to describe an abductive (or inductive) research process, which this research follows. There is a lack of instruction, how this kind of non-traditional logistics research approach should be documented to achieve “coherent structural dissertation form”. One way to gain “coherence” could be the integration of the empirical and theoretical framework into same chapter. This alternative documentation logic for logistics research could describe abductive research process better than traditional structure.

The role of positivism might be the reason, why logistics research papers does not always has an explicit scientific presumptions statements (Kovács & Spens 2005, Spens & Kovács 2006), even there is a clear need for them (Mentzer & Kahn 1995). According to Spens & Kovács (2006) “Making the research approach explicit would also help to overcome a problem with the content analysis, e.i. the fact that our classification are often a result of reading between the lines, due to the fact that many authors do not discuss the starting point of their research.” This statement describes major challenge of this theoretical framework.

The theoretical framework of this research has very subjective nature. It collects, “useful for this researcher in this case”, models, frameworks, methods, tools and concepts into the same chapter. There is a threat, that researcher has misunderstood some of these “non-explicit scientific presumptions theoretical point of views”. Even the researcher find those theoretical point of views valuable for himself, there is no guarantee, that other researchers will “read between the lines” in the same way. This jeopardizes the development of these theoretical points of views, and at the same time, undermines the scientific value of the theoretical framework of this research.

3 EMPIRICAL RESEARCH

This chapter is one result of abductive research process (see Figures 3, 5, 6 and 8). The purpose of the empirical research chapter is to describe and analyze the research by using model of Harland et al. (2004). The empirical research starts with a chronological description how the material is gathered. Chapter “3.1 The preliminary research” portrays how preliminary research proceeded and Chapter “3.2 The research” describes the progression of the second phase of the empirical data gathering. After chronological description chapters, the empirical material is analyzed from theoretical viewpoint in a Chapter “3.3 A conceptual model for researching creation and operation of supply network”.

The empirical research started in Autumn 1999 and it ended 2001. The main task of the research from Firm’s point of view was to develop Firm’s supplier network performance to be more efficient and effective. The research is described through development actions that are connected to each other. The research has adopted the chronological approach to describe the development actions, because the former actions also give the background for the next actions. The empirical research has two phases; the preliminary research and the research itself. Table 7 describes how the research material was gathered during the preliminary research, while Table 12 shows how the research was utilized for conclusions. Actions in the Tables are numbered, and they are used to show the connection between the empirical research and the findings of the research.

It is not easy to evaluate the reliability of the case study methods. Another researcher should be able to repeat the study by using the description of the study, and the numbering of the empirical actions here gives to a new research tool to connect the empirical part to the findings of the research. The empirical material gathering took place over two years and multiple methods were used. The description of the empirical research is a compromise between detailed, very long, and hard-to-follow description, and one with only the most valuable actions described. It was a difficult task to choose the development actions to describe this research, and it could have been done in many different ways. The description emphasizes the start of the research where the background was described, and the methods and themes of the development processes were chosen. The customer complaints form the main field area of the empirical research.

3.1 The preliminary research

The preliminary research emphasizes the supply network's point of view, how the suppliers see the current situation, and what are the main development areas. One aim of the preliminary research was to study how the supply networks see the role of Firm as a focal company, and how the focal company has helped the supply network to work in a more efficient and effective way. In the preliminary research the suppliers were asked to describe the main threats and opportunities of the markets in the self-assembly pine furniture business. The preliminary research is based on ten company visits. During the visits the members of the supply network were interviewed and they also filled a questionnaire.

Table 7. Empirical material: preliminary research

Number	Time	Name/aim	Method	Members	Documentation	Results
1	24.8 1999	The goal's and timetable of the project	Group discussion	Prof. Kess, prof. Lehtinen, researcher Firm's general manager, purchase engineer, and buyer	Memo by researcher	The goal's and timetable was documented
2	Autumn 1999	Firm's view: structure, problems and development of the network,	Discussions	GM, purchasing and marketing departments	-	Firm view: structure, problems and development of the network
3	15.10 – 9.11. 1999	Supplier's view: structure, problems and development of the network	Visiting the suppliers: layout, photos, questionnaires and interviews	Ten suppliers	Memos by researcher	Suppliers view: network, problems and development
4	3-4. 11. 1999	The first network day/common view	Presentations and group discussions	Eleven suppliers, Firm's GM and 9 other employees, researcher	Memo by researcher	Shared view of network and plan for year 2000
5	17.12 1999	Preliminary researcher rapport			By researcher	

Before the interviews, the researcher interviewed the general manager and the employees of the purchasing department of Firm. By these interviews the researcher could grasp the extent and composition of the supplier network and choose the companies for site visits from the supplier network. After the first seven, out of ten, supplier interviews the researcher was ready to arrange the first network meeting. The findings of the preliminary research were put together to a project report, on which this chapter is also based. The report was sent to those

members of the supplier network who were interviewed or who were participants of the first network day. The suppliers and Firm's employees had a chance to comment on or suggest corrections to the report. Figure 32 describes the research area of the preliminary research.

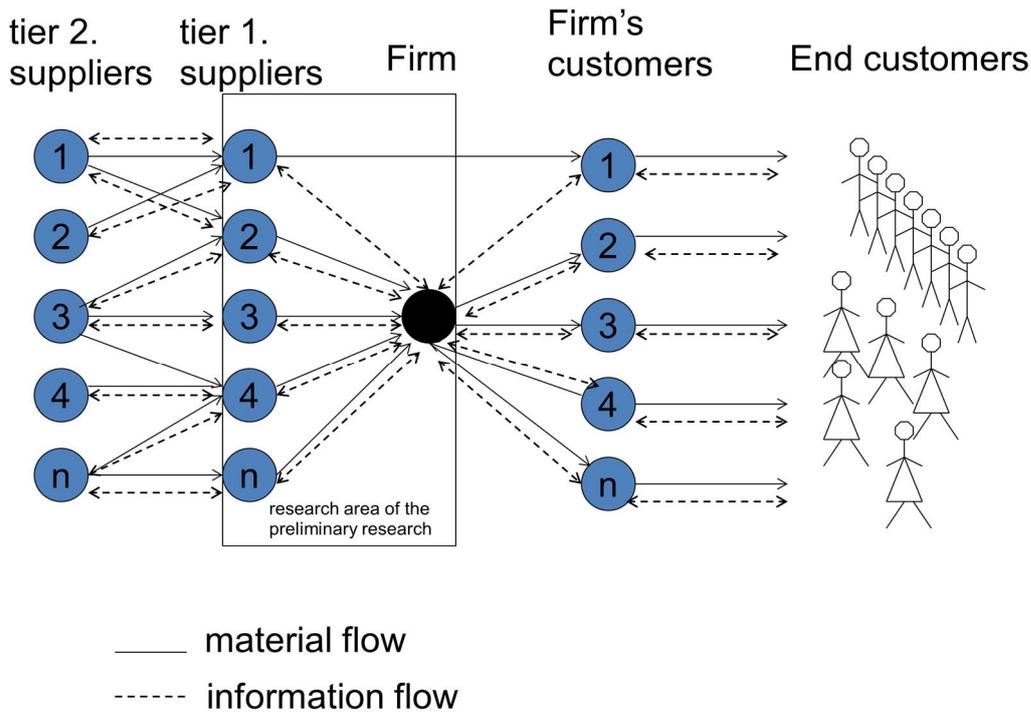


Figure 32. Research area of the preliminary research

3.1.1 Firm's supply network

The supply network of Firm is composed of about thirty suppliers and it is divided into three groups: ready made-furniture suppliers, component suppliers and planed parts suppliers. Examples of ready-made furniture are tables, chairs, beds, and storing furniture (shelves, cabins and wardrobes). There are many kinds of components, for examples desk and tabletops, and they can comprise different kinds of moldings and lathe-turned products. Planed components are for example unsurfaced wooden frames for begs and lofts. Four of Firm's suppliers are from abroad (Russia, Latvia and Estonia). The supplier network is very heterogenic, suppliers' turnovers, amount of employees, and machinery varying hugely between the companies. A typical supplier is a small company that has supplied Firm with many kinds of components and/or ready-made furniture over the years. Firm started to audit the suppliers in the late 1990's. Firm's auditing program

includes about 20 suppliers. Firm knows what kind of capabilities and knowledge the supplier network has, and if there is a problem they know whom to contact.

3.1.2 *Visiting the suppliers*

This chapter is based on ten interviews. Firm provided the researcher with a list of its main suppliers, and from this list the researcher picked up at random ten suppliers for the visits. The visits and interviews took place between 15.9. and 9.11. 1999. The researcher was warmly welcomed to every supplier's factory and it was easy for suppliers to find time for the visits. The aim of the visits was to find out how the suppliers see the current situation and the future of self-assembly soft wood business: the structure of the business, the strengths, and the problems.

Description of interviewed companies

Tables 8 to 10 contain the descriptive data of the interviewed companies.

Table 8. Turnovers of the interviewed companies

Turnover (euros) / year	Number of companies
0–499	4
500–999	1
1000–1499	3
1500–2199	1
2200–3499	-
3500–	1

Interviewed companies had an annual turnover of between 200 000 to 4 000 000 euros while their average turnover was 1 300 000 euros.

Table 9. Amount of employees of the interviewed companies

Employees	Number of companies
1–3	2
4–6	1
7–9	2
10–13	2
14–20	2
21–	1

The smallest company studied had only three employees while the biggest had 39. The average interviewee was the general manager/owner of the small company. Even the biggest company felt that they are too small to have their own R&D unit, and marketing was a real challenge from them because customer relationships were quite expensive to handle.

Table 10. Firm's share of the interviewed companies' turnovers

Firm's share of turnover	Number of companies
0–20%	1
20–40%	4
40–60%	1
60–80%	–
80–100%	4

At the time of the study, Firm was an important customer to all interviewed companies, and for some of the companies Firm was the only really important customer. Most of the interviewed companies were dependent on Firm's R&D as well as its marketing and purchasing knowledge.

Interviews

Interviews consisted of two phases: open questions and questionnaire form. First the suppliers filled in the questionnaire form, and afterwards answered to the open questions.

The questionnaire is reported in Table 11. It has three sections; in the first part the supplier describes how well he/she knows Firm. In the second part of the questionnaire the supplier determines how he/she gets information from Firm, and the in the last section how much help the supplier has get from Firm. The ranking scale of the questioner is one to five, where one means almost nothing and five equals to excellent.

Table 11. Questionnaire form: average values, smallest and highest given evaluation and standard deviation

Part one: How well you know Firm? Scale 1-5	Average value	The smallest value	The largest value	Standard deviation
Employees of purchasing department	3,8	2	5	0,78
Employees of R&D department	2,7	1	5	1,16
Management of Firm	2,6	1	5	1,26
Employees of marketing department	2,4	1	4	0,97
Firm's strategies and policies	3,4	2	5	0,97
Firm's marketing situation	3,3	1	4	0,67
New R&D projects	2,2	1	4	0,92
Firm's customers	2,5	1	4	1,08
The end use of the products	3,5	2	4	1,35
Average value of part one	2,64			

Part two: How well you have get information from Firm	Average value	The smallest value	The largest value	Standard deviation
Demand changes short time period	2,4	1	4	0,84
Delivery changes	2,7	2	4	0,95
Product changes	2,7	2	4	0,82
Quality criteria	3,5	2	4	0,85
Demand changes long time period	2,4	1	4	0,84
R&D projects	2	1	4	1,05
Supplier network policy	2,9	2	4	0,88
Development of product prices	2,8	1	5	1,32
Changes in Firm	1,9	1	4	0,99
Average value of part two	2,33			

Part three: How well Firm has helped your firm	Average value	The smallest value	The largest value	Standard deviation
Quality systems	2,2	1	4	1,14
Quality improve tools for production	2,4	1	4	0,97
Production management	2,7	1	4	1,25
Purchasing	2,6	1	5	1,26
Cost reduction	2,2	1	4	1,23
Production machinery investments	1,7	1	5	1,34
Problem solving in production	2,1	1	4	1,37
Finding new customers	1,9	1	3	0,74
Finding new suppliers	2,2	1	4	1,03
Technical development	2,3	1	4	1,16
Average value of part three	2,2			

Firm and its supply network are in the middle of a change process. There are mixed feelings about Firm and its actions in the supply network as a focal company. There also are a lot of single issues to develop. The supply network's general knowledge of Firm does not give a very good starting point to develop a deeper

co-operation in the supply network. Even though many of the suppliers are very dependent on Firm's R&D, marketing, and purchasing knowledge, they don't feel that they have had a lot of help from Firm with their business development process. General knowledge of Firm and Firm's employees should be ranked at 4 or 5, if the supply network would want to deepen the co-operation in the supply network. The third part of questionnaire got the lowest evaluation even though Firm started the auditing process before the interviews.

Open questions were used to find out how the suppliers see the current situation and the future of the solid soft wood self-assembly furniture business, and what are the main current and future challenges in the business. When answering the open questions the suppliers gave ideas on how to develop the supplier network and what would be Firm's current and future role in the supplier network. The suppliers also evaluated their own purchasing process in the open questions. The main challenges, which were mentioned in the open questions, are listed in Figure 33. Comments are linked together by arrows.

Even if the answers to the open questions created a negative view of the solid wood self-assembly business, there were also some positive comments. Firm's actions during the last year were encouraging, for example. Firm's ordering process was also seen to be much better than it was year earlier.

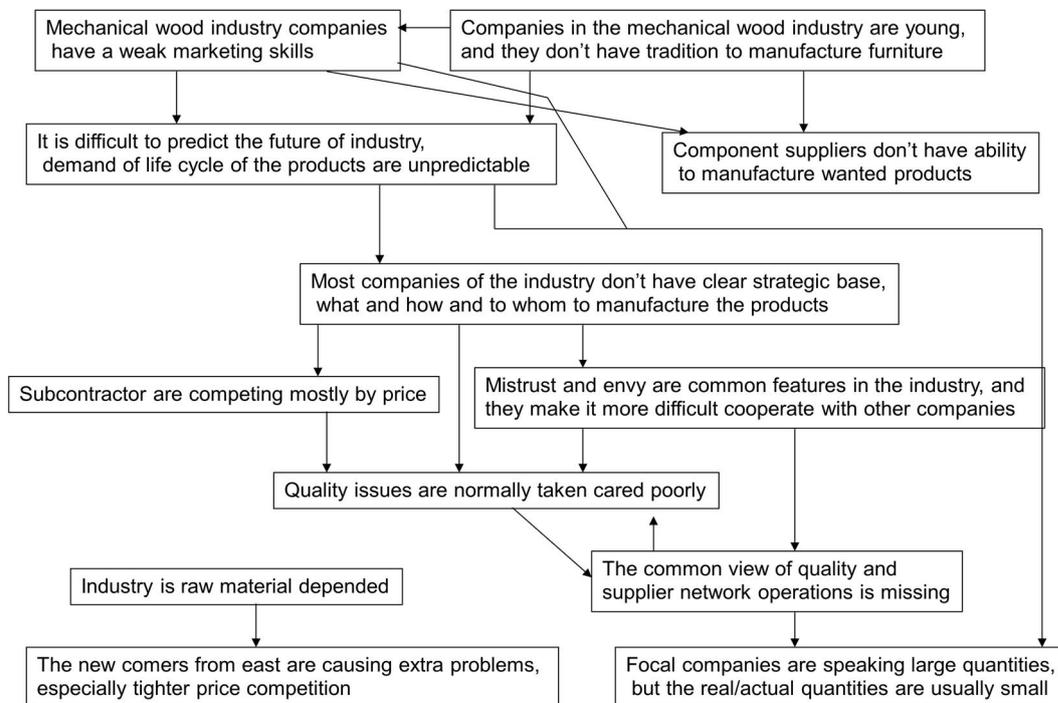


Figure 33. Open question comments connected by arrows

Mechanical wood industry had lot of changes during the 1990's: Finland joined EU, the collapse of the Soviet Union, and the deep economical depression are examples of the forces that changed the environment of business during the last decade. There are only a couple of companies that have resources to be powerful focal companies of the wood industry supply networks in Finland. The lack of focal companies has influenced the development of the markets and the structures of the supply networks in the business. Short-term thinking was one of the most common features mentioned in the answers of the open questions. The main criterium to choose a supplier for the components or ready-made furniture has been the price of the product. The relationships between Firm and the suppliers have normally a long history, but contracts are made for a short time period. Short time period thinking does not give a good background to develop suppliers' performance to serve Firm's needs. The suppliers felt that it is difficult to make any investments, because the future is so unpredictable. Suppliers themselves do not have proper marketing resources to estimate the market developments, and the view given by Firm does not form a good background to make investments. According to the suppliers' general opinion, Firm's strategic planning is quite poor for a focal firm; they don't know what their core competences are, and they are changing the outsourced products and components constantly "staying alive in a short time period" seems to be the main aim for Firm. Short-period thinking does not support quality improvement, and there is not a common view on how the supplier network should work and what the quality criteria for it would be. Price-based competition, poor strategic planning, short time period thinking, and an unclear view of quality led to general mistrust in the supplier network. The supplier network has been only a production resource for Firm where they have bought manpower and machine capacity for unwanted products and quantities. The short-period thinking and price-based competition seem to be common strategies for the companies in the self-assembly solid wood business in Finland.

Information flow from Firm to the supplier network was mentioned many times during the open questions as one of the main challenges. The information of Firm's production changes during summer holidays and changes in Firm's staff in general were examples on where Firm should be more careful towards its suppliers. Next to the information flow, the next challenge is Firm's strategic planning - what Firm will manufacture itself - what is its core competence - and what it will outsource. After that decision it is possible to develop other supply network activities, for example how the supplier network can be integrated into Firm's R&D process.

The typical supplier didn't know much about the other members of the supplier network. They also typically did not know what were the core competences of

other members of the supplier network, nor did they do any kind of planning together or had joint development projects.

There were also comments among the suppliers about their own purchasing processes. Some of the suppliers had no problems with their purchasing processes while some of them had experienced lots of problems with their suppliers. One of the interviewed companies had so much problems with its suppliers that it tried to do as much as possible by itself. Sawmills were often mentioned as difficult suppliers.

Questionnaires and the open questions revealed different kinds of issues and the answers to these were not coherent. Some of the interviewed persons, who allocated relatively high ranking points in the questionnaire, presented very critical views in the open question phase, while some of those who gave quite low ranking points in the questionnaire, made relatively high evaluations in the open question part of the interviews.

Some of the suppliers had a clear vision of their core competence. They had a specific component or a piece of ready-made furniture, in which they were good at in manufacturing knowledge and had suitable machinery. These clearly specialized companies had much less problems with Firm. They felt that the information flow with Firm was working as it should, they knew what kind of products they should produce, and they also had a good grasp of what kind of investments they should make to develop their core competence.

These preliminary research findings were introduced to Firm's general manager after seven interviews. At this stage the general manager decided to take quick action because of the poor situation in the supplier network. He gave to the researcher and to the purchase engineer a task to arrange the first network day.

3.1.3 First network days

The first network days were arranged between 3.11.–4.11.1999, with eleven suppliers and ten Firm's employees present. There were many themes, presentations, and group works during the network days. The most valuable parts of the network days were the presentations of general manager of Firm. Next, the summary of those presentations is described. It is worth of note, for reliability considerations, that the general manager has read and accepted the summary. The general manager used the term contract manufacture (in Finnish, "sopimusvalmistaja") when talking about the members of Firm's supplier network.

The form of the future supplier network

Contract manufacturing describes Firm's and the supplier's view on how the supplier act when offering production services to Firm. A contract manufacturer has to offer a specific and cost efficient product or service, and needs to have an attitude and ability to develop the co-operation with Firm. A contract manufacturer also needs to be active in the relationship with Firm's R&D department and to co-operate with Firm's purchase and production departments. The aim is to integrate Firm's and contract manufacturer's processes in as close a co-operation as possible. The idea of contract manufacturing, as understood in Firm's network, is based on a long-term co-operation, trust, and the use of open books. The relationship network, which connects people from different tasks and departments, is one of basic elements of Firm's supplier network.

The problems in the current supplier network

The ways of making the make-or-buy decisions have changed many times in the 1990s. Firm has not had a clear vision of its core competence and, therefore, Firm's suppliers also have not had a vision of how to make long-term plans to serve Firm's needs. Even Firm's staff does not really understand what the difference between offering production capacity or offering production service is. The full dependence on the business of Firm is a risk for both Firm itself and the contract manufacturer. The changes in the furniture markets can cause temporary collapses due to decreasing demand and, therefore, the supplier's financial situation may become very weak if Firm is the only customer of the supplier. A bankruptcy of the contract manufacturer would likewise be a great loss to Firm and its supplier network, and losing the knowledge and production capability when losing a supplier may cause difficulties in the future to the supplier network as a whole.

Members of Firm's supplier network have not this far had clear core competencies, due to the past difficulties in Firm's strategic planning process. Therefore, there is quality and capacity problems in the supplier network. The information technology solutions utilized, as well as the size differences between Firm and its suppliers, have at least partly caused the misunderstandings and breaks that have appeared in communication within the supplier network. The suppliers' documentation, in general, also has not been on sufficient level.

Benefits for the future supplier network

The contract manufacturing idea is based on efficient operations, which can be achieved by specialized competence. According to the transaction-cost theory,

cost savings must be greater than the cost of building trust and better information flow. The contract manufacturers' specialized competence offers Firm and its supplier network a better quality and price than Firm's own production would. Cost savings can be achieved also in the smaller order quantities realized, where Firm's production is not efficient enough. The speed of technological development is fast and it emphasizes the importance of strictly holding on to one's core competences only. Investments are ageing faster than before, and the predicted product quantities have to be ever larger for investments to be profitable. Firm might not by itself see enough demand for justifying a specific production investment. Firm's core competence clearly is marketing and logistics, not production. The situation where the members of the supplier network have their own core competences and are developing them by co-operation with supplier network is the best for all.

Requirements for being the member of the Firm's supplier network

A company that wants to become a member of Firm's supplier network needs to have the ability to develop specific core competences and low transaction costs. Building real trust in the supplier network relationships will take one to three years of cooperation. Good information systems are needed in order to lower the transaction costs to the level where strategic cooperation is possible. Quality of workmanship of the supplier company will be also evaluated whenever a company wants to become a member of the network. The supplier company needs to have enough staff to build skilled, effective teams and enough knowledge to build the quality in the product. Efficient production also requires reasonably modern production technology.

The required action to become a member of Firm's supplier network

In order to qualify in Firm's supply network, the company's whole staff typically will need training and development projects. The presumptive supplier company also has to have its own supplier network. Responsibilities inside the company and in its suppliers' network have to be clear. The company has to be active with its relationship to Firm, and Firm's products must be familiar to the company. An effective relationship between the company and Firm is based on open discussion and feedback. The network will only find eventual problems and challenges through open discussion and feedback, which form the background for future development projects. Firm has to know the company and, for that reason, the company will have to make all the major decisions together with Firm. Teamwork is key element of the supplier network operations; inside the company the team leader typically needs special training in languages, teamwork methods, and sales. The company is responsible for auditing its own supplier network so that team-

work and required training are also implemented all over. The main aims of training and teamwork are met by ongoing development of service quality.

Near future of the supply network

Firm will describe the core technologies that it will develop but that it will not outsource. Products of other technologies, so-called supporting technologies, will consequently be bought from the supplier network. Products of supporting technologies will also require special competence, for example the ability to economically make small series of products. There will be two different types of demands: the demand for Firm's core technology and the demand for the supplier network's production. After a clear description of Firm's core technology has been developed, the members of the supplier network also will have a clear vision to decide what their role is in relation to the other core competences in Firm's supplier network.

3.1.4 Summary of the preliminary research

One issue was commonly agreed in the interviews – Firm and its supply network will face lots of challenges in near future. Suppliers do not participate in the R&D process, and, therefore, the products are not designed from the supplier network point of view. Firm's core technologies again are not described and for that reason the supplier network has no vision towards which to design their own production, in order to serve the needs of the whole supplier network. The main criterion of supplier selection currently is the price of the product, and thus the whole cooperation is based on short-term thinking.

Firm and its supplier network want to develop the supplier network operations from short-term thinking/temporary purchasing to long-term strategic cooperation. Long-term thinking is one of the key issues when Firm and its supplier network are developing better-defined core competencies for each of the members of Firm's supplier network.

Development actions/tools for the future supplier network include

1. Firm's clear description of its core competences, in other words those entities, which will be kept strictly inside Firm, but especially those, which are going to be bought from its supplier network.
2. The supplier network analyses on whether the current supplier network companies have the attitude and the desired features of a member of the future supplier network

3. Clear roles for the contract manufacturing
4. Tools and actions for closer supplier network cooperation
 - hiring a supplier network development engineer
 - temporary exchange of the employees between companies (from Firm to supplier network and from network to Firm)
 - inter-company training and coaching
 - network meetings
 - supplier network association.

The description of Firm's core competences will have many positive effects to Firm's supplier network. For example, the view on the operations from Firm's R&D department will be better. They will know in early phase of the R&D process what products and components Firm will buy from its supplier network, and therefore R&D department will have better chance to integrate suppliers early into the product design process.

3.2 The research

The main research activities are, naturally, based on the preliminary research. The decision to hire a supply network development engineer was the Firm's first development action. The researcher started his work as supplier development engineer on March 1., 2000. The first task of the development engineer was to understand how Firm operates and at the same time he would have to develop a clear description of Firm's core competences. The researcher visited two of Firm's factories and the headquarters. He interviewed 13 employees and made recorded observations in the factories and headquarters. The second task "The supplier network analysis" was clarified during the preliminary research. The supplier network analysis was based on 16 visits to the suppliers. The researcher arranged supplier network meetings, intercom training, and visits from Firm to supplier network (and vice versa) in order to achieve closer co-operation within Firm's supplier network. In June 2000 the researcher visited three Danish furniture companies. Further in December 2000 the researcher visited one Latvian and three Estonian furniture companies. During these visits the researcher gained a better general understanding on how the furniture business in operating. During the research the author analyzed over 3700 customer complaints and visited two Firm's

main customers' headquarters, as well as made first-hand observations in their retail stores. Findings from preliminary research and this research were introduced in four conferences. These conferences and other data-gathering actions are listed in Table 12.

Table 12. Empirical material: the research

Number	Time	Name/aim	Method	Members	Documentation	Results
6	March – April 2000	Firm	Visiting at two factories	Employees	-	Better understanding how Firm is operating
7	March - April 2000	Firm's point of view	Interviews	GM and 12 other Firm's employee	Memos by researcher	Better understanding how Firm is operating
8	April 2000	The second	Presentations and group discussions	14 suppliers, 10 Firm's employees, researcher, project manager	Memo by researcher	The plan for the project
9	May - Agust 2000	Second network round	Visiting the suppliers: layout, photos, questionnaires and interviews	16 suppliers	Memos by researcher	Better understanding how the supply network is operating
10	June 2000	Danish companies	Plant tourneys, interviews	Three companies	Memos by researcher	Better understanding how the mechanical food industry is operating
11	June 2000	XII NOFOMA conference	Writing the conference paper and presentation	Project manager and two researchers	Conference paper by researchers	Better scientific background, new ideas
12	August 2000	Third network day	Presentations and group work	18 suppliers, 19 Firm's employees, researcher, project manager, 2 consults	Memo by researcher	Better understanding how the supply network is operating and plan for future.
13	Autumn 2000	Reclamation analysis	Statical analysis	Over 3000 reclamations	Memo by researcher	Better understanding why there is so many reclamations
14	December 2000	Baltic companies	Plant tourneys, interviews	Three Estonian companies and Latvian company	Memos by researcher	Better understanding how the mechanical food industry is operating
15	Spring 2001	Visiting the customers	Interviews and store analysis	Two customers	Memos by researcher	Better understanding how the supply network is operating
16	April 2001	Fourth network day	Presentations and group work	13 suppliers, 16 Firm's employees, researcher, project manager, 3 consults	Memo by researcher	Better understanding how the supply network is operating and plan for future.
17	November 2001	Fifth network day	Presentations and group work	18 suppliers, 19 Firm's employees, researcher, project manager, 2 consults	Memo by researcher	Better understanding how the supply network is operating and plan for future.
18	December 2001	II C&C conference	Writing the conference paper and presentation	Researcher, prof. Juga & prof Haapasalo	Conference paper by researchers	Better scientific background, new ideas
19	March 2002	XI ISPERA Conference	Conference paper	Project manager and two researchers	Conference paper	Better scientific background
20	June 2002	XIV NOFOMA Conference	Writing the conference paper	Researcher, prof. Juga & prof Haapasalo	Conference paper by researchers	Better scientific background

3.2.1 Interviews and observations in the factories and in the headquarter

The researcher studied Firm's operations and core competences through thirteen interviews and lots of observation time in Firm's factories and headquarters. The researcher interviewed Firm's general manager and all in all ten other managers/buyers of Firm. Two of the interviewed employees worked as order service clerks. Figure 34 demonstrates the interviewed persons' roles in the organization.

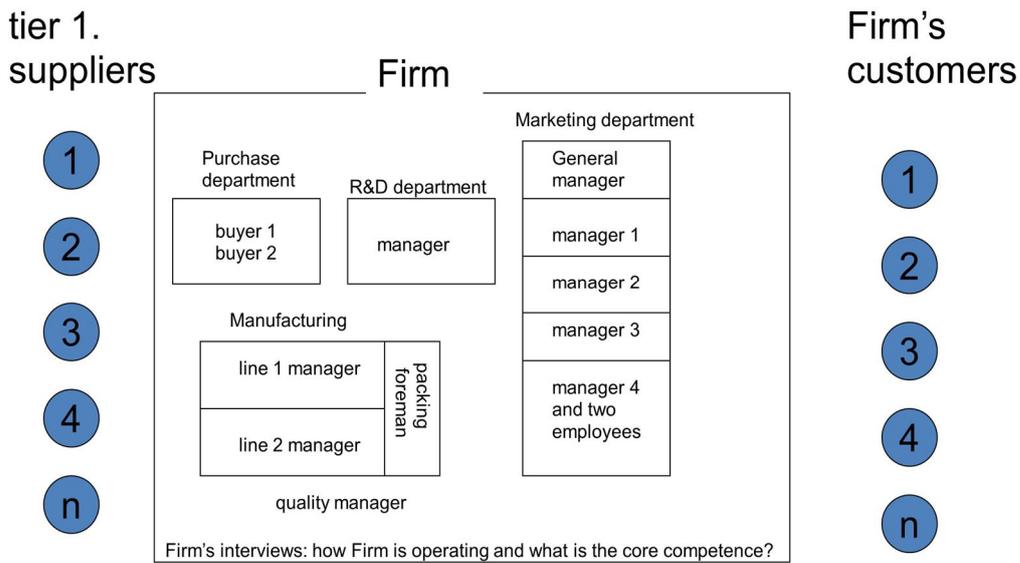


Figure 34. Interviews at Firm

Marketing department's view of the operation of the supplier network

The operations of Firm's supplier network are based to customers' quality and quantitative demands. Customers have different demands, and therefore the supplier network has always many possible ways to satisfy the customers' needs. There are four basic different ways to operate with different customers. The next chapters are based on interviews of marketing managers who have the responsibility of the market area mentioned. For reliability purposes, these managers have, again, read the descriptions and approved of them.

The marketing process of customer A

Firm has two different marketing processes with customer A. The first one is based on customer's A first contact; it will send the description of the furniture to be ordered to Firm. Firm will manufacture a model of the product, based on customer A's description of design, price, material, and timetable. The description of the product also determinates the production throughput time of the model: the model will be produced quite fast if the description is clearly specified. Customer A uses the model for test marketing, and will be able to estimate the demand of the product. After the test marketing customer A and Firm will plan the production of the product together. Before starting the production, customer A will also invite tenders from other producers. Firm is ready to start the production if its offer is the best.

The second type of marketing process starts with Firm's proposal. Firm will send a ready-made model to customer A, who will test it by using test audience. If the test audience will approve the product, customer A will calculate the price of the product by using the formula:

$$\text{Estimated price for end-customer} - \text{profit of customer A} = \text{price offered to Firm}$$

The production of the product can be started if the price satisfied Firm. Over 80 % of the products are made by the first model, and almost every product is at least assembled in Firm's main factory.

Marketing process of customer B

The marketing process of customer B has five phases; it is described in Figure 35.

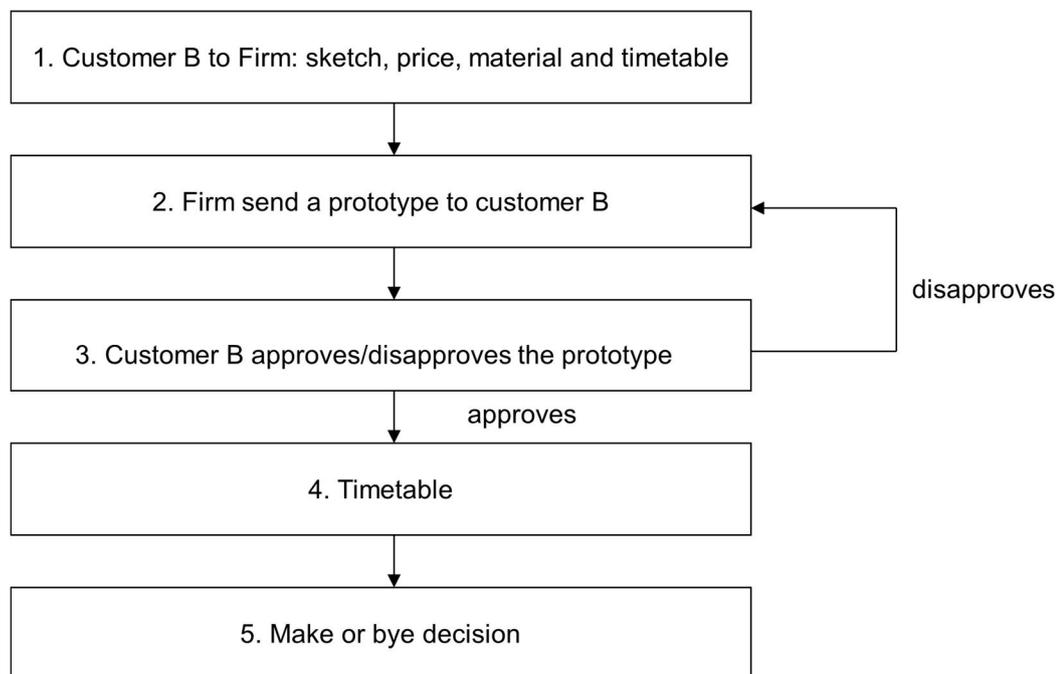


Figure 35. Marketing process of customer B

Phase one: Customer B contacts Firm marketing department and sends them a sketch of the requested product, and describes the ideal price, materials, and timetable for the product. The description of the product determines the R&D time of the product.

Phase two: Marketing department orders a prototype of the product from Firm's R&D department. R&D department needs two to three weeks to produce the manufacturing drawings and the prototype of the product.

Phase three: Prototype is shown to customer B in Firm's R&D department, or will be sent to customer B. Normally customer B requires some changes to the prototype (for example product design, colors or material changes). Based on the new information, Firm's R&D department will produce a new prototype and manufacturing drawings. The product will enter the next level when customer B approves the product for manufacturing.

Phase four: The production timetable is approved

Phase five: The production, R&D, and purchasing departments at Firm decide who will produce the product. There are three main points of view, when the make or buy decision is made. The first one is the scale: small quantities of products, say, under 200, generally do not fit into Firm's production, and they are fully made in the supplier network. The second issue is surface of the product. Natural colors are most suitable for the supplier network. The third issue to be considered is the complexity (quantity of components) of the product. The products that consist of many different components do not flow in proper way through Firm's factories. Firm's own product is designed to be manufactured in a bigger scale than the Firm's supplier network's planned production.

Marketing process in the marketing area C

Customers within the marketing area C (later noted as customer C) demand the same type of services from Firm and its supplier network. Customer C's sales volumes, however, are much smaller than those of customers A's and B's. Generally, customer C does not initially have a clear view of the product that it wants to be produced. The first sketches of the products required are not very clear, and thus they demand relatively more R&D services from Firm. Normally customer C wants to see a prototype of product, together with a prognosed price, before it is ready to make more detailed descriptions of the required product. Otherwise customer C's marketing process is quite like customer B's marketing process (see Figure 35).

Marketing process in the customer area D

Marketing area D includes many customers, with whom the sales volumes are low. Customers in the marketing area D (later named "customer D") have a similar way to operate with Firm. Marketing process with customers in area D differs from other types of customers in many ways. Product design/ordering process of customer D emphasizes the production of the product, not the end-customer opinion. Customer D wants from Firm "a catalog of the products" that the producer manufactures in the most efficient way, and from that catalog customer D then is

ready to choose the products it wants to sell in its stores. Customer D does not want to be involved in Firm's R&D or production planning process. Customer D's idea of buying products is "We don't know what a producer's core competence is, and therefore it is the producer who will show where it is most efficient and what kind of products it can offer. We just pick the products which on the whole are the best for us." This different culture of buying products affects the cooperation in many ways; for example, Firm does not manufacture for customer D any custom-designed products.

Exhibitions, advertising, phone calls and newspaper articles play an important role when Firm is marketing its products to customer D. After the first contact to the customer is achieved, marketing manager and R&D department may do the first sketches of products. The prototypes of product may be produced, if the sketch satisfies customer D. Firm may further start to deliver the "test series" of the product to customer D's stores if the prototype satisfied customer D. Firm and customer D will monitor the sales and end-customer satisfaction, and based on that data they will decide on how they will go on with the product.

R&D department's view of the operation of the supplier network

The R&D department of Firm has six employees. Temporarily, the department is also able to use resources from the production department and the supplier network, in order to handle the demand peaks. The next chapter is based on an interview of the manager of the R&D department. He, again, has read the chapter and he approves of the correctness of the facts reported in it.

Starting phase

A contact from the marketing department or from the customer starts the operations of the R&D department. The product planning is based on information given during this first contact. Normally the customer (or marketing department) proposes a sketch of the required product, defines the price, material, and scale, and describes the requested surface of the product. By this information R&D calculates the costs of raw material, mountings, and packing material, and suggests the best production methods for the product. A product demand estimate is needed for internal cost calculations. After these calculations the R&D department will make the drawings, and the marketing department will prepare the offer to the customer. The customer will respond to the offer and the general manager will finally make the decision of the product future. The R&D manager will call the kick-off meeting of the product if the general manager approves the product into production.

Kick-off meeting

The marketing, production, purchasing, and R&D departments are called to a kick-off meeting to decide upon preliminary timetable, resource planning, and responsibilities of making the product (product group). The product will have detailed goals for cost levels, resources, production times, product demand volumes, and material use.

Planning

The product group makes the preliminary plan, which includes product calculations, product drawings, make or buy decisions, material cost calculations, work cost calculations, and product manufacturing time estimates. Results of the preliminary plan are compared to detailed goals from the kick-off meeting, and the planning is going on in iterations until the criteria from the kick-off meeting are met.

The make or buy decisions are made on the basis of four considerations: product volume, the machinery/knowledge required, materials required, and the current workload of Firm's own factories. Make or buy decision of ready-made products is made by general manager, production leader, and R&D manager. Make or buy decision of components is made by the production managers and the buyer of Firm.

Zero series

Critical materials and equipments, as well as supplies needed, are bought after the customer's approval. A pre-production zero series is ready for production after the critical material and equipment is bought in.

Final planning

Experiences from the zero series are needed for final planning. Experiences and data from producing the zero series are compared to the goals from the kick-off meeting and the required changes are made to the product and production process. Production planning includes also signing the contracts with supplier network.

The production department's view of operation of the supplier network

The production department of Firm's main factory has three subdepartments: production line 1, production line 2, and packing (see Figure 36). Production line managers and packing foreman are managing their own organizations and the production leader is their upper-level superior.

Production line 1.

This chapter is based on production line 1 manager's interview and he again has read the chapter and approved it. Customer A is the main customer of this production line. Long-term production planning is based on an Euro-sum deal with customer A. The marketing department makes the long-term deals with customer A. The medium period planning is based on four-week orders from customer A. The line manager plans the production, and the production leader and customer A will approve of it. After that the buyers and furniture makers are ready to work within their weekly routine.

The reclamation/complaint level of the production line has been very low. Customer A's quality requirements fit well with production line 1, and the line has been successful with its quality development.

Production line 2

This chapter is based to production line two's manager's interview and he also has read the chapter and approved of it. The line manager's work is mainly about planning the production of the line and managing the implementation of that plan.

The background to the production planning is the cooperation with marketing department, R&D department, and the customers. Purchasing does not belong to this line manager's obligations, but sometimes he needs to get involved with the supplier network operations. Production line 2 is very sensitive to interruptions, and quality of the whole supplier network is dependent on its weakest link. The line is working in three shifts, and therefore it is difficult to find time to correct interruptions. Surfacing is the bottleneck of the production line two. Firm has a plan to correct the challenges in the surface treatment part of the production, but implementing it has not been going on as it should. The quality of surface is very much dependent on the earlier operations of the production (for example, sanding), and therefore there is lot of challenges for being able to produce a good quality of the final surface. The stock areas of the main factory are limited, and they have also not grown as fast as the production of the factory. The factory is running out of stockholding area, and therefore the home calls of the components have to be made in tighter time periods in the future, maybe even on a hourly level.

The production of the main factory has been changed excessively during the last decade. The last huge changes have taken place in the product scope. The product scope of the main factory has decreased; for example, production line 2 nowadays produces furniture only to customers A and B. The volumes of the products are,

on the contrary, much bigger than previously, and therefore the production assembly times are shorter. Also the quality of the products has increased.

Packing

This chapter is based on the interview of the packing foreman, and he has again read the chapter and approved of the correctness of it. The daily routines of packing, the timetables, work instructions, and motivation and monitoring of the employees of the packing, are the main task of the foreman. One important part of the job is to make home calls to suppliers, telling the supplier when components can and have to be available in the main factory. The packing foreman also monitors the reclaims from customers A and B.

The quality of the product has three dimensions: the surface, the packing, and the assembly. When furniture cannot be assembled there is an assembly quality problem; these problems can be caused by both design and/or production. The end product may have components manufactured and surfaced in different factories. The quality risk is extremely high when the surface treatment is done in several different locations.

Quality problems of color may not affect the end-use, but color problems cause a lot of dissatisfaction to the end users, and are a quite typical cause of reclaim. Packing problems have two dimensions: problems in quantity and problems of quality of packing. The problem of quantity occurs, when some part of the end product is missing. The transport route from the main factory to the end-user may be physically very long. One aim of the packing is to protect the product during that journey. A quality problem of packing occurs, when the packing has not succeeded to correctly protect the product, and the customer or end-user is complaining about it.

Figure 36 demonstrates the production within the main factory. Packing has four inputs: production line 1 and 2, Firm's second factory, and the supplier network. Unsurfaced components are coming in to Firm's surface line, and surfaced components proceed to packing. Most of the components are surfaced. Quality control of end products is one of main tasks of packing. Quality and quantity of components are checked before the end product is sent to customer. Some of the end products are also test assembled.

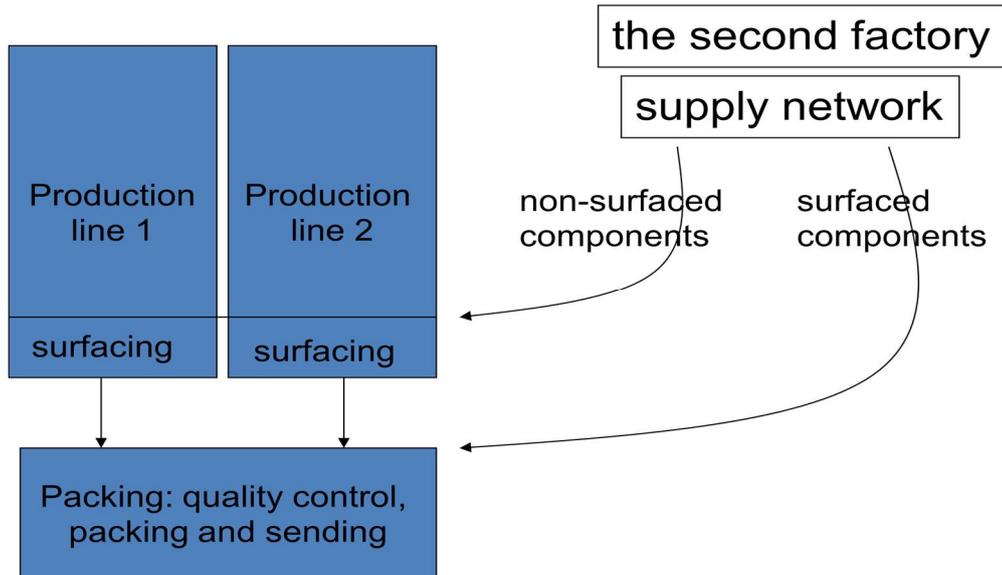


Figure 36. Production of the main factory

There are several possible shortcomings in the quality control of Firm and its supplier network. The need of a test assembly illustrates those risks, even if the situation is currently better than earlier. There are clear introductions on how to control the quality in the supplier network, but the packing foreman does not believe that the instructions are being followed as they should. There are a lot of color problems in the components, even if the supplier network has color samples in their factories. The end user packing instruction quality also has not been in the level required. Quality problems are not always caused by the R&D, Firm's production lines, or the supplier network. The customers themselves also may cause reclaims and they also have different processes to operate with reclaims.

There are certain products that are causing a lot of customer complaints and reclaims. The quantity of the reclaims of those products is decreasing even if the products have been manufactured in three different factories. The quality requirements of the customers are not the same, and that might be one explanation when there are a lot of reclaims.

Self-assembly furniture manufacturing is a low profit business and it is very difficult to do profitable business if there are a lot of reclaims, returns and repairs. We have used the next formula to calculate the cost of one reclaim.

Cost of reclaim [in euros] = 25 euro/sending + price of product to Firm (3,5–5 euro)

The calculation does not cover all costs. The direct costs from reclaims are sometimes much higher and even they are very difficult to analyze. The real costs of the reclaims are even harder to calculate, because a reclaim has many almost uncalculable effects, for example the cost of lost reputation (“cost of lost opportunity”).

Buyer of the components

The buyer of the components is working at the main factory. His main task is to buy in the wooden components and packing materials for products, which are made in the main factory. Buying includes negotiations with suppliers, as well as finding out the basic information from the suppliers and forwarding it to the marketing department, R&D department, customers, and production. One part of the basic information is reclamations, and another part is the quality of the deliveries. The quality of delivery means that the right quantity of the right products is in the right place at the right time. The basic information is analyzed in the management team of the production. An important part of the buyer’s duties are the home calls of components from suppliers. The buyer needs to consider main factory’s and supplier network’s production when he is optimizing these home calls. The buyer is also one member of the team handling the orders from Baltic countries and Russia.

Quality engineer

The main duty of the quality engineer is the building and management of the quality management systems and the environmental management system. Firm’s core competences in the main factories are the manufacturing processes of glued timber slabs and beg legs. The general features of the main factory’s production competence are high cost and high volume investments.

Purchasing department

Buyer of the supplier network

The buyer of the supplier network has read the chapter below and he has approved of its contents. The buyer of the network has to travel a lot around Finland. His main duty is to make contracts with suppliers and help them to develop their operations, mainly production processes. The contracts describe the manufacturing process of the products, the prices, and quantities of the products. Auditing of the suppliers and development of production methods play an important role in the buyer’s job.

Firm has at least four employees who can ask for an offer from the supplier network. Firm has also many different ways to be cooperative with the suppliers, and for those reasons Firm's purchasing process from the supplier network is very confused. Suppliers do not have clear knowledge on whom to contact, when they have something to ask or when they need to send some kind of information to Firm. There is a clear need to develop Firm's purchasing process description – who is doing what. Firm has generally very tight timetables for its production, and therefore the real order-deliver times are very short in the supplier network. The tight timetables are one cause of the quality problems in the supplier network.

The basic information of a supplier that is produced by the buyers of components is misleading. The buyer of components typically does not document all the facts into the basic information package. The suppliers are blamed of the mistakes of Firm's own main factory's production, and that basic information is still used in the evaluations of the suppliers.

The general managers point of view and the future of the development engineer

The chapter is based on an interview of the general manager and he has read the chapter and approved of it. Firm's and its supplier network's way to produce, packing and delivery of the product is shown in the Figure 37. From the quality point of view, the model does not work in the appropriate way.

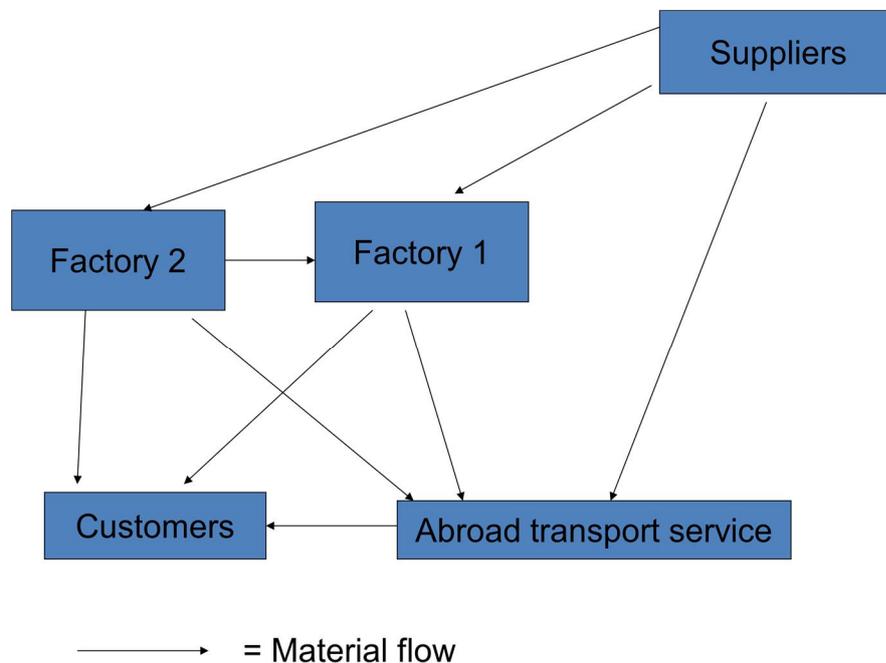


Figure 37. Material flow of the supply network

The products and the components are surfaced in many different places, and there have been difficulties to adjust the colors of different factories to an acceptable level. Therefore the color of the product has been one main source of the reclaims. Product and components are delivered from different places to customers. The complex logistics of the supplier network is one reason why monitoring the quality has been difficult. Firm trusts the quality on its the supplier network, even if there has been a lot of reclaims. The complex logistics is also the reason why Firm and its supplier network have been able to optimize the deliveries to customers. Product deliveries to customers are based on needs of a single customer, not the needs of the whole supplier network. Customers A and B are the only customers, with whom it is possible to make profit by using the current logistics chain. The manufacturing processes of Firm and its supplier network were at the time of this study designed to produce low-scale products. The reclaim quantities from the low-scale products were multiple times higher, compared to high-scale products. Thus Firm changed its logistics system in the near future. Figure 38 demonstrates the plan for the logistics systems change.

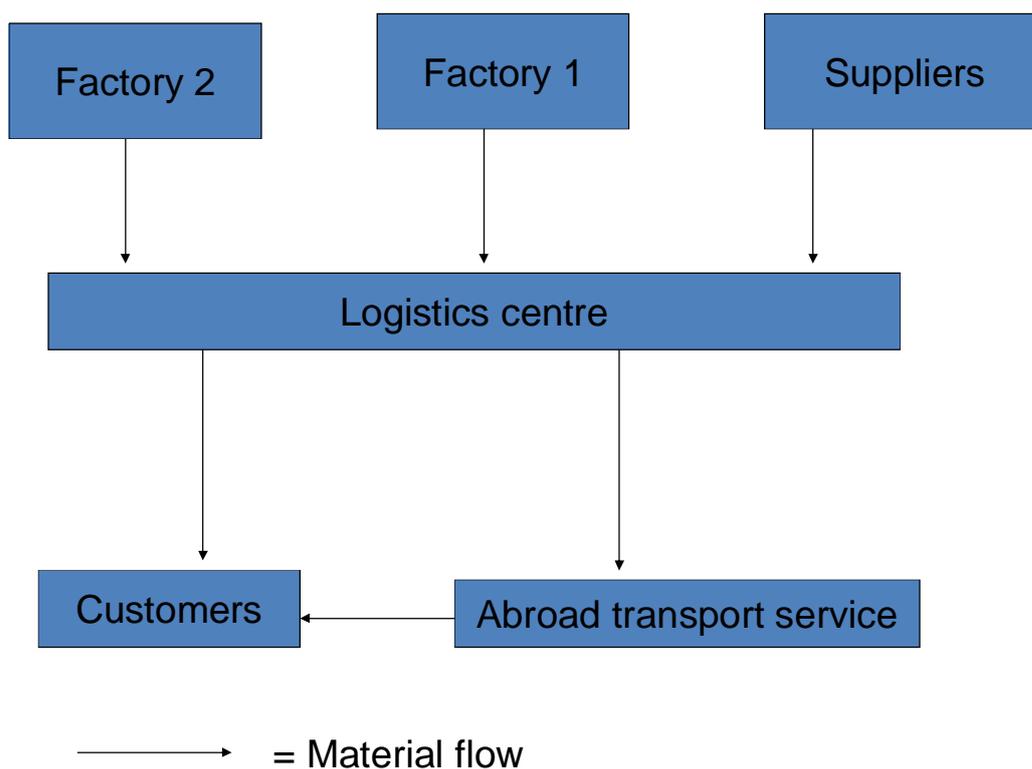


Figure 38. The plan for a new logistics system

The better quality control is one the main aims of the new logistics system. New logistics and surfacing center were ready in the end of year 2001. Firm then con-

centrated all the supplier network's surface processes, quality assurance, packing and the delivery planning to the new logistics center.

The new strategy for the supplier network, including the new logistics center, requires a new attitude. The short-period thinking will not work with the new strategy, and the whole supplier network has to move towards a closer cooperation and long-period supplier network operations planning. The supplier network's manufacturing processes have to be coherent with Firm's product's processes. This change process, from old attitude to new strategy, determined three development projects for the development engineer.

1. Quality of the production of the supplier network

The ability to produce high quality products has to be coherent within Firm. The base for the ability to produce quality products comes from the ISO standard-derived quality and environmental management systems. The systems were to be built until the end of year 2003. The ability to produce quality product was the requirement for marketing the supplier network's products.

The first development action was to analyze why there were so many reclaims. The current level of reclaims was a serious threat to cooperation with the supplier network. There was so many reclaims that the profitability of Firm's supplier network operation was not ensured. The structure of the supplier network had to change and the members of the supplier network had to find their own core competences. It was felt that clear and well-known core competencies and specialization were the only ways to be able to increase the scale of the products in the supplier network, and therefore to be more efficient.

2. The information flow in the supplier network

Problems in the information flow also were a serious quality risk, which affected the supplier network operation in many different ways. The supplier network had to achieve the equipment and knowledge levels where the information flow would be simple but reliable. The hardware does not alone ensure the information flow. The common and well-known patterns to communicate are also needed.

3. The members of supplier network are not alone in the Firm supplier network

The requirement for growth of the supplier network was seen to be stronger network members. The members of the supplier network had to have rich cooperation with other members of the supplier network. Investments are a good example of areas where the cooperation with other member of the Firm's supplier network

was required. Coherent capacity development of the supplier network can be achieved only by the co-designed investments. Wide customer base is also an important issue to reduce the risk of demand changes. It is also easier to have new customers and a wider customer base when the members of supplier network have clear and well-known core competences. The members of the network are partners, not competitors, and they have the same aim in the supplier network.

The success of the development actions was to be evaluated by three measures.

1. *The development of the supplier network's delivery quality*
2. *The development of the reclaim quantity*
3. *The development of the supplier network's sales*

Development issues in the supplier network operations

At the end of every interview of Firm employee, the researcher asked the same question "what are the most important development issues in the supplier network operations?" Employees of Firm gave over 50 different ideas of areas that required development actions. The researcher wrote a list of those ideas and they were put on the agenda for the second supplier network meeting.

3.2.2 The second network meeting and supplier tour

The second network meeting was arranged after the interviews within Firm. The aim of the second supplier network meeting was to forward information to the supplier network and to have an open discussion about the future of the supplier network. There were 28 participants in the second supplier network meeting. The next chapters are based on the researcher's promemoria. The memo was sent to all participants of the meeting, and they were able to comment and correct the memo.

1. The current situation and the future of Firm/ General manager of Firm

The quality of the product was seen to be the key feature. That was anyway the reason why customers chose Firm's products. The aim of Firm was to gain equal quality of the product, no matter whether it was produced in Firm's own factories or in the supplier network. The weakest link of the supplier network determinates the quality of whole supplier network; Firm needs its supplier network and supplier network needs Firm.

Generally, Firm's customers also have their own furniture production capacity. Therefore, Firm also were their competitors in the furniture manufacturing business. Competition in the furniture manufacturing business is challenging, and any company must be very efficient to survive. Raw material plays an important role in the business, and the prices have been cheaper in Russia and in Baltic countries. Firm had hired four employees to its purchasing and supplier network development.

The customers of Firm are also among the most powerful actors in the furniture business. Firm's key idea at the time of the study was close cooperation with customers, and that required over 1,8 million euros sales per customer. Firm's investments were also growing. During the year 2003 Firm invested 1,3 million euros and in 2004 Firm investments were prognosed to be 3,0 million euros. One of the main investments was the mentioned new logistics center, and its prime target for this investment was to ensure quality improvements.

2. *Development project of Firm's supplier network/ Development engineer Vesa Moilanen*

The development engineer demonstrated the results of Firm's interviews. All of the more than 50 development issues were taken under discussion.

3. *The environmental management system of Firm main factory/Environment systems engineer*

The environmental systems engineer introduced the environmental system of the main factory. It was felt that the environmental issues might become one the growing areas in the supplier network, while pressures to develop a system also may come from the customers.

4. *Firm's supplier network/ production leader of Firm*

Firm's main factory worked at the time of the study in three shifts and sales were about 500 000 euros a week. The production interruptions were causing Firm serious problems. Firm's main factory was not able to reach its sales targets. The interruptions analysis was stratified by the place where they were stemming from: the beginning of the production, surfacing, and the packing. Fifteen per cent of the interruptions were found to stem from the beginning of the production, and these were caused exclusively by the supplier network. The deliveries had typically been late and thus the amount of the products delivered was short of complete. However, a full eighty per cent of Firm's interruptions were due to the packaging activity. The supplier network also caused some of the problems in the packaging;

component deliveries to the packaging were also often being late. It was difficult to recover the losses of these interruptions because Firm's main factory was already working in three shifts, 24 hour per day. The information flow of the problems from the supplier network thus was deemed very important. Firm needed to find a way to minimize the losses due to the quality problem. The supplier network's reclaim quantities were too high, and the delivery times of the rest deliveries were too long; something had to be done. The target time to correct a reclaim situation was at the beginning of this study three days. In May 2000, Firm developed a new reclaim delivery time monitoring system. In this scheme, the supplier had to pay a penalty of late reclaim delivery, if the reclaim did not leave the factory of the supplier within three days.

5. *Near future of the markets/ general manager of firm*

USA: The first sales to USA were made at the time of the second network days. The next sales and also some bigger orders were expected to come true in the following summer. These first sales were so called "testing sales", where the customer was analyzing Firm's ability to produce required qualities and quantities. It was clear that there would be no second change, if Firm couldn't satisfy their criteria.

Customer A: The management of customer A had been very worried about the situation of the self-assembly pine furniture business. The demand had been decreasing and the customer was searching for ways to change that. Firm was one of the eight key suppliers of the customer A and had a contract with them that included penalties for ending the relationship with Firm.

Customer B: Customer B was decided to withdraw 30 % of its business during this year.

Customer D: The business of Customer D was also going down. The Reclaim quantities were very high and a Danish competitor was trying to get those customers that were dissatisfied. Sales with customer D was expected to even double, if Firm could get the reclaims down close to zero.

The second days were ended with the conclusion " money is the key issue, and we have to listen the one who is paying – Firm has to listen customers, and the supplier network has to listen what Firm has to say."

Observation during the second supplier network meeting

The members of supplier network were very active during the second network meeting. They didn't hesitate to provide their opinions and comments. The gen-

eral feeling was positive, even if the issues were difficult to the supplier network. At the end of the supplier network meeting, the direction of the future development action was taken under discussion. The discussion was based on the general manager's points. It was decided that the next development action would be a second supplier tour. During the tour the development engineer was to visit the supplier network, and demonstrate the ideas of Firm: how it saw the future of Firm and its supplier network, and what were to be the future development actions in the supplier network. Suppliers were to have an opportunity to say how they saw the situation and the future, and express their views on what would be their role in Firm's supplier network.

The second supplier tour

The second supplier network tour started in 12.5. 2000 and ended in 24.8. 2000. The tour included sixteen site visits with members of the supplier network, and the agenda was the same every time. The discussion of the memo of the second supplier network day started the visits, after that the supplier had the opportunity to comment the presentations of the meeting. During the visits the researcher asked the basic information about the supplier: sales, amount of the employees, products, customers, bottlenecks of the production, competitions, history of the supplier, and so on. After that the engineer visited the production facilities of the supplier, drew the layout of the factory, and took photos. The aim of this was to develop the engineer's understanding of the supplier's production process. At the end of the visits the supplier was asked to fill in the questionnaire form.

The second supplier tour gave a good background for planning of the third supplier network meeting.

3.2.3 The third supplier network meeting

The third supplier network meeting took place 30.8. 2000. The members of the supplier network had had time to think about Firm's ideas on how the supplier network would operate in the future. The meeting was a great success from a participation point of view. There were 18 members of Firm's supplier network and 19 employees of Firm present, along with three consultants, and the researcher. The supplier network participants were mainly general or vice general managers of the suppliers. Almost every manager of Firm participated to the meeting. The meeting consisted of two stages. In the morning, there were six presentations, and in the afternoon, the participants conducted some teamwork sessions. Participants of the meeting were very active to comment the presentations. In the next chapters three of the presentations are documented in more detail. The chapters are

based on memos that the researcher wrote and that were sent to all participants. This increases the reliability of the documentation because they all had a chance to comment and correct the memo.

The first phase: Presentations of the meeting

Firm and the current marketing situation /general manager of Firm

At that moment Firm was having a temporary low demand, and it was based on two facts. The first was that most of the products were in the end stages of their respective life cycles, and the second was that customer B had had a bad summer season. The demand had been so low that Firm had to lay off its main factory's employees. More layoffs were being planned in the second factory. The Finnish labor laws did not allow for much agility to rearrange the systems, and that was one reason why layoffs were seen the easiest way out of the problems; the near future was anyway seen to be better.

There were three general trends in the markets at that time: prices were going down, volumes were growing and customers were cutting the amount of their suppliers. These trends naturally also affected Firm's actions. During the previous year, Firm had cut the amount of its customers from 32 to 11, and a large part of their products had been discontinued, because there were unprofitable.

There were three main reasons, why the suppliers were not able do business straight with customers.

1. *The members of Firm's supplier network did not have the volume that was required to do business with customers.*
2. *The members of Firm's supplier network did not have the required marketing resources or knowledge*
3. *The members of the supplier network did not have the required R&D resources or knowledge.*

Firm had instead invested heavily in its R&D, marketing, and order delivery resources. These resources are expensive, and the main part of these investments served the smaller customers, which were mainly customers of the supplier network. These small customers were not profitable to Firm, and their future growth expectation was the only reason to keep these customers. The current situation was not supporting to retain these small customers. The quantities of the reclaims had been so huge that it was clear that the small customers would not be large in the future.

The reclaim target of the main factory was 0,5 % and the actual level was indeed under 1 %, but for small customers the reclaim quantities were much higher. The operation of supplier network had to change, because as noted earlier the small customers were not profitable. Firm was willing to give these small customers completely to the supplier network, if someone would have been willing to take over the whole responsibility for them.

The main customers were growing over 20 % per year at that time; this was the main source of market pressure for Firm. Firm had invested millions of euros and lot of hard work to the production process of its main factory. The main factory was one of the most efficient furniture factories in Europe at the moment. Firm had also made big investments into purchasing, for example hired a new material manager and started a new unit in Latvia to manage the purchasing in the Baltic countries. Purchasing had grown to a very global action, for example the Danish competitors were buying from China and Vietnam.

Even if the current demand situation was quite poor, the future could quickly develop to be very different. The challenges would also differ, if the customers approved all the sales offers. The success was seen to depend on very small details. The customers of Firm were so huge that only one high-demand product could cause difficulties to production and supplier network. Pine is not a well-known raw material in US furniture markets, and that had been a challenge in the US. The customer from US also ran its own production, and it was on the same quality level as Firm. There were also some differences in the US markets, for example the end-customer service level was much higher in the US than it was in European markets. US customer had typically access to 24-hour service each day, to help their end-customers. Firm were able to produce a good first impression, but the relationship was still young and the future unclear.

Firm and its supplier network/ New material leader

The buyer, who was managing the recently-opened purchasing unit in Latvia, had a major role in the purchasing organization. Customer A was investing in Eastern markets, and Firm needed to have same kind of cost structure than they had, thus also had to go East. Firm had moved a lot of products to Baltic countries, for example all the chair models were made in Baltic countries. Firm also needed to think the production out very carefully, because the costs were smaller in Baltic countries; for example to an Estonian worker 350 euros/ month was a good salary (about one quarter of a Finnish average salary at that time).

The new material leader and buyer engineer visited Siberia. Russian soldiers had at that time moved from East Germany back to Russia and therefore Germans had

made a lot of investments in Siberia. In the near future, there was expected to be a lot of capacity of wooden production there. The place where the products are made does not typically give any extra value to furniture customers. The costs are the main criteria for purchasing, and Firm would also buy its products were they are cheapest.

During that autumn, there was planned to be a new system to monitoring the purchasing at Firm. Numerical measures would give a background to develop the other systems. The starting point was quite good in Finland, even if there was lot of challenges. Firm also was decided to continue its supplier auditing. The quality of the suppliers' products had not been at a required level, and therefore there had been a lot reclaims. Customer D(1)'s quantity of reclaims had been 6–10 %, and every problem was caused by the systems of the network of Firm even if there were claims that they were mostly caused by the customer. Actually the quantities of reclaims were so huge that there was a need to think, if there was any kind of sense to continue business with these customers. The reaction times of the reclaims had also been too long. Average delivery time of the reclaim had been 17 days, and it should have been under five days in every case. Customer C (3) has listed their unwanted suppliers, with Firm on that list, because of the poor quality and the long delivery times of reclaims. Reclaims were clearly eating the profits so much that it was important to rethink the supplier network operations. Firm had basically three choices:

1. *Keep these customers and the supplier network as it was, but require clear quality improvements.*
2. *To produce the product to these customers by itself in a new own factory in Baltic countries.*
3. *To give up, and to release these customers to someone else.*

Comments from the audience:

Vice general manager of the supplier E: We have produced small-scale products. Our aim is to produce a bigger scale product, and about in a 100-fold scale we have a same amount of problems that Firm has even if its scale is much smaller.

General manager, supplier F: What is the reality of reclaims, the current situation does not satisfy anyone?

General manager of Firm: We could move these “problem customers” away from our normal business process, and start a new trading firm, where we could move these customers. Anyway, we have to decide this before end of this year.

Vice general manager of supplier E: Today the market situation is weak, and we are living day by day, so does Firm have anything to share?

General manager of Firm: The profitability of Firm's supplier network operations has to be ensured. We can't give subsidies to our supplier network. Firm is concentrating its resources to its A-level customers. We are making all the investments required to serve their needs. The size of the customer is a criterion that also shows how we are operating with it. With small customers it is more likely that we operate by the stock than with A-level customers. Small customers have a lot of fixed costs and they don't have 50 million euros' volumes. They are using our R&D and marketing resources but we do not have profits from it.

The new material manager continues: Supplier network operations are based on partnership. But what is this partnership? The question was, is there something to share? There have to be a balance between our own production and the suppliers' network operations. Firm won't invest in the beginning of its production – we will in the future buy all planned components and glued timber slabs. We will instead invest in the end part of our production. The timetable of the logistics center has changed; there will be a one-year delay to the plan.

The layoffs in our own factory are an example on how we will operate also with the supplier network now and in the future. Those products that are decided to be manufactured in the supplier network will stay in there. We won't take those products back into our own factories, even when we have demand difficulties. Firm's factories and the supplier network have different products; Firm's factories are concentrating only on big-scale production. We have over 30 suppliers, and eleven of those are from abroad. Three are from Russia and six from Baltic countries. Firm and its supplier network are buying about 80 000 m³ of wooden products from sawmills and we are the biggest Finnish customer for them. We should be an interesting customer for them.

The situation with Finnish glued timber slabs is the most difficult at the moment. Russian glued timber slabs have an excellent competitive strength. Earlier, the logistics from Russia was lacking, but now all parts are in order: the quality and the price, and the logistics. The supplier network manufactures many critical components to the main factory's production. This is a huge risk. The interruption caused by a missing component may cost Firm a loss of 18000 euros turnover per hour.

General manager of Firm: Finland is not a very well-known producer of furniture in the US. For example, we have a penalty payment of 10 M\$, if we are found to

use child workforce. Therefore, we are using customer A's contracts to buy ferules.

As said earlier, we are cutting our customer base, and we require 50 million euros sales per customer to go on. These customers are what we call A-level customers. We won't have customers with turnover under 10 M euros.

For Finnish furniture producer, the best way to lose a product and therefore market shares, is to produce unsurfaced products. Surface and R&D process gives the competitive strength against cheaper producers.

To end of the October, the material manager and general manager will make a statement to Firm's Board of Directors. These statements will include proposals on how to choose suppliers to Firm's components. There is a clear need to cut the supplier base. At the moment the future seems to be positive, and there might be a lack of production capacity. We need to see how the sales to our A-level customers are developing. We will lose all our customers under 10 million euros' volume, if the quality of our products won't be at the required level. The information flow in the supplier network is critical; our production management requires direct information about problems in the component deliveries.

Supplier network research / development engineer (Vesa Moilanen): (The researcher presented the results of the Firm's interviews and the second supplier network tour.)

Based on these interviews, the supplier base was divided into three groups: 1. Suppliers of ready-made products, 2. Suppliers of planed components, and 3. Component suppliers. Each group had a different view of supply network, for example its challenges, weaknesses and strengths. The members of each group had same kind of key features, for example turnover, product mix and the quantity of employees.

Production leader of Firm's main factory (on cost efficiency of supplier network):

Firm's main factory had to layoff over 50 employees. The layoffs were caused by the demand changes. Our second production line has only one work shift at the moment; normally we are working in three shifts. There will be more layoffs in our second factory. We have made big investments in our main factory's efficiency. The better efficiency can be achieved by reducing the interruptions and by the shorter production times. There won't be any major machinery investments, and

the aim is to achieve total efficient growth of 20–25 %. We won't hire any new employees and this has been very heavy development process to all of us.

The prices of our products are going down. For example, we have to decrease product X price by 40 % if we want to keep it. This is customer A's proposal, and if we want to keep our turnover level, we need to increase our production volume by 25 %. How can we operate, when the prices are going down again? The costs of employees and raw material have to decrease also. The costs of the raw material are 75-80 % in components, and a supplier of the components can't be as efficient buyer as Firm is. Big players, competitors, are competing in the same raw material sources than we are, and they have the advance in purchasing the raw material. Russia and China are coming more and more strongly to our business, and their ability to produce quality is at western level. You can't know anymore, what furniture is produced in the west and what is produced in the east. Customers don't want to discuss about the quality of the product, a good quality must be an automatic feature. The quality of the raw material is the only quality feature under negotiation. We all will be out of work if we don't have the ability to produce the required quality. The price of the product is an issue in the negotiation, and that is always going down, even when the costs of material and components are going up.

How we can be profitable, and decrease our prices 20 % at the same time? The only hope is to concentrate on our core competence and act fast, and the logistics of the raw materials have to very efficient.

Material manager, IT manager of Firm, and IT-consultant (on Information flow in the supplier network)

The supplier network has already the tools to efficient information flow. The question is: do we have the knowledge to use them and how do we want to use them? The information delivery time and the quality of the information are the main issues to develop. There is some mistrust in the production of Firm; they don't trust in the supplier network's ability to deliver the product in the right time. Storages could be temporary answers to that, but it does not solve the real problem, of mistrust.

Quality system consultant:

Consult describes how to build the quality system in a small and medium size production company.

The second stage: teamwork sessions

In the second phase of the meeting, the participants were divided into three different groups: 1. Suppliers of ready-made products, 2. Suppliers of planed components, and 3. Component suppliers. Each group had a different view on the supply network, for example on its challenges, weaknesses, and strengths. Working in small groups helped to create a special network meeting agenda to each “network meeting” participant.

The aim of these groups was to promote an active and open discussion, and therefore find the best solutions to the challenges that were discussed and discovered. Each group had a chairperson/secretary who lead the discussion and wrote a memo on the work done in the group. The next chapters are based on those memos. Firm’s general manager and some other Firm employees acted as so-called traveling participants, moving between the groups checking how different groups were working, and providing valuable comments.

“Suppliers of the ready-made products” team (Secretary: Vesa Moilanen)

Participants: 6 employees of Firm and 5 employees of ready-made products suppliers; 5 “traveling participants”.

From suppliers’ point of view, the main development issues were:

1. Short-period thinking, and therefore small scale products and big scope
2. Reclaims, specially why there are some many reclaims

Firm’s point of view: the main development issues were:

1. The quality of the deliveries, in right place, time, and quantity
2. The quality of the products, reclaims and the delivery time of the reclaims

Development actions that were decided upon:

1. Development engineer will analyse the reclaims and after that will give instructions how the quantity of reclaims can be decreased.
2. Development engineer, R&D department, and employees of packaging will arrange a training meeting for suppliers. Packaging will be the main issue of that meeting, for example what kind of requirements the customers do have and how Firm is considering those needs.

“Suppliers of planed components” team (Secretary: Firm’s buyer engineer)

Participants: 2 employees of Firm, and 8 employees of planed component suppliers.

Firm and its suppliers had only one-year experience to buy and to produce the planed components, and therefore there had been a lot of challenges. Planed components are high value added products to the producers, typically sawmills, and Firm did not know very well the production processes of the sawmills.

From suppliers’ point of view, the main development issues were:

1. The product scopes. Firm had not been able to estimate the product measures in time, and therefore there had been a lot of losses in the production.
2. The order-delivery time was too short. It was very difficult to handle the production from forest to customer delivery, based on two weeks orders or three months’ raw estimations.
3. Firms employees had changed, and it had been difficult to contact the right persons.
4. Firm had done some mistakes with reclaims. Firm had sent reclaims to wrong addresses, to wrong suppliers. Suppliers had had some difficulty to trust Firm’s ability to monitor the quality of products, when the reclaims had been sent to wrong suppliers.

From Firm’s point of view the main development issues were:

1. Quality of the delivery. Deliveries had not been on time in the Firm’s factory, and the quantities had been short. It was not enough to deliver 400 planed components out of 500 ordered. It would cause an interruption to the production every time.
2. The quality of the products had not been at the required level. The loss of planed components had been 5–20 %.

Development actions decided upon:

- Firm needs to redesign its production planning, and send the product measures at least mount before the delivery.

- Firm and supplier will visit each other's factories three times per year. Supplier employees will see how their components become a part of the end products, and why there are quality requirements of planned components. Firm's employees will see how the planned components are made in the sawmills. During the visits, the reclaims will be analysed. Development engineer and Firm's buyer engineer will arrange these visits.

Component suppliers (Secretary: project manager)

Participants: 4 employees of Firm, 5 employees of component suppliers, and 2 consultants.

The material flow through Firm's packing line is quite huge, Packing is operating with one million components per week. One single product may have 680 parts. The packing is quite sensitive; even one missing component can cause an interruption to the packing process. The delivery quality of the supplier network is very important issue to the packing process; right place, right time and right quantity.

From suppliers' point of view, the main development issues were:

1. Information flow: the use of intranet/extranet, forecasts; there was not enough time to plan the manufacturing. Firm's employees had changed, and there were difficulties to contact to right persons.
2. The quantity of raw material stock: raw material producers plan their production on the weekly base, and therefore there was a need to stock large quantities of raw material.
3. Short order-delivery times were also a problem.

From Firm's point of view, the main development issues were:

1. A need to cut the components' supplier base. The problems were concentrating to the same suppliers nearly every time.
2. Suppliers have development problems in information systems, production planning, and managerial accounting. These development issues were causing many kinds of problems. The quality of delivery and information flow from supplier to Firm had not worked as they should.

Development actions decided upon in the team:

- Firm will develop its information flow to suppliers.

- Development engineer will analyze the reclaims and he will present the results in near future.
- The instructions to the supplier will be documented in intranet, and the paper versions will be destroyed.
- Firm will analyse the supplier's performance, and after that, Firm will decide the future of the supplier base.

3.2.4 *Development actions after third supplier meeting*

Firm's main factory burned down in May 2001. After that accident, Firm had to arrange its production into its second factory and into the supplier network. The material manager of Firm banned the development engineer's further visits to the supplier network after that crisis. According to the material manager, there was a clear lack of resources in the supplier network, so they would not have time to develop their operations during the crisis. After the fire accident, Firm also needed to rethink its customer base. It had no more the capacity to serve every customer, and thus Firm decided to concentrate to serve only the big A-level customers. The capacity of the supplier network was under serious pressure during the time after fire accident. Firm and its supplier network succeeded to satisfy the A-level customers' needs, even if the circumstances were very challenging. The most important customer relationships were saved by close co-operation between Firm and its supplier network; for example, Firm's main factory's employees were moved to work in supplier network production. The way Firm and its supplier network handled the situation was proof of the real level of the network cooperation.

Firm and its supplier network all gave very positive feedback about the third supplier network meeting. Based on this feedback, the development engineer and the buyer engineer arranged two other supplier network meetings with the same agenda: presentations and team workshops.

After the third supplier network meeting, suppliers of the planned components visited in Firm's main factory, and Firm's employees visited the factories of the suppliers of the planned components. During and after these visits, the co-operation was developed into a much better direction, and the quality of the deliveries and products was improving. In spite of the positive developments, the suppliers of planned components were not able to achieve Firm delivery and product quality requirements. Firm was continuously searching for new planned components suppliers, and Firm coincidentally also changed the suppliers many times during the

time the field research was ongoing. For this, Firm made a detailed component supplier analysis. Some component suppliers went out of the business, because they realised the challenges of the market situation being too big for them, and some of them went into bankruptcy. The development engineer, the R&D department, and employees from packaging arranged a training meeting for ready-made product suppliers. Packaging was the main issue in the agenda of the training meeting.

All supplier network development actions (the preliminary research, Firm's interviews, the second supplier network tour and the third network meeting) emphasized the importance of diminishing and handling the reclaims from customers. After the third supplier network meeting, the development engineer concentrated most of his effort to the reclaims. Next chapter describes the reclaim development actions.

3.2.5 *Reclaim analysis and development actions*

There was no common view on why the quantity of reclaims is so high. Even the employees of Firm provided many opinions, guesses, and explanations on the quantity of reclaims. There was an open discussion about reclaims in the ready-made product group session of the third supplier network meeting. The following quotations are from that group work.

Buyer of Firm (supplier network): I believe that some of our customers are making money by reclaims. For example, I have been wondering about customer C(1)'s reclaims. Firm and its supplier network have to pay customer's employees mishandlings, because it is the most easiest way to customer C(1) to cover the losses of these mishandlings. Firm doesn't have tools to check the reasons for reclaims."

Firm's marketing manager, area C: Order clerks are making their best to check the real reasons for reclaims, and they are documenting reclaims in the detail manner. We can call the reclaimed products back to Firm, if there is some reason to believe that Firm or its supplier network has not been the cause of the reclaims. There are some cases, where the product has been called back, but the basic presumption is that reclaims are real.

Firm's marketing manager, customer area D: White products have been more sensitive to reclaims than other color products. White color is difficult, because in the white color the mistakes of surfacing and all other mistakes can be seen more

easily. But the reclaims are not concerning only the surface. The quantities of other kind of reclaims are also high.

Buyer of Firm (supplier network): The white color has a terrible history. We made all possible mistakes with that, no marketing research, wrong white colors; ... we should not produce white color products.

General manager supplier R: We tried to produce white color products, but it was a mistake.

General manager supplier W: It is difficult to me to understand the quantities of customer D (3)'s reclaims. We have produced the same kind of product to customer A and B, and in multiples of customer D(3)'s volumes, and the reclaim quantities were very small. I don't believe that our ability to produce quality is decreasing when we are manufacturing products to customer D(3).

During the Firm's interviews and the second supplier network tour, the development engineer found two commonly agreed issues behind reclaims: 1. The quantity of the reclaims differs between customers, and 2. The complexity (high quantity of the parts) of the end product drives up the reclaims.

Reclaim handling process, Firm's point of view

Firm's complaints are all handled in a similar manner from Firm's point of view. The customer makes a complaint to the order clerk, pointing out the cause for complaint and explaining the required address of delivery for the replacement product or part. The order clerk informs the manufacturer of the product (who manufactured the product itself; main factory, factory 2 or an actor in the supply network) about the complaint and the manufacturer then delivers the replacing product or part either straight to the customer or to the store where the product was sold.

The order clerk of Firm is responsible for the follow-up of the delivery of replacement products and for keeping statistics on them. The statistics on complaints provide the following information: the number of the complaint, the date when the complaint was registered at Firm, the date of delivery of the replacement product or part, the cause for complaint, the product that the complaint is about, the amount of the parts that the complaint was about (e.g., two screws were missing) and the supplier of the product.

Statistical analysis of the reclaims

After the third supplier network meeting, the development engineer asked for an Excel file from Firm’s information technology department. The file included all the documented information of reclaims. The next Figure is based to reclaims made during the period 1.1.1999–31.12.2000. The Figure shows how the quantity of reclaims has developed during the years 1999 and 2000.

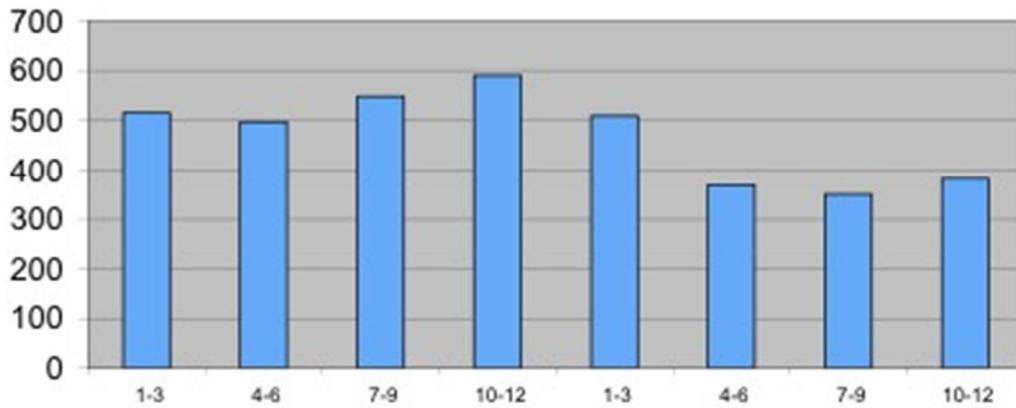


Figure 39. Reclaims of Firm between 1.1.1999–31.12.2000

The total quantity of reclaims was 3769 during 1999–2000. When the quantities of the quarters of year 1999 are compared to the next years quarters, the development is obvious – the quantity of reclaims has been decreasing. Figure 40 shows Firm’s main factory’s, Firm’s second factory’s, and the supplier network’s reclaim development during years 1999 and 2000.

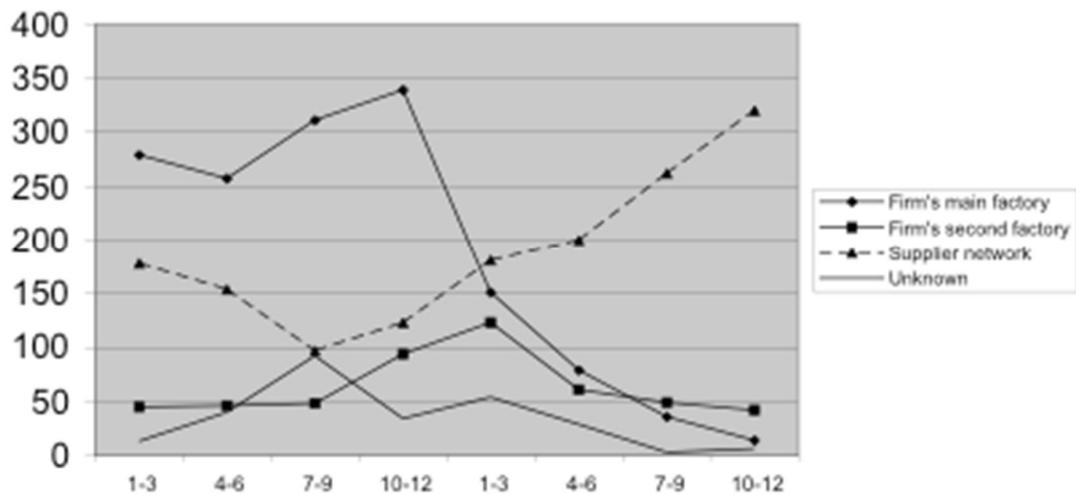


Figure 40. Reclaim analysis: Firm's main factory, Firm's second factory, supply network, and unknown origin

Figure 40 shows clearly that Firm's main factory's reclaims have decreased over 90 % during the time period, and supplier network's reclaim numbers have been increasing very rapidly. Firm's second factory has a little peak in first quarter of year 2000, but otherwise the reclaim quantities are quite stable there. Figure 41 shows the number of the reclaims divided by customer.

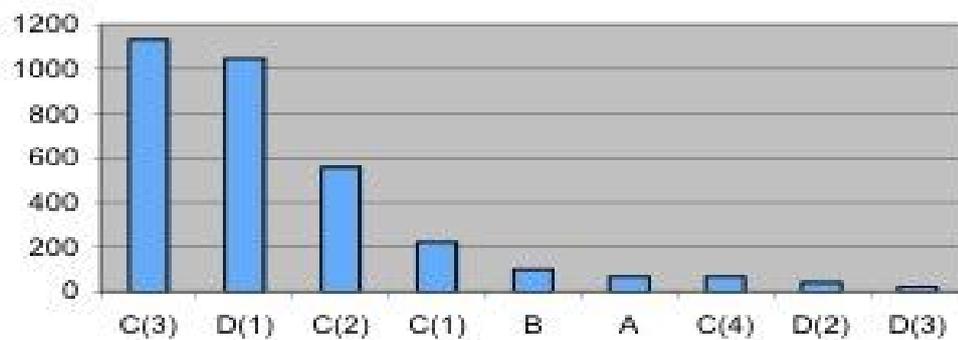


Figure 41. Reclaims by the customers during 1999–2000

The turnovers and the product quantities between customers are different, and therefore the absolute reclaim quantities do not describe the quality level of the cooperation. In the next table the quantity of reclaims has been divided by the turnover of the customer, and it show also the customer's share of the Firm's sales.

Table 13. Relative claim numbers per customer (Firm's sales to customer)/(quantity of reclaims) and customer's share of Firm's turnover

	C(1)	D(1)	B	A	Average
Turnover / reclaim	3173	2089	162348	739481	19345
Customer's share of Firm's total turnover (1999-2000)	5 %	3 %	21 %	67 %	

The differences between customers were huge. The development engineer, employees of Firm, and members of the supplier network all were amazed by the fact that Firm and its supplier network can sell over 300 times more products per reclaim to customer A than to customer D(1). Firm reanalysed its profits per customer, and the conclusion was clear. There were only two profitable customer relationships. The results confirmed the earlier decision; Firm needs to reduce its customer base.

The differences between customers also explained the differences between the producers (see Figure 40). During the year 1999, Firm moved almost all customers C and D products into its supplier network. Main factory's reclaim quantities decreased over 90 % after that decision, and at the same time supplier network's reclaims increased very fast.

The simple statistical analysis of the reclaims also confirmed the claim that white products were sensitive to reclaims. The product complexity, the quantity of parts of the product, also clearly increased the quantity of reclaims as was suspected. The results of the statistical analysis were the main issue in the agenda of the fourth supplier network meeting.

3.2.6 *Analysis of the reclaim process of customers A and C(1)*

Based on the results of statistical analysis, the development engineer decided to study the customers' reclaim-handling processes in more depth. He observed the reclaim handling process at customers' A and C(1) stores, and visited their purchasing departments. The aim of the observations and visits was to discover why the differences are so huge between customers. During the purchasing department visits, the employees of customers A and C(1) described their reclaim handling process and some of the Firm's reclaims were taken under more detailed discussion. After the observations and visits, the development engineer wrote memos,

which were then sent back to customers for comments and corrections. Next chapters are based on these memos.

Customer A

A short description of the interior decoration products chain: There are about 150 stores around the world and they sell interior decoration products to homes. The turnover per store is about 6300 units.

The end customer's buying process: The customer walks around in the store, looking for a suitable product for his home. The customer finds it and writes down its code. The customer fetches the product from the store's warehouse and walks up to the checkout to pay for the selected product. The products of Firm are kept in the warehouses of the store, where the customer can fetch the product immediately.

Complaints management and follow-up of suppliers: The customer with complaint enters the store and walks up to the customer returns department where a trained employee receives the complaint from the customer. He tells the employee what is on his mind, e.g., 'a part missing'. The customer gets the replacement part or product or his money back immediately and he can then leave the store. It takes from five to ten minutes for the customer to get the service he wants.

The manager of the customer returns department analyses the cause for return belonging to one of the four following categories:

1. Change of mind

The customer changes his or her mind about the purchase; for example, a woman's husband cannot stand the new furniture she has bought.

2. Wrong sale

The customer has got a wrong idea about the product or the customer has been given wrong information about the product.

3. Mishandling

The customer has mishandled the product, the package has dropped on the ground during the transport, or the product has been damaged while assembling it at home.

4. Technical defect

The product has been damaged during the manufacturing or packing, and there are defects such as missing parts, displaced drillings, or variance in coloration.

In practice, in every case, the customer gets his money back, so that customer satisfaction can be assured. Changes of mind are natural, and misunderstandings always happen when people communicate. Even mishandlings do happen, but their amount can be decreased by industrial product design, for example by designing the packages more carefully. 'Technical defect', the fourth category, can result from either the supplier's, the product designer's, or the manufacturer's mistake.

The technical defects are carefully monitored, and if there are more than three defects in one product or there are returns caused by a technical defect worth 800 euros or more, a notice will be sent to the central warehouse. If the returns caused by a technical defect are worth less than 800 euros, it is not financially profitable for the customer A to start a process to demand the refund from the supplier.

When the department store gets more than three complaints and/or their value exceeds 800 euros, it forwards a notice to the central warehouse. The central warehouse is responsible for investigating the complaint and for evaluating its seriousness. The complaints are classified into three classes according to the consequences of the defects. The first class, "Ban on Sales", means that the product could put a customer in danger. A complaint classified in this class leads to a stoppage of the sales of this product in all stores until the cause of possible danger has been removed. A product is classified in the second class of complaints if it cannot be used for the intended purpose, for instance the product cannot be assembled. If the complaint is classified as belonging to the third class, the product can be used but it is not what it should be like, for example there are differences of color between the articles of a same series.

After the evaluation, the central warehouse sends a notice of the complaint to the buyer of the product and to the client, from which the follow-up of the delivery of the supplier's compensation will begin. If the supplier accepts the complaint and the suggested way of refunding, the supplier must answer to the complaint within five days. The ways of refunding include also physical issues such as a return of the product, sending spare parts to the customer, and breaking up the product. If the supplier does not accept the suggested way of refunding nor the complaint, the supplier must contact the local office of purchase, which then takes charge of handling of the complaint. The complaining party then accepts the response to the complaint and registers the date in the database. When the defective product has

gone through the required repairs or other measures, the central warehouse permits the sale of the product and records this in the 'free date' database. Now the complaint process has proceeded its full course. During the company visits, the technician/quality coordinator of the customer A's local office of purchase checks that the refunding measures have been introduced. This practice makes sure that there will not be similar complaints in the future.

Customer A's quality management strategy has changed over time. About twenty years ago, the quality management was based on the product inspections performed at the central warehouse. The practice of inspecting the quality of products has been replaced by the practice of inspecting the line of action of the producer of goods. When the lines of action of the supplier of goods are in order, the supplier is likely to supply goods of high quality. Inspecting the supplier is a long-term operation and much cheaper than inspecting products. If the quality of the supplier's products falls too much, the customers will surely give feedback about it. Customer A classifies its suppliers into four groups on the basis of their ability to produce good quality. The suppliers of the first group (the worst) shall not in the long term be accepted as suppliers to the customer.

Group 1: The technician of customer A performs the final inspection of all leaving parcels.

Group 2: The supplier performs the final inspection in a manner that customer A accepts, following customer A's directions.

Group 3: This is a supplier that meets customer A's own quality standards. An accepted inspector of the local office of purchase performs the approval inspection.

Group 4: This group consists of suppliers that use and accept a quality management system inspected by a third party. This includes systems developed under ISO9000 and other internationally acknowledged quality management standards.

Customer C(1)

A short description of the interior decoration chain: C(1) has about one hundred stores in three countries that sell interior decoration and furniture. The turnover per store is about 800 units.

The end customer's buying process: The customer walks around in the store looking for a suitable product. The customer finds the product, goes to a salesperson with whom the purchase is made. The customer pays for the product. The product is delivered either home or to the store where it can be fetched later. The products

of Firm are not kept in the store's warehouses, but are delivered to the customer from the central warehouse. Home delivery takes about a week.

The process of complaints management and the follow-up of suppliers: The customer enters the store and looks for the salesperson to whom to tell about the defect (e.g., a part missing). The salesperson apologizes and promises to order the part in question either from the warehouse of the store or from the supplier of the product. There is no replacement product that could be given to the customer right away from the store. The missing part or replacement product is delivered either to the customer's home or to the store from where the customer can fetch it. The delivery takes from three days up to several weeks, depending on whether the replacement product or missing part could be found in the warehouses of the store or should it be manufactured and delivered by the supplier. The salesperson books the complaint in the file maintained by the purchase department. He reports the cause for the complaint, the date, the end customer's wish about the place of delivery, and the supplier of the product in question. The staff of purchase department is responsible for the follow-up of complaints at customer C and informs Firm of it. On the basis of the complaint file, client A analyses its suppliers. In practice, all the complaints are intended to be passed on to the supplier as quickly as possible.

During the visit the researcher discovered that the complaint files of Firm and customer C did not match. In Firm's statistics there were about 30 % more complaints than in the complaint statistics of customer C. This resulted from the fact that the salespeople of customer C had acted against the instructions: they had informed Firm directly of the complaint, and thus the staff of purchase department was not aware of the complaint. The order clerk of Firm had already been wondering about the client's confused practice of complaint reporting. The file that is used in managing customer satisfaction and follow-up of suppliers had given a distorted picture of the reality.

Summary of reclaim analysis and development actions

Customer A and C(1) have very different reclaim handling processes. These different reclaim handling processes are the main reason, why there are so huge reclaim quantity differences between customers.

3.2.7 Summary

In late 1990's Firm's business environment started to change rapidly. The main reasons to the change were globalization and the development of information

technology. Firm realized that there is also a stable trend in the market: prices of Firm's products are going down.

Firm was also undergoing many internal change processes during the end of 1990's and beginning of the 2000's. Firm's general strategy changed, many of Firm's employees changed, Firm customer base changed, and Firm's supplier base changed. In 1998 Firm had over hundred customers. To those customers, Firm and its supplier network produced a large scope of products in a small scale. In 1999 Firm started to accomplish the new strategy in its main factory's manufacturing – to cut the scope and increase the scale of the products. This was achieved by cutting the customer base of the main factory; in year 2000 the main factory produced furniture only to customers A and B. The complaints of the main factory decreased over 90 % in short period of time. The supplier network's customer base changed also, and therefore the quantity of reclaims went up. After the main factory's fire accident, Firm decided to follow its customer base cutting strategy to the end. At the beginning of 2002, Firm had only the "old" main customers, customer A and customer B, and one new customer from US. The supplier base changed also, the co-operation with supplier network was redesigned, and Firm also started a purchasing unit in Latvia. Firm sought actively new suppliers from abroad and Finland, because the new supplier network operations didn't suit its "old" supplier network members. Firm also sought very actively new customers, but the criteria for new customers were very tight: their business would have to show the potential of over 50 million euros sales. Smaller sales would not allow a close enough cooperation with customers. After Firm's main factory's fire accident, Firm's supplier network operation came to a real test. The main factory's production had to be moved to the supplier network and Firm's second factory. During the test, the supplier network showed its real potential, when Firm and the suppliers were able to satisfy the main customers' needs even in these very challenging circumstances.

3.3 A conceptual model for researching creation and operation of supply network

Firm and its supplier network are only a small part of the whole self-assembly furniture business, and they have only a little effect to the markets. The network context, on the other hand, determinates the whole environment where Firm and its supplier network are operating. Therefore, there is a good reason to study the context of network before the supplier network activities are taken under closer study, despite the fact that, the original journal article of the chosen method (Harland et al. 2004) described the network operation before the network context.

3.3.1 *Network context*

Harland et al. (2004) isolated four conceptual variables of network context: market environment, nature of product and manufacturing process, network structure, and focal firm network strategy. They did not describe the network context analysis in very detailed way, and therefore this researcher has an opportunity to decide on how these variables are to be analysed. The selected variables are closely connected to each other. The nature of Firm's product describes the needs of end-customers and therefore it was seen to be the most powerful variable. Firms choose their position in the other variables (manufacturing process of the product, network structure, focal firm network strategy, and market environment) to fulfill their customers' needs.

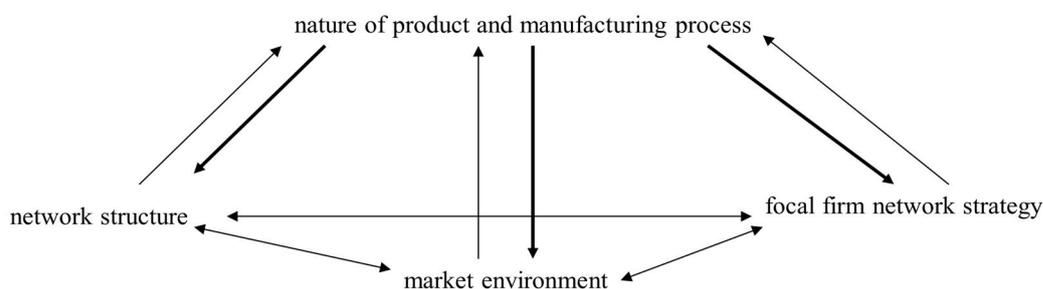


Figure 42. Network context

In the theoretical part of this study, many of the issues included in the variable “Focal firm strategy” are studied from the “nature of the product” point of view, and therefore these two variables are here integrated into one chapter.

Variables “Nature of product and manufacturing process” and “Focal Firm’s network strategy”

Firm’s, and its supplier networks’, products are self-assembly pine surfaced furniture: tables, chairs, beds and storage furniture. The self-assembly is an important feature of the product. The quantity of the parts of a product describes how difficult or easy it is to assembly. There can be over 600 parts in one product, and it brings a lot of challenges to design the instructions by which the product would be easy to assemble for the buyer. The statistical study showed a clear correlation between the quantity of parts of a product and the quantity of reclaims. Self-assembly brings many advantages into logistics, and therefore the costs of self-assembly furniture are usually lower than the costs of the traditional “single part furniture”.

During 1998–2001, the manufacturing volume of the products increased a lot, and the customer base decreased from over 100 to three. The manufacturing process is closer to low-tech than high tech, and it is more modular than integrated. The prices of Firm's product had a general decreasing trend during the time of the study, and Firm and its supplier network had to conduct ongoing analyses on where to cut the costs of the products. The structure of product cost is an important feature of the product, and it describes the changes necessary to cut the cost of the product. The general cost structure of Firm's product is shown in Table 14.

Table 14. Cost structure of Firms and its supplier network's products

Source of the cost	% of total cost
Wooden material	45–70 %
Labor	5–20 %
Ferrules and fasteners	5–10 %
Packaging	5–10 %
Other (for example glass windows)	0–10 %

The wooden material has a major role in the business, because almost always the cost of the wooden material is over 50 % of all costs. Generally, Firm's profit margin ratio was 20 to 30 %. The value of Firm's product increased highly, when it entered customer stores. The end-customer prices are 3 to 4 times higher than the producer price; the end-customer price also includes the VAT. The producer prices have decreased a lot during the years 1996–2001, and this trend was one of the main reasons to conduct this research.

Figure 43 analyses Firm's relationships with five customers in 1998. The analysis is based on Gadde & Snehota (2000) tool.

		Volume of business with the supplier	
		Major	Minor
Posture of relationship	High involvement		
	Low involvement		A C(1) B C(2) D(1)

Figure 43. Firm's position of relationships and volume of business with suppliers 1998

In Figure 44 the same customer relationships are analysed by Christopher's (2000) model. The Figure shows the situation in 1998.

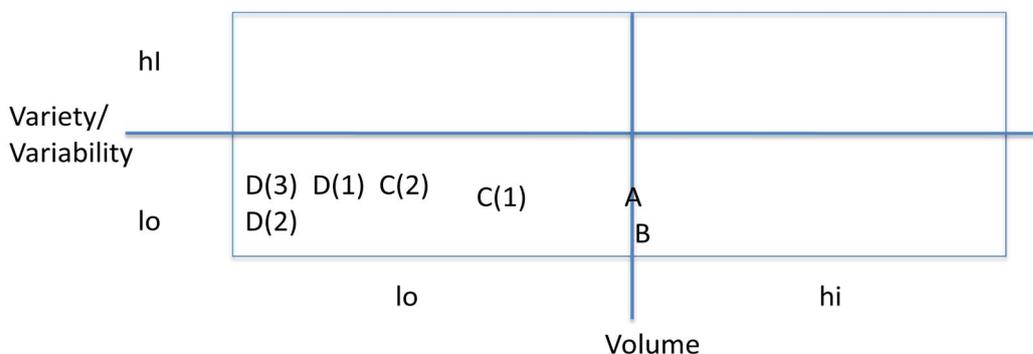


Figure 44. Firm's customer portfolio by the customers' product variety/variability and volume in 1998

In 1998 Firm had over 100 customer relationships, which all were based on low volumes and a high variety of products. In 1998, the strategy of Firm indeed was to serve as many customers as possible. A wide customer base was a way to insure the Firm's business against the customers' negotiation power. Then the business environment changed, and the prices of the products started to decrease. In this situation, Firm was not any more able to satisfy all its customers' needs. Firm's products are mainly functional, and not of high-end design. In 1998, Firm's supply chain strategy was not efficient or responsive, when the chain is analysed by Fisher's (1997) tool.

In 2002, Firm's new strategy was to build an efficient supply chain. Close customer relationships were the base element of an efficient supply chain, and thus Firm had to decreased its customer base. In 2002 Firm had only three direct customers. Figure 45 describes Firm's position in relationships and volume of business with suppliers in 2002. Firm was searching new customers very actively, but the criteria for accepting a new customer were strict, as noted.

		Volume of business with the supplier	
		Major	Minor
Posture of relationship	High involvement	A B N	
	Low involvement		

Figure 45. Firm's position of relationships and volume of business with suppliers 2002

Firm's place in the Harland et al. (2001) matrix had changed during the study (see Figure 29). In the beginning of the study, Firm's supply network position was in the upper right corner of the matrix. Firm's strategy was based on short-period thinking, and it changed its products' producers frequently. Firm had then over 100 customers and the quantities per customer were low. Some of the supply network members had direct contacts to Firm's customers and they were thus also Firm's competitors. At the end of the study, Firm's position in the matrix was in the lower right corner of the matrix. Firm had only three customers and it was one of the main producers of the self-assembly whole wood furniture to its customers. Firm's supply network members knew the strategy of Firm, how it will choose the manufacturers of the product, and they could be sure that Firm will not change the producer based on any short-period profit opportunities. Firm took care of all its supplier network marketing and R&D processes towards its customers, and the members of the supplier network did not any more have direct contact to Firm's customers.

The nature of Firm's supplier network was more routinized than dynamic, even if there indeed were a lot of changes in the supplier network, because Firm changed its strategy, which shows in its position of in the Harland et al. (2001) matrix.

Network structure

Figure 46 demonstrates Firm's supplier network structure in 1998 by using Lambert & Cooper (2000) point of view.

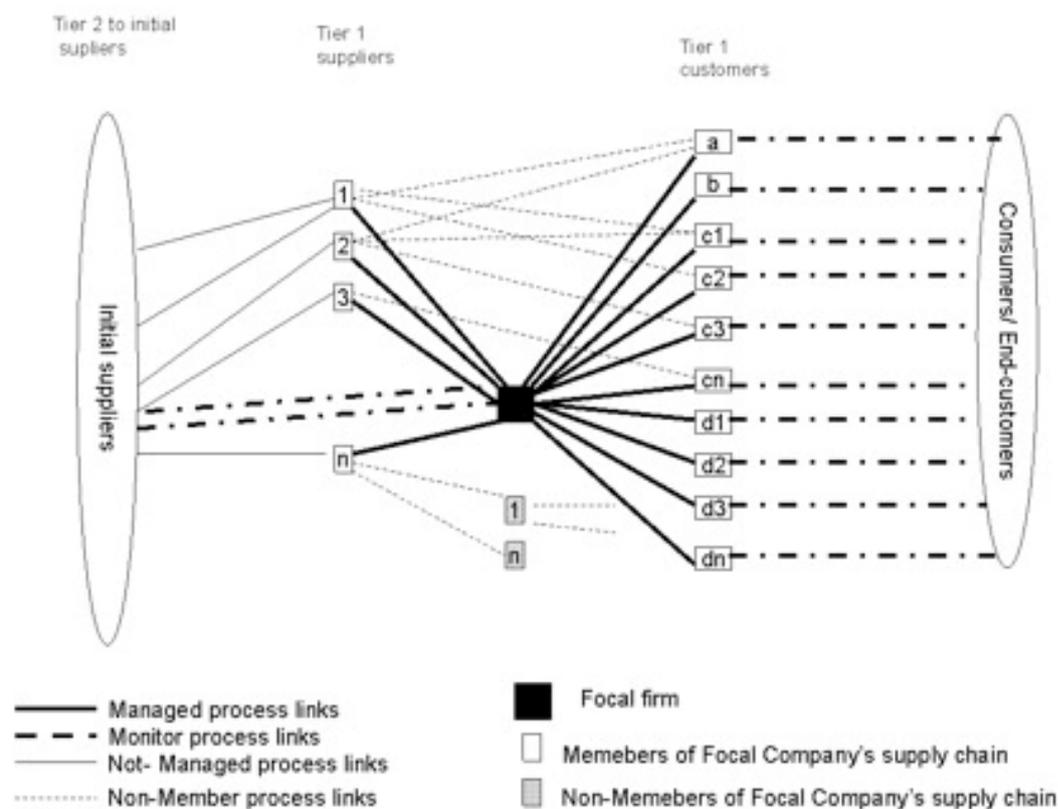


Figure 46. Firm's supply network in 1998

The quantity of Firm's managed process links was large, and turnovers and product quantities per link were small. Most of Firm's customers acted locally, and they had their special requirements for the products. Firm had no resources to be highly involved in the relationships with customers, and customer relationship management was based mostly to individual orders and reclaims from customers. Firm had over 30 suppliers, and, as noted, some of them had direct contacts to Firm's customers, so they were also Firm's competitors. They handled their own marketing and R&D process towards Firm's customers. Firm's supplier network did not have a common purchasing strategy, and most of the supplier bought their raw and packing material, as well as ferrules and fasteners.

The market environment was changing, and Firm realized the challenges of the situation. Firm thus started to develop and implement a new strategy, and there were two main aims for the supplier network structure; firstly, closer relationships with customers, and secondly, a clearer supplier network structure. Firm was not able to fulfill all its customers' needs and thus it selected two of its old customers, with whom it started to build a closer co-operation. This strategic change affected also customer A's supplier network actions: it ended all direct contact to Firm's supplier network members during the time of this study. Figure 47 demonstrates

Firm's supplier network structure in 2002 by using Lambert & Cooper (2000) point of view.

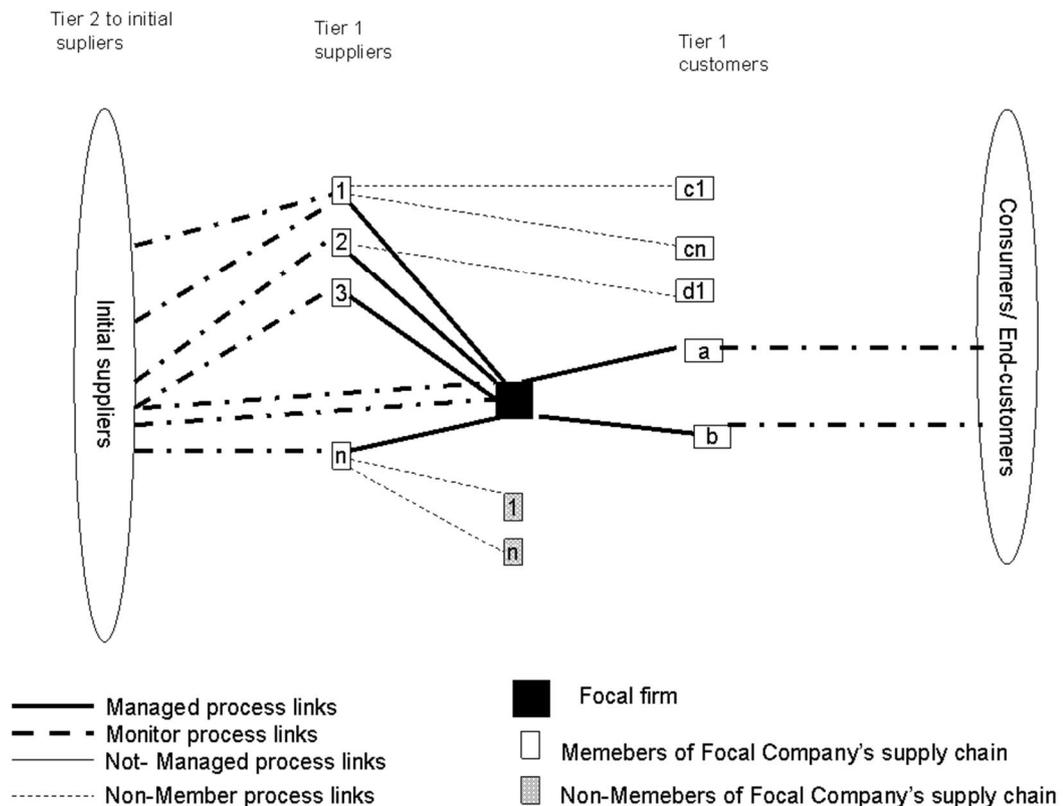


Figure 47. Firm's supply network in 2002

There were only three managed process links to customers, and the turnovers and product volumes per customer were large. The links between Firm and the member of the supplier network upper stream were much clearer than in 1998.

At the time of the field research, customer A had three distinct supplier network evolution structure stages (described by Lehtinen, 2001; see Figure 31). In 1998, Customer A's supplier network structure was in stage one. Customer A had many self-assembly solid wood furniture producers and had direct contact with them. Customer A employed a supplier network engineer, who negotiated with suppliers in Northern Finland. He audited the supplier network members and helped them to develop their performance. The supplier network engineer was an experienced and highly respected person in the supplier network. At the end of the research, customer A's supplier network structure was in the stage three: customer had direct contact only with Firm, and Firm audited and managed the supplier network.

Market environment

Firm's customer had many different product clockspeeds. The average life cycle of the product was 4 to 8 years. The researcher did not study the process clockspeed actively during the research and therefore it is difficult to give any good estimation for process clockspeed. The development trend of the industry clockspeed was mentioned during the interviews, and it was seen that the clockspeed was growing. Firm's management's turnover was also high at the time of the study. In 2000, Firm hired the new logistics manager, who left Firm in 2001. Five of the fifteen interviewed Firm's employees left Firm during the study. The researcher had close daily relationships with the network buyer and the purchasing engineer, and both of them left Firm during the research period.

The product requirements are changing between marketing areas. Marketing areas have also their own fast changing internal trends. Assembling instructions, colors, form and other visible issues require deep end-customer knowledge. In 2000, Firm's R&D department had two processes through which to plan the products: one based on end-customer needs, and one based on Firm's production. With customers A and B, Firm's R&D department based its planning process to end-customer's need. These customers had the ability to produce end-customer demand information, and translate this information into detailed product features. Other customers didn't want or they could not produce end-customer demand information to Firm's R&D department, and the planning process thus had to be based mostly on Firm's and its supplier network's production abilities. This second way clearly was a failure: Firm was not able to fulfill end-customers' needs, and the quantities of reclaims were large. These customer relationships were unprofitable for Firm.

Next, Firm's supplier network is analysed through Porter's (1980) five-force model (see Figure 26). The bargaining power of buyers of the self-assembly solid wood furniture industry has increased: information technology development and globalization have opened new purchasing opportunities for buyers. The buyers are much larger than the manufacturing companies in the industry, and many of them have their own production. The products of the business are sold almost always under buyers' own labels. The buyers have a wide product and service portfolio in their stores, and the self-assembly solid wood industry only makes up a limited share of it.

The main customer, customer A's, share of Firm's turnover was over 70 % in early 2002. The prices of the products were clearly decreasing. Firm had to develop its supplier network operations, to be able to answer customer A's price-decreasing demands. Customer A had its own self-assembly solid wood produc-

tion, and Firm had to be as efficient as customer A's own production. Customer A is the global market leader in the decorating business, and Firm's ability to fulfill customer A's needs was a good sign for Firm. Firm and its supplier network were a world-class self-assembly solid wood furniture producer. Customer A audits Firm's processes every year, and it monitors the reclaims of the products in a very detailed way (see Chapter 3.2.6). Customer A also helped Firm's purchasing marketing processes. Firm was allowed to participate in customer A's purchasing deals, when Firm was seeking new customers.

Decreasing prices have influenced the structure of the self-assembly solid wood manufacturing business in Finland. Many of Firm's suppliers have exited the business through bankruptcies or otherwise during 1998–2002. In Finland the labor costs are much higher than they are in eastern part of Europe or in China. However, the labor costs are only 5–20 % of the cost of the whole product (see Table 14), and this is achieved through efficient production. Wooden raw material purchasing is the most important part of the total cost. For that reason, Firm started a new purchasing unit in Latvia. Its aim is to ensure the availability of cost efficient wood raw material, components, and ready made-furniture.

Self-assembly solid wood furniture business is not very attractive for new potential entrants. The profits per product are low, and the entrance to the business requires multi-million-euro investments. The buyers' bargaining power is high, and many of them have potential to initiate self-assembly solid wood furniture production.

Self-assembly solid wood furniture business has two features that are protecting it from threat of the substitute products and services. Firstly, the solid wood is very traditional and highly respected raw material and it is difficult of replace. Secondly, the self-assembly brings many logistical advantages, which are difficult to achieve any other way. Firm and its supplier network members felt that the threat of the substitute products and services is small.

Suppliers bargaining power changed during the study and between three different supplier groups. In 1998, Firm had two kinds of suppliers, component suppliers and ready-made furniture suppliers. Firm's purchasing strategy was based to short-period thinking and suppliers didn't trust to Firm. Firm was the only customer to some component suppliers, but generally the suppliers were not very dependent on Firm. There were clear supplier network core competences in Firm's supplier network, and make-or-buy decisions were based mostly on the price of the product. At the end of the research period, Firm's supplier network consisted of three different supplier groups, suppliers of ready-made products, component suppliers, and suppliers of planed components. Most of the ready-

made product producers were very dependent on Firm's R&D and marketing departments, even if some of them had their own R&D and marketing resources. They did not have any direct contacts with Firm's customers, and Firm's share of their turnovers was large. Component suppliers were also dependent on Firm, because they did not have sufficient R&D or marketing resources, and Firm's share of their turnovers was also big. Firm was a much larger company than its ready-made or components suppliers. The core competences in the supplier network were much clearer than in 1998, and members of the supplier network had an opportunity to invest in and develop their core competences. Ready-made suppliers' and component suppliers' trust to Firm was much higher in 2001 than it was 1998. In 2001, there were common purchasing deals for Firm's supplier network members made by Firm. By these deals, Firm could ensure its supplier network cost-efficient packing material, ferrules and fasteners, and wooden raw material purchasing. The planed component suppliers were of the same size or bigger than Firm was. Firm share of their turnover were small, and the planed component manufacturing was only a little different than the sawmills' normal production. Firm had difficulties to find planed components producers who could fulfill Firm's quality requirements.

In many interviews, component and ready-made product producers had wistful memories about the time 15 years later. The prices of the products were much higher and the quantities were much smaller. The situation was quite like Alasoini's (2000) "1970's handcraft rationalized model". In 2000, our researcher group visited a Danish furniture factory that still worked in the "1970's handcraft rationalized model". The Danish furniture company was over 100 years old, and it had very long lasting customer relationships with German "high brand" decorating chains. They still ran small-quantity and high-price production, and the production looked very different than it was in Firm's supplier network's factories. The products contained a "finger touch" of the producer. In 1990's, Firm or its supplier network members could not find enough "high brand" decorating chains as customers to continue the way they used to produce the products. First they changed the strategy to Alasoini's (2000) second phase "1980's flexible product technologies and JOT-thinking" and eventually to the third phase "breakthrough of process managing in the 1990's".

Summary of network context

Network context has changed a lot during the years 1985–2002. In middle of 1980's, the successful concept to serve customers was "1970's handcraft rationalized model", which first changed to "1980's flexible product technologies and JOT-thinking" and eventually to "breakthrough of process managing in the

1990's" model (Alasoini 2000). Many of Firm's supplier network members were not able to change their basic underlying assumptions required to correctly answer the question "How to best serve the customers?" They failed to change their operation modes in response to the environmental change, which emphasized the cost efficiency and, more specifically, manufacturing core competence and a closer cooperation with supplier network.

In the last stage, Firm's supplier network context contained five key elements, which described the context: self-assembly, low prices and low profits per product, high scale of products, and high diversion of the quality demand in the different market areas. Firm and its supplier network did not have the ability or resource to study the markets globally, and therefore it had to trust in customers' ability to provide the required correct market information. Without high-quality market information it is very difficult to design the product to fulfill end-customer needs.

3.3.2 *Network activities*

Harland et al.'s (2004) network activities concept contains two distinctive phases, supply network creation and supply network operation. They have eight common activities, but the ninth component, partner selection is a central activity only in the supply network creation phase. Firm's supplier network context changed during 1998–2002, and therefore the network activities changed coincidingly. Firm's supplier network was basically under ongoing supplier network re-creation phase, and it was difficult to recognize when supplier activities moved from the creation phase to the operation phase. From a development engineer point of view, Firm's supplier network had problems that had to be resolved, and therefore there were continuously actually two different kinds of situations in the supplier network. When everything is going as planned the situation can be described as stable and, where things are not going as planned, conflict situations. Next chapters describe how the researcher saw Firm's supplier network activities from a conflict resolution point of view.

Conflict resolution

The network activities are closely connected to each other, and therefore it is reasonable to study them in connection. The main goal of the development engineer was to isolate the conflicts within Firm's supplier network and to solve them. Figure 48 describes how the researcher analysed Firm's supplier network conflicts.

Network context

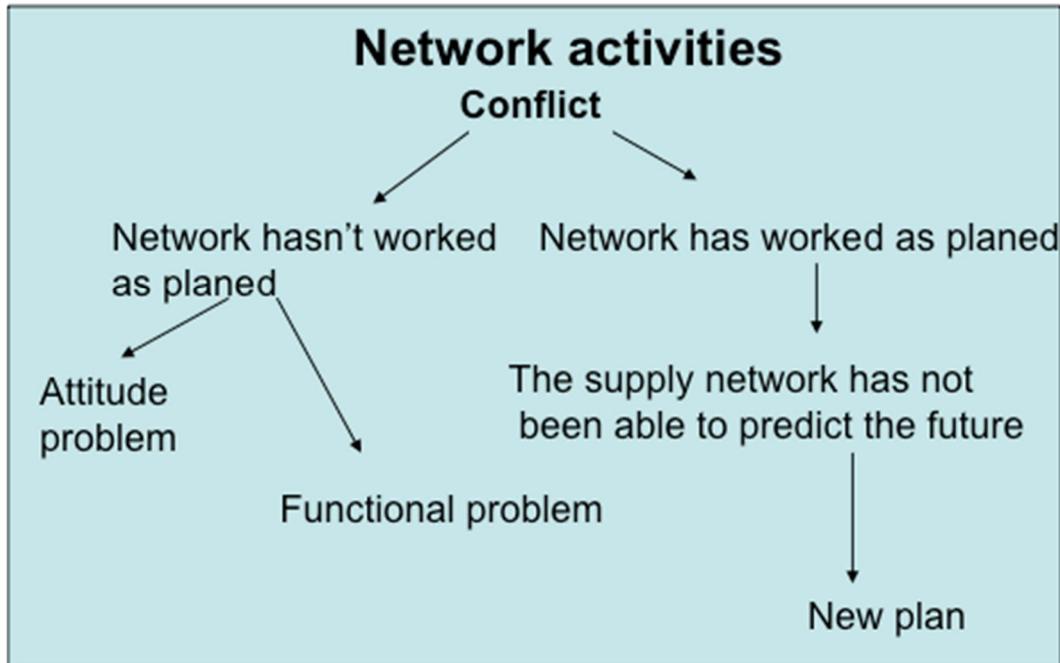


Figure 48. Network actions from a conflict resolution point of view

A conflict is in this study seen as a situation, where Firm's supplier network's financial future is being threatened. The threats can be caused by conscious or unconscious operations. When Firm's supplier network has not worked as it has agreed and planned, the threat is conscious – it consciously takes a risk. The supplier network, or one member of it, is consciously not following the agreed supplier network operation plan. The threat is unconscious, when Firm's supplier network has followed the agreed plan. The problems then are caused because the network has not been able to predict the future of its context, and they have agreed to do something, what turns out to be financially unprofitable.

There are two kinds of conscious threats to supplier network financial situation. The attitude problem occurs when a member of the supplier network is not acting as planned even if there are requirements for it to do so. For example, most of Firm's planned component suppliers didn't deliver right quantity or quality of products to Firm, even they have the infrastructure and instructions to do so. They did not fulfill the deal with Firm, because planned components manufacturing was a different business that their normal business was. The underlying assumptions of planned components producers was based on manufacturing a lower value products than Firm needed, and they were not able to achieve the products or delivery

quality that could fulfill Firm's needs. The researcher tried to motivate and change the attitude of planned components suppliers by different actions, for example by educational stories pointing out the consequences of bad product and delivery quality. During the network meetings, Firm and the planned components suppliers conducted several teamwork sessions, where they tried to solve the product and delivery quality problems. Planned component suppliers also visited Firm's main factory, and they saw why the product and delivery quality is an important issue for Firm's supplier network. Firm's employees also visited planned component suppliers' factories, and tried to help them to improve their manufacturing, so that they could achieve Firm's requirements, but all these actions did not lead to the achievement of the required product or delivery criteria. Motivation, risk, and benefit sharing are closely linked together. To change the basic underlying assumptions were a very challenging task, which would require a lot of resources. Eventually when the supplier saw how challenging it was to fulfill Firm needs they did not want to invest their resources to fulfill Firm deals. The benefits of planned components manufacturing were too low for them as compared to the risks of a new business area. Some Firm's customers have attitude problems also; for example customer C(1) did not follow the agreed deal on how to act when the reclaim occurs (see Chapter 3.2.6). From a knowledge capture viewpoint, attitude problems are very challenging and overcoming them requires higher levels of learning (see Figure 18).

The functional conscious threat occurs when member of a supplier network is not able to conduct the agreed and planned actions, even if it wanted to do so. This type of threat was not usual, and the supplier network typically was able to act proactively against functional conscious threats. In the network meetings, Firm and its supplier network conducted a risk analysis to act proactively against functional threats. Firm and its supplier network were able to prevent these conscious threats and Firm invested in its IT capabilities to improve the information flow to Firm whenever functional conscious threat would occur. This was, however, quite reminiscent of the phenomenon described by Harland et al (2007) as "eLands with SMEs adrift of them: Firm did develop its own IT facilities, but most of the supplier network members did not have the knowledge and/or technology to gain advantage from it. The fire accident of Firm main factory was the most serious functional conscious threat event in the Firm's supplier network during the time of the study. This conscious functional threat prevented planned operations of the supplier network. Firm was covered by an insurance policy for a fire accident, but the policy did not cover the loss of customers' trust. This conflict was an extreme test for the supplier network's operations, for how it was able to save the most valuable customer relationships under some very challenging circumstances. The main factory's share of the Firm's turnover was about 60 % before the fire acci-

dent, and it all was destroyed in the fire. Firm was able to save the three main customer relationships after the fire accident by using its second factory's and its supplier network's capabilities.

The members of Firm's supplier network faced two of Alasoini's (2000) ideal-typical industry changes during the last 15 years (1986–2001). The suppliers felt that they do not have the ability to predict the future of markets. The inestimable future of the markets prevented most kinds of new major investments, for example, information technology investments. Every network meeting started with Firm general manager's or material manager's presentations that focused on the current situation and estimating the future of the markets (see Chapters 3.2.2 and 3.2.3.). After presentations, Firm and its supplier network members worked in sessions, where supplier had an opportunity to ask more detailed market questions and explain their views on what the future of the supplier network should be.

In 1998, the starting point of this study was an unconscious threat. The supplier network had followed the agreed plan quite minutiously, but still there were problems. Firm and its supplier network manufactured products to customers C and D as planned, but there were large amounts of reclaims and these customer relationships clearly were not profitable. Firm was not able to find the answers to these challenges by single-loop learning, so Firm had to rethink its strategy and ways to co-operate with customers. Firm decided to change its strategy, and concentrate on a few customer relationships, bigger volumes and smaller scope of the products. Firm was able to design its products to fulfill end-customer's needs better through a closer cooperation with customers. From a knowledge capture point of view (see Figure 18), it was a very challenging project to promote the new strategy to Firm's own employees and its supply network. Supply network meetings were the chosen way to respond to these challenges. Social coordination was one of the main tasks of the supply network meetings, solved through open group discussions on how the network will survive in the challenging future.

Difficulties or challenges of conflict resolution can be analysed from the learning models (see Figure 18) point of view. Conflicts that require only the low level of learning were typically easy to find and manage. Normally Firm had the ability to be prepared before the conflicts took place, and if they appeared they were easy to solve. The conflicts requiring a higher level of learning were harder to find and solve. With planned components suppliers, the development engineer did not manage to find the way to solve the problems.

Motivation

Firm's main needs from the supplier network were production capacity and more detailed production capabilities. Suppliers of Firm, in response, were in need of marketing and R&D abilities, which they did not have by themselves. The cooperation with Firm provided suppliers with an opportunity to use Firm's supplier network's deals for raw and packaging materials. Firm's buyer also helped suppliers to develop their production. Normally Firm's share of the components suppliers' turnover was large, in many cases over 90 %. The members of the supplier network did not have any direct contact with Firm's customers in 2001. The change of the structure of the supplier network increased the power of Firm towards its supplier network, while the difficulties for suppliers to find new customers of their own increased.

Visibility is one part of the motivation. Without visibility you cannot see the consequences of your actions. Firm and its supply network developed visibility in many ways during the study. Firm invested into information technology and Network meetings where one main task was to improve the information flow from Firm to the supplier network and from supplier network to Firm.

Resource integration

During the study there were many kind of resource integration actions: joint training for Firm's employees and supplier network members, labor-borrowing schemes from Supplier network to Firm and from Firm to supplier network, and common deals for buying packaging material. Normally resources were integrated, because Firm and its supplier network needed to level the production capabilities. After Firm's main factory's fire accident Firm borrowed its employees to supplier network. It could have been very difficult to fulfill Firm's main customers' needs without Firm's skillful workers in the supplier network. Before the fire accident the supplier networks' employees were at times working in Firm's main factory, when the supplier network had low demand periods.

Members of the supplier network mentioned many times that they want to join the R&D process in some way. They wanted to make sure that their production capabilities have been recognized in the R&D process. It is difficult to change products physically after the R&D process, and it determines the major part of the cost of the production. Firm's purchasing staff knew the supplier network production capabilities, but Firm's R&D process did not consider the supplier network production needs. In the supplier network meetings the R&D processes were many times under serious discussions, but we did not find the way to make the supplier

network closer to Firm's R&D process. The supplier network has not got resources to participate fully in the R&D process.

Firm and its supplier network did discuss vendor-managed inventory (VMI) during the supplier network meetings, and it was seen as a good way to improve the visibility and the quality of deliveries. Firm and its supplier network did, however, not proceed on VMI during the time of the study. One of the main reasons was Firm's main factory's fire accident. Firm and its supplier network did not have the resources to start a new process on the logistics during the very challenging times after the fire.

Partner selection

Firm's way to select its customers changed in a major way during the study. In 1998, Firm had over 100 customers, and all companies were basically welcomed to be Firm's customers. In 2002, Firm had only three customers and it had very strict criteria for accepting new customers. Firm sought actively for new customers, and invested into finding new customers heavily during the study; for example, it send its own agent to the USA.

Supplier selection was an ongoing process. Firm was not able to find a planed component supplier who could manufacture and deliver products to Firm to the required quality level. The situation with ready-made furniture manufacturers and component suppliers was more stable; however, Firm sought new suppliers from Baltic countries and Russia. Competition in the Firm's industry was tough, and many suppliers were declared in bankruptcy. Fire accidents were not a rare phenomenon in this industry, and Firm had to have a wide supplier base to ensure the product deliveries.

Knowledge capture

Challenges of knowledge capture can be evaluated from the point of view of the learning levels (see Figure 18). Firm was able to solve the problems or challenges, which required basic learning capabilities; when Firm's supplier network context was stable, it was easy to work as was done earlier, by the normal routine. The situation was much more difficult when problems or challenges needed high level of learning.

By 2001 Firm had reached the second phase in Corelick & Tantawy-Monsou's (2005) four phases model. The focus of the supplier network operations was on making tacit to explicit knowledge, on content management, and supporting collaboration through group ware and collaborative technologies.

The reclaims analysis can also be seen from Nonaka & Takeuchi (1995) theory point of view. The first phase is socialization: Firm's production, marketing, and purchasing departments and its supplier network had many kind of opinions on why there is such a large amount of reclaims (see Chapter 3.2.5). In the next phase, externalization, statical analysis demonstrated that customers A and B have only a small quantity of reclaims while others have large quantities of reclaims. In the combination phase the researcher studied customers' reclaims action in the stores and interviewed the staff of customers A and C. This information was integrated with results of statical analysis, to make Firm ready for phase four, internalization. Firm decided to reduce its customer base, and do business only with customers who can produce real end-customer information. This is a good base for close cooperation.

Social coordination

Social coordination plays an important role in Nonaka & Takeuchi (1995) theory. Socialization is their starting point, and it is connected tacit-to-tacit knowledge transfer. Challenges of the social coordination at Firm were discovered, when the researcher tried to solve quality problems with planed component suppliers. The business was new for the sawmills who did not have the tacit knowledge to manufacture furniture components, and they did not understand how tight the quality criteria in furniture business are. We tried to solve the problems by socialization, allowing Firm's employees to visit the sawmills and the employees of the sawmills to visit Firm's main factory, and during the supplier network meetings Firms employees and planed component suppliers also tried to solve together these problems, but we ultimately failed.

Risk and benefit sharing

Many of Firm's customers have their own manufacturing capacity. They know the cost structure of their products and they know how much profits Firm and its supplier network can be assumed to raise. Customers know that Firm and its supplier network is not a threat or a competitor to their core business, selling furniture to end-customers. Visibility helped the risk and benefits sharing in self-assembly furniture business.

The CPFR level of Firm supplier network also changed during the study. In 1998 customer and supplier relationships were at the basic CPFT level, and the relationships were based to deterrence trust. The members of the supplier network did not trust all Firm employees. Especially, there was one Firm production employee, who had not behaved in a good manner. He was mentioned many times during the supplier interviews. Suppliers did, however, strongly trust Firm's network

buyer. His strong experience was highly respected in the supplier network, and he was warmly welcomed into every supplier's factory. The cooperation with buyer was based on personal trust. In 2002, the cooperation with customer A was at advanced CPFR level, and was to its nature knowledge-based trust. Firm and its supplier network relationships were mostly at developed CPFT level, sometimes even at advanced CPFT level.

Decision making

In the end of 2001, customer A's share of Firm's turnover was over 70 %. Firm had a very close cooperation with customer A. The manager of customer A participated in the fifth supplier network meeting. He told how customer A saw the present market situation and the future of markets. The message to the supplier network was very simple: Firm's primary purpose it to keep customer A satisfied. At the end, customer A has the power to decide what the future of Firm and its supplier network will be. Firm was able to find a new customer and deliveries started in 2001. Firm's dependency from customer A was not a suitable situation to Firm or to customer A. Customer A had some demand changes, and these changes were a risk for Firm's future. Customer A helped Firm to find a new customer from USA. Firm's component suppliers and ready-made products suppliers were depended on Firm's R&D and marketing capabilities. With planed components suppliers Firm had difficulties, because their business with Firm was new for them and different from sawmills main business.

Information processing

Firm's technical feasibility was in good order in 2001, but Firm's supplier network had a lot of challenges in that area. Problems caused by failures of the information capabilities were rare during the study. This might be one reason why the members of the supplier network were not very keen to invest in a fast aging technology infrastructure. The use of intranet/extranet was under discussion in the supplier network meetings, but these plans did not proceed during the time of the study. From a supplier network point of view, the most serious problems in information processing were changes in Firm production plans. There were some cases were Firm had changed its production plans in a very short time period. The supplier network had serious difficulties to respond to this kind of last-moment changes. Normally Firm production had no difficulties to follow the production plans; the difficulties arose when a new product was launched into production, and Firm's production did not have the required manufacturing routine.

4 RESEARCH FINDINGS

The main idea of the research is to produce development ideas to develop the logistic research process and to help future researchers to gain better understanding of the supply network phenomenon. These development ideas are produced through pragmatic observations and the model of Harland et al. (2004). There are three levels of research questions and the value of the lowest level – the pragmatic findings of this research can be questioned, because the empirical framework is quite old. The chapter answers to the second level of questions Q(1) and Q(2) concerning the model of Harland et al. (2004) and after that the chapter analyses the contribution and quality of using the model. The last subchapter summarises and represents the development ideas for logistic research and answers to the third research question.

4.1 The second level research questions

The Chapter “4.1.1 The Usefulness of the Harland et al (2004) model” answers the first question and demonstrates how useful the model was to the researcher. The Chapter “4.1.2 The development ideas of the Harland et al (2004) model” answers the second research question and describes the development of the ideas that occurred when the model was used. The Chapter “4.3 Contribution and the quality of the model” analyses the contribution and quality of using the model.

4.1.1 *The Usefulness of the Harland et al (2004) model*

The Chapters “3.1 preliminary research” and “3.2 Research” described chronologically how Firm’s supply network developed during the years 1998–2001 and in Chapter 3.3. A conceptual model for researching creation and operation of supply network, the same phenomenon was described from the Harland et al (2004) model point of view. Using the two points of view is one way to demonstrate the added value of the Harland et al (2004) model – what new ideas the model brings to the research. The chronological description shows how the researcher saw the situation before the model was used, and the second description demonstrates the issues that the researcher produced with the model. The answer to the first question is divided into three subchapters, the first one analyses the supply network context, and the second subchapter answers how useful the supply network activities analysis was and the third subchapter summarizes the answer.

Supply network context

The model brings forth clearly the role of the Firm's supply network context – Firm is a small player in the global market and therefore the supply network context determines the supplier network activities by which Firm and its supplier network can be successful.

The model introduces four different types of contextual factors relating to supply network context: The Nature of the product and manufacturing process, the Market environment, the Network strategy, and the Focal firm's network strategy. The model does not determine the factors of the supply network context in a very itemized manner, and therefore the researcher has the opportunity to define the factors so that they are suitable for the researcher and the supply network. Writing a more detailed definition of the supply network context (see theoretical framework Chapter: 2.2.2 Network context) and writing the analyses of Firm's supply network context (Chapter 3.3.1 Supply network context) helped the researcher to understand how complex a phenomenon the supply network context is – all four factors are closely connected to each other.

Globalization and ICT development were the main forces, which effected Firm's supply network context. (see Figure 49)

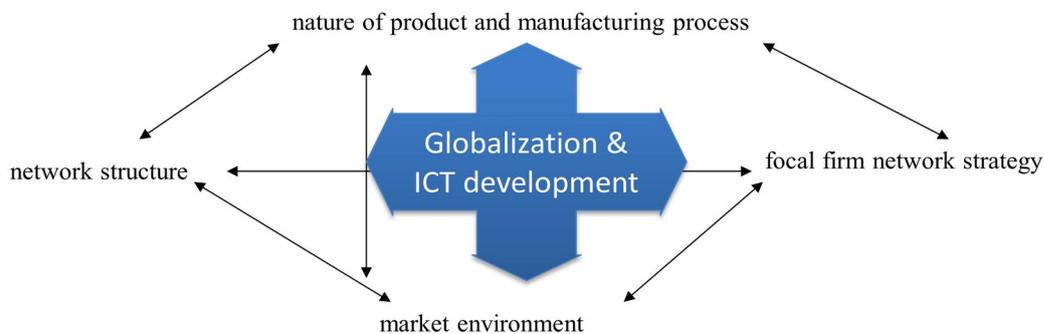


Figure 49. Globalization & ICT development

There are many ways to define the factors of the supply network context, and the choices that were made in the theoretical framework are researcher's personal decisions and they are made to suit this specific supply network context and to this specific researcher. For example the researcher decided to integrate two supply network context factors the "Nature of the product and manufacturing process" and the "Focal firm network strategy" under the same chapter because many of the theoretical points of view integrated these two factors (see for example Gadde & Snehota (2000), Christopher's (2000) and Fisher (1997)). The decision

to integrate the two factors worked well for this researcher and in this supply network context, but there are no guarantees that it will work as well in a different supplier network context or for another researcher.

The use of the model produced many interesting questions. For example, during the period of 1998–2002, globalization and the development of ICT affected Firm's supply network context, but how might these effects be described? The researcher thought two different ways to portray the effects.

In the beginning, the researcher thought that globalization and ICT development mostly affected the supply network context factor "Market environment" and changes in the Market environment forced Firm's supply network to change the other supply network factors, the Nature of the product and manufacturing process, the Network strategy, and the Focal firms network strategy.

Finally the researcher decided that globalization and ICT development affected strongly upon the integrated factors the "Nature of product and manufacturing process" and the "Focal firm's network strategy" and changes in this integrated factor affected forcefully upon the other two supplier network context factors (see Figure 50).

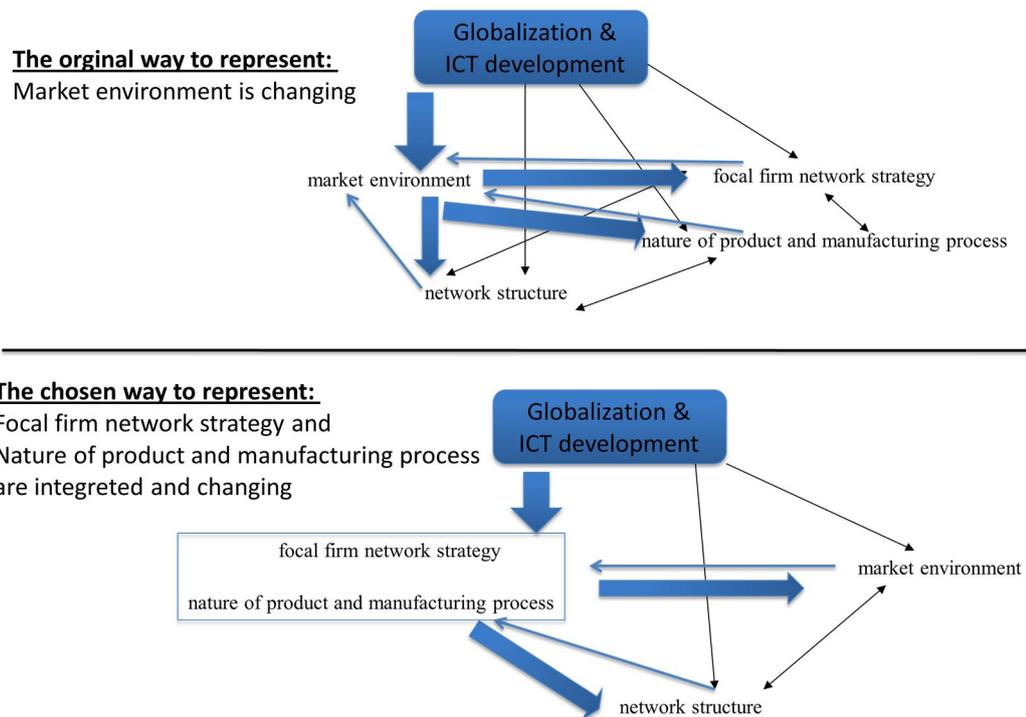


Figure 50. Two ways to represent the effects of globalisation and ICT development

The product of Firm's supplier network was not the same in 1998 and 2002, even though the products looked the same from the end-users' point of view. In 1998, the Supply network strategy and the Nature of the product and manufacturing process were based on small quantities, a large product scale, a large customer base, short-term co-operation and "high" prices. In 2002, globalization and ICT development decimated these markets and Firm supplier network's "Network strategy" and "Nature of product and manufacturing process" were based on large quantities, a small product scale, a small customer base, and long term co-operation.

What was new that the Harland et al.(2004)model's network context brought to the research?

The nature of the model is two-part. It is tight because it recognizes (exactly) four context factors. It is loose, because it does not define those factors in a detailed manner. The two-parted nature of the model forced the researcher to rethink the phenomenon from a new point of view. The researcher had to definite four supplier network context factors (see Chapter 2.2.2 Network context) and analyse how the context appeared in the study (see Chapter 3.3.1). Rethinking deepened the researcher's understanding of the phenomenon, and especially the complexity of the supply network context was demonstrated to the researcher.

The definitions of the four factors and analyses of the supplier network context are results of the rethinking produced by the model. All definitions and analyses that were produced by the model were useful to the researcher, but the value of these results to other researchers is not explicit. The value of the definitions and analyses in this research can be questioned by the fact that they are designed to suit this specific researcher and supplier network.

Supply network activities

The Harland et al. (2004) model identifies two supply network activity phases, supply network creation and supply network operation. The model helped the researcher to recognize how profound the change of Firm's supplier network was during the study. The change of the Firm's supplier network context was so deep and long lasting that Firm was going through only the supply network creation phase.

The model helped the researcher to understand how the supplier network context and supplier network activities were connected to each other. The supplier network context defines "the rules of the game", what kind of supplier network activities and their combinations can be successful. The competitiveness of Firm's

supplier network is built by the nine supplier network activities. Figure 51 demonstrates how the supplier network context effects to the nine different supplier network activities.

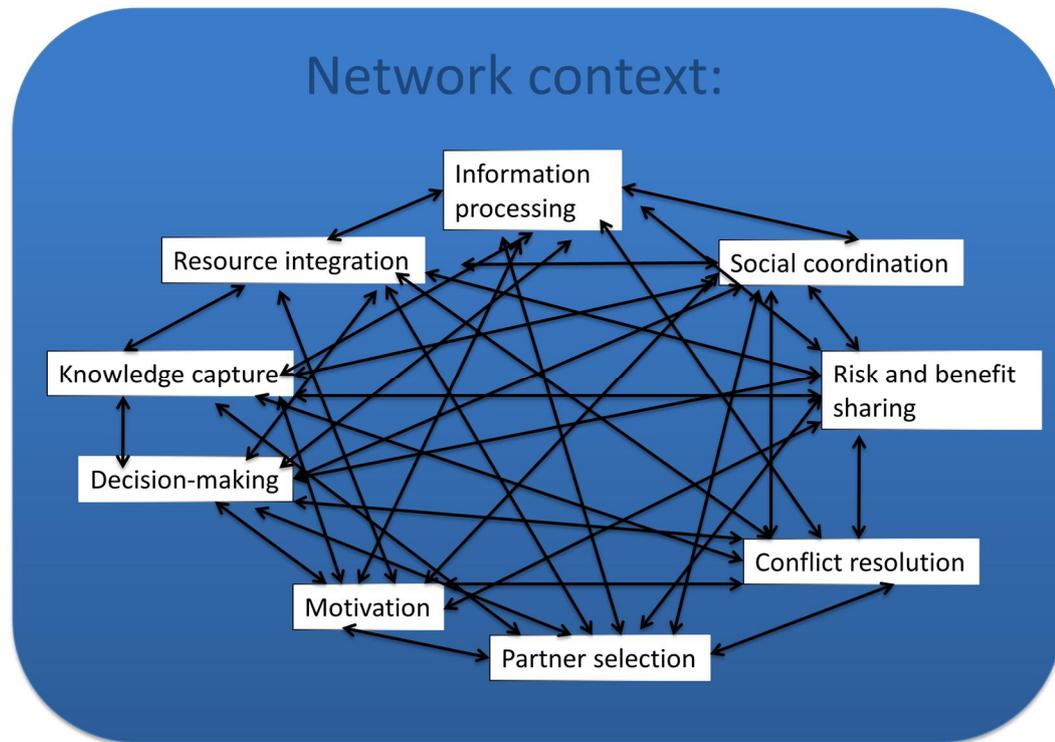


Figure 51. Supplier network context and nine supplier network activities

The main message of the Figure is the complexity of the supplier network activities. For example, a change in the supplier network context (blue background) can effect all supplier network activities and the relations between supplier network activities (black bidirectional arrows). Firm's supplier network context was changing and so was Firm's the optimum state of the supplier network activities.

The models two-part nature appeared during the definitions and analysis of Firm's supplier. It has (exactly) nine activities and therefore nature is tight. The model does not define those activities and therefore nature is loose. The two-parted nature of the model forced researcher to reanalyse the phenomenon from new a point of view. The researcher had to determine nine supplier network activities (see Chapter 2.2.1 Network activities) and analyse how the actions appeared in the study (see Chapter 3.3.2 Network activities). Rethinking deepened researcher's understanding of the phenomenon, especially the complexity of the supply network activities was demonstrated to the researcher.

The model forced researcher to rethink the phenomenon and write determinations and analyses of the supplier network activities. All the definitions and analyses that were produced by the model were useful to the researcher, but the value of these definitions and analyses to other researchers is not explicit. The value of the results in this research can be questioned by the fact that they are designed to suit this specific researcher and supplier network.

The importance of researcher's background was clearly brought forth by the model. During the work as development engineer, the researcher's first duty was the development of Firm's supplier network activities, and the researcher has a strong background as a teacher. Therefore, the supplier network activities description and analysis emphasises the importance of the conflict resolution activity and the knowledge capture activity.

Summary of the first answer

Harland et al.'s model (2004) provides a good basis by which to study the development actions at Firm during the years 1998–2002. It provides strength for the structural validity of the analysis, and it shows how deeply the different elements of the supply network context and supplier network operations/creation were linked to each other. The analysis from Harland et al.'s (2004) point of view has helped to understand why some development actions were failures and some were successful.

The model of Harland et al. (2004) has the role of a framework in terms of Dupois and Gadde (2002). The model of Harland et al. (2004) has both a loose and tight nature of a framework. It is tight, because it describes exactly what to study such as, for example resource integration, information processing and knowledge capture. The model is loose and emergent, because it does not give precise instruction of how to analyse them. The tight nature gives the researcher confidence that a certain structural validity has been achieved, when all the mentioned parts of the model have been studied. The loose nature gives the researcher the ability to design a theoretical framework to fit into the actual empirical world.

4.1.2 The development ideas of the Harland et al (2004) model

This chapter answers the second research question: how can we develop the Harland et al (2004) model's usefulness to gain a better understanding of the supply network phenomenon? The answer is based on the experience, which was archived by answering the first researcher question.

The first finding: explicit scientific presumptions

The first and prime finding is a lack of explicit descriptions of scientific presumption. A user of the model has to make them. The researcher made a latent content analysis of the model on pages 16–17, where he figured out that the model fits the presumptions of this research. The analysis has a subjective bias and it is a result of reading between the lines. The conclusion “the model fits”, was not easy to make, especially when the research approach of this study does not follow the dominant research approach of logistics. The coherence between scientific assumptions, methods, and practical actions is a basis of scientific research (see for example Pihlanto 1994, Arlbjorn & Halldorsson 2002, Arbnor & Bjerke 1997), and the lack of an explicit description of scientific presumption is a risk for this basic principle. According to Spens & Kovács (2006), an explicit reporting of the research approach “will lead toward rigor and help clarify important issues such as the link between qualitative and inductive research”.

The theoretical framework offers an example, where Pidduck (2006) found six assumptions from existing models of partner selection, which could be better described (see page 33). These assumptions were leading her to develop a new Partner Negotiation Model. In the mentioned article, she did not express explicitly ontological or epistemological assumptions of the existing models of partner selection nor her new model. There might be a change, in that the Partner Negotiation Model and the existing models of partner selection do not share the same scientific assumptions, and six omissions are reflections from the role of positivism in logistics. In that case, a model without explicit scientific assumptions might not be the best answer to omissions.

The first finding: The model should include explicit statement, for example, this model is based on “these scientific presumptions” or “when the model is used by “these scientific presumptions” it has “these kinds of limitations and advantages”.

The second finding: Consider the dynamic nature of the model, and pay extra attention to descriptions

The model describes neither the supply network context nor activities in a detailed manner. The dynamic nature of the model gives to the researcher an opportunity to design the definitions to suit researcher and supply network. The dynamic nature is strength, but it also leads to specific requirements. The researcher needs to pay extra attention to how descriptions are made and why they are made. For example, the researcher found out that “When the development work of the supply network is the main target, conflict resolution is a good choice to start the network creations/operations analysis.” The value of this finding is only anecdotal.

tally without detailed descriptions of how supplier network activity “conflict resolution” is determined and analysed and what was the researcher’s background to do these kinds of definitions and analyses. In this study, the supplier network context and activities were defined in the Chapter 2 Theoretical framework, and the background of the researcher is demonstrated in the Chapters “3.1 The preliminary research” and “3.2 The research”. The analysis by the model is demonstrated in Chapter “3.3 A conceptual model for researching creation and operation of supply”.

The second finding: The model’s dynamic nature is strength, but it also leads to specific requirements. The user of the model has to pay extra attention to how the supplier network context, activities, actual analysis and the researcher’s own background is defined or demonstrated. Another researcher should be able to follow the user’s logic and find out how useful the model is for him/herself.

The third finding: Supplier network context first, then supplier network activities

The model of Harland et al. (2004) was divided into two dimensions: supplier network context – the areas and roles in which the operation/creation decisions are made – and the supplier network operation/creation. In Firm’s case, it was important to realise what the limitations and roles in the old strategy and the new strategy were. After that it was easier to see why Firm had to change the way it was cooperating with the supplier network.

This research defines the supplier network context as a “rules of the game”, the context determines what kind of supplier network activities can successful and therefore it is logical to study the “rules” before the activities.

The third finding: Study and analyse the supplier network context before the supplier network activities.

The fourth finding: the role of learning levels

This study defines analyses four supplier network context factors and nine supplier network activities. They all were useful to the researcher, but only two of them are mentioned here as a research finding. As a definition and analysis of conflict resolution and knowledge capture, the researcher understood one reason as to why some of the supplier network development activities were successful and some of them failed to achieve their goals. This finding also demonstrates the first and second research findings.

The forth finding:

Requirement 1 (see the first research finding): When the scientific presumptions are convergent with this research and

Requirement 2 (see the second research findings): when the supplier network context and activities definitions and their analysis, and the background of the researcher are convergent with this research, then conflict resolution is a good starting point of the supply network creation/operation phase and essential to realize the learning levels needed in the network conflict resolution.

4.2 Contribution and quality of using the model

This chapter analyses the scientific contribution and quality of using the model of Harland et al. (2004). According to Kekäle's (2001) listing, a doctoral thesis must

1. contain a contribution to existing research;
2. show proof of logic and a mastery of research methodology; and
3. contain enough evidence to support the thesis.

The next subchapters aim to demonstrate how using the model answers to this these goals. In the Chapter “4.2.1 Contribution” contribution is discussed from Olkkonen (1993) point of view and in the Chapter “4.2.2 Quality of using the model”, the validity and reliability of the research is studied.

4.2.1 *Contribution*

According to Olkkonen (1993), the contribution has six main features, and they all have to be part of the dissertation.

Originality of the study

There have been a few logistics papers (see for example Spens & Bask 2002), which were aimed at developing a framework by previous researchers, but there were no journal articles where the models of Harland et al. (2004) were used as a research method.

The self-assembly solid wood furniture supplier network development project during 1999–2001 in the Finnish context is a unique research context.

Explanation to the phenomenon

The model helped to describe and provide explanations for why Firm's business environment was changing during 1997–2001, why Firm and its supplier network changed its strategy, how the strategic change process was implemented, and what features affected the success of implementation.

Solution to a problem

The research suggests four central findings to increase the usefulness and future development of the model. The scientific presumptions of the model and definitions and analysis of the supplier network context and activities need to be described in an explicit manner. The context of supply network should be analysed before the supply network creations/operations. Conflict resolution is a good starting point for the supply network creation/operation phase, when a study fulfil certain requirements, and in that case, it is essential to realize the learning levels needed in the network conflict.

Added evidence to earlier theory

The research adds evidence to many early theories for example the study suggests that Alasoini's (2000) general industry development stages are valid also in the self-assembly solid wood furniture industry and the three different businesses of Hagel & Singer (1999) were clearly also present in Firm's supplier network.

New knowledge

There were no journal articles where the model was used as a researcher method, which therefore answers the research question one and two (Q1 and Q2) in the Chapters 4.1 Usefulness of Harland et al. (2004) model and 4.2 The development idea of the Harland et al. (2004) model can be approved to be new knowledge.

Generalization

Research findings 1 and 2 can be generalized into a wider context. Generalization is discussed more closely in Chapter External validity.

4.2.2 The quality of the using the model

According to Gummesson (2000), a researcher's number three challenge is quality, and it is about reliability, validity, objectivity, relevance, and so on – the list of criteria is a bit ambiguous, as is any discussion about "quality". "At any given

point of time, opinions on what represents good research tend to vary. Within a university department, different groups of researchers representing different research paradigms may either actively oppose each other, or accept some form of coexistence” (Gummesson 2000). For example Lukka (1991), Kasanen et al. (1991), Lukka & Kasanen (1993), and Lukka & Kasanen (1995) have described this debate of the quality of research.

The key elements of research quality have been presented in various ways (Sykes 1990a); for example Mentzer & Kahn (1995) proposed twelve questions for evaluation of logistics research, Olkkonen (1993) defines validity as follows: “Validity means research’s ability to measure what needed to be measured” and Mentzer & Flint (1997) “... validity in research is actually a hierarchy of procedures to ensure that what we conclude from a research study can be stated with some confidence”. According to Uusitalo (1991) quality or validity is basically easy to measure, you just compare the measured results to the correct measures of the phenomenon. The problem is that the correct measures of the phenomenon are seldom available.

Construct validity, internal validity, external validity and reliability

According to Yin (2003) there are four commonly used tests to establish quality of any empirical social research: construct validity, internal validity, external validity and reliability. Yin’s four tests have been commonly used in the Finnish IEM research, for example Virolainen (1998), Collin (2003), Jokinen (2004), Appelquist (2005), Iskanius (2006), Pikka (2007), and Sissonen (2006) used the test in their dissertations. Table 15 summaries the four design tests and the case study tactics for them.

Table 15. Case study tactics for four design tests (Yin 2003)

Tests	Case study tactic	Phase of research in which tactic occurs
Construct validity	Use multiple sources of evidence	data collection
	Establish chain of evidence	data collection
	Have key informants review draft case study report	Composition
Internal validity	Do pattern-matching	data collection
	Do explanation-building	data collection
	Address rival explanations	data collection
	Use logic models	data collection
External validity	Use theory in single-case studies	research design
	Use replication logic in multiple-case studies	research design
Reliability	Use case study protocol	data collection
	Develop case study database	data collection

Yin (2003) further divides validity into three dimensions: construct validity, internal validity and external validity.

Construct validity

Construct validity establishes the correct operational measures for the concepts being studied. To meet the test of construct validity, an investigator must be sure to cover two steps (Yin 2003):

1. Select the specific types of changes that are to be studied (and relate them to the original objectives of the study) and
2. Demonstrate that the selected measures of these changes do indeed reflect the specific types of change that have been selected.

The first two research questions Q(1) and Q(2) aims to develop the Harland et al (2004) model. The development of the model is based on the use of two case descriptions. The first description demonstrates how the researcher saw the supplier network phenomenon before the model. It demonstrates chronologically how the development actions were planned together with Firm's management and the supplier network members. First, we studied the situation of the Firm's supplier net-

work and then we decided what were the main development areas and how to act within them. There was no lack of motivation; it was a case of survival in the changing business environment. The second description demonstrates the same phenomenon from the Harland et al. (2004) model point of view. The model has a two-part nature, it is tight because it defines four supplier network context factors and nine supplier network activities. It is loose, because it does not define those supplier network activities and context factors in a detailed manner. The tight nature of the model strengthens the model's construct validity. The loose nature of the model emphasises the role of the researcher, how he/she will define and analyse the supplier network context factors and supplier network activities.

The research was a part of a larger research project. The researcher had a chance to discuss with other colleagues active within the field of this research. At the beginning of this study the researcher's pre-understanding of the science or the self-assembly solid wood industry were not on a very high level. The roles of an experienced research manager, the supervisors and re-examiners were very important to this study's construct validity.

Yin (2003) demonstrates six sources of evidence for case studies: documentation, archival records, interviews, direct observations, participant observations, and physical artifacts, and all of them have had a role in this research. Every memo and report of the study was sent back to the informants, and they had a chance to correct and comment on the memos and reports that then were used as a background material for the thought process.

Internal validity

Internal validity establishes causal relationships, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious and random relationships. Internal validity is only a concern for causal case studies, in which an investigator is trying to determine whether event x led to event y. (Yin 2003)

In this research, the same supplier network phenomenon is described two times to the gain better internal validity. The first description demonstrated how the researcher saw the phenomenon before the model was used and the second description demonstrates issues which were produced by the model. The use of two descriptions clarifies the added value of the model and, therefore, strengthens the study's internal validity.

The starting point of this research was an action-oriented method; the researcher would conduct detailed actions to achieve better supply network operations, for example, lower the level of reclaims and so on. During the study, the complexity

of Firm's supply network and its operations became clear. It is very difficult to develop an airtight causal relation between single actions and the outcomes in such a complex world. This was the main reason why this research adopted a descriptive single case study method. The starting point of the study, key development actions, and the situation after the actions, have been described in the study, and the employees of Firm and members of the supplier network both agreed that development actions had a positive effect on Firm's supplier network operations.

Because the causes must take place before the effects, the empirical chapters of this dissertation utilise a chronological order to depict the actions during the study to establish the logical chain of evidence.

External validity

External validity deals with the problem of knowing whether a study's findings are generalizable beyond the immediate case study. Case studies rely on analytical generalization, where the investigator is striving to generalize a particular set of results to some broader theory. (Yin 2003)

Lukka & Kasanen (1995) found three main views in the accounting literature to describe the possibilities for generalization in case studies. One extreme end is the view, which denies the possibility of generalization; generalization is impossible in case studies, because statistical reasoning cannot be carried out. At the other extreme end, there is the view, which denies the rationale of the aim to generalize; the purpose of generalization should be to reject the case made in case studies as it represent modernism. The third view is a moderating view; properly conducted case studies of high quality can produce generalizable results.

The first view of the generalization of case studies seems to accept a case study, though with reservations – namely, if their role is limited to generating new research ideas and hypotheses to be later tested more “properly” by mainstream studies with larger samples (Lukka & Kasanen 1995). Even if this research has not adopted this extreme view, this is a valuable point of view. One way to demonstrate the quality of this research is the quantity and quality of ideas for new research that are born out of the study. According to Kasanen et al. (1991), “To be fruitful, science not only needs to solve problems but to create new ones. Thus, contribution in science can be seen as a growth of knowledge as well as becoming aware of previously unknown problems and questions.” These new ideas demonstrate a researcher's ability to higher levels of learning (see Figure 18); without the higher level learning ability (analysis/synthesis/evaluation and valuing/organization/characterization), it is very difficult to produce new research ideas from the gap between existing knowledge (theory) and the empirical case

study. From the single-loop and double-loop learning point of view, these ideas are signs of double-loop learning (see Figure 21).

According to the third view, the moderating view, high quality case studies can produce generalizable research results, but not to be based on the statistical inference typical to modernism, but rather would be, in one way or another, “theoretical” or “analytical” (Lukka & Kasanen 1995). According to Lukka & Kasanen (1995), the literature on this “new” type of generalization is so far undecided, even if there are some ideas as to how to gain a generalization possibility in a qualitative case study: “The interpretation of empirical case findings through, or against, existing theories as well as an extremely systematic induction through comparative case analysis have been mentioned as a concrete means by which to gain generalization in case studies.” (Lukka & Kasanen 1995)

This research has adopted a broad notion of generalization from Lukka & Kasanen (1995): “by generalization, we mean the derivation of and argumentation for conclusions covering many or all cases of a certain type based on one or more observations of the real world.” Lukka & Kasanen (1995) introduced four types of generalized conclusions; (1) conceptual frameworks, which offer us the possibility to discuss the subject in general; (2) descriptive models, attempting to show “how things are” in the problem field, covering more objects than the studied ones; (3) explanatory models, which attempt to capture the significant general relationships in the subject area; and (4) prescriptive models, offering solutions to practical problems and guidance for future decision making in other similar, or corresponding, organizations.

According to Lukka & Kasanen (1995) there are thus ways to make the generalizations concerning the real world more credible, for example by grounding them on continually more adequate theoretical models, by more and more carefully designed experiments, or by making continually more sophisticated tests on the statistical significance of the results.

The main purpose of this research can be seen as generalization – to produce development ideas for logistic research in order to gain better understanding of the supply network phenomenon. These development ideas for logistic research are made through analysing the external validity of using the model.

This research has adopted the third view of the generalizability of the qualitative research described by Lukka & Kasanen (1995). There are some results from using the model, which can be generalized into a wider context, even if the case of Firm and its supplier network is a unique case in the Finnish self-assembly solid wood furniture business. The next findings can, arguably, be generalized into a

wider context: Contributions to the Harland et al. (2004) model. (1) The model needs explicit scientific presumptions. (2) The descriptions and analyses of the supplier network context factors and supplier network activities, and the background of a researcher have to be defined or demonstrated so that another researcher can follow the logic of the researcher and evaluate the model's usability. (3) It is fruitful to first study the supply network context and then network creations/operations. (4) When the development of the supply network is the main target, conflict resolution is a good choice to start the network creations/operations analysis, and (5) it is essential to realize the learning levels needed in the network operation conflict resolution.

The first inference (a1) is basic for the development of any scientific model or tool or framework or concept.

The dynamic nature of the model emphasizes the meaning of the second inference (a2). The model gives a researcher the possibility to define and analyse the supplier network so that definitions and analyses are suitable for the researcher and the studied supplier network. However, without adequate supplier network definitions and analysis, as well as background documentation, the value of the researchers is only anecdotal to other researchers.

Inference (a3) can be generalized because the supply network context depicts the limitations and "rules" for the network activities.

The generalization of the fourth and fifth inference (a4 and a5) are examples where the scientific presumptions (inference a1) and supplier network definitions and analysis, along with the researchers background need to converge with this study. For example the generalization of fifth inference (a5) is based on the analysis of all the development actions that were done during the study. The high learning level needed to solve the problems discovered was the key figure in every development action. Even though there were many experienced, practical-minded engineers from the field of solid wood furniture, and many researchers from the field of IEM, and though the problem with the planned component suppliers was clearly visible from within Firm, we still had serious problems to successfully plan and implement in the network those development actions which required higher learning abilities. Assumptions are difficult to change from one company to the other; a company view is simpler than a network view.

Reliability

Reliability is about demonstrating that the operations of a study can be repeated, with the same results, by another researcher, and it thus aims at minimizing the errors and bias during the research process (Yin 2003).

According to Sykes (1990a), in the context of qualitative research, the concern with reliability is most commonly manifested in two forms: would the same study carried out by two researchers produce the same findings; and would a study repeated using the same researcher and respondents yield the same findings.

The main doubts about the reliability of qualitative research methods are that their inherent characteristics are not conducive to replicability, and for that reason, the entire research process should be made 'transparent' to the readers of the research reports (Sykes 1990a).

The main questions of validity are intimately tied up with issue of reliability (Sykes 1990b). Lukka & Kasanen (1993, 1995) introduced preconditions for generalization in case studies, as well as in any properly conducted accounting studies. Reliability is a precondition for generalization in a case study. The goal of the case study is to reach a fundamental understanding of the structure, process, and driving forces of a phenomenon. It is impossible to derive any kind of generalization from a case, if the research fails to document the research in a reliable way. (Lukka & Kasanen 1993, 1995)

The dynamic nature of the model emphasizes the role of reliability. Every user of the model has an opportunity to define and analyse the supplier network to suit the user and the studied supplier network, and if user does not document the research in reliable way, it is impossible to derive any kind of generalization from the case.

One reason for the chronological description of this research is reliability. It should be easier for other researchers to follow the study, when it is described in a chronological way. The development actions of this study are listed in the Tables 7 and 12. The actions are numbered from number one to number nineteen. Table 16 summarizes the research findings and defines the main development actions where the findings are made.

Table 16. The findings of the research and connection to development actions

Research questions/findings	Number of the development actions, where the findings were made
Q(1): How useful is the model of Harland et al. (2004) to increase our understanding of supply network phenomenon?	
Harland et al.'s model (2004) provides a good base to study the development actions at Firm.	All
It provides strength to structural validity of the analysis, and it shows how deeply the different elements of supply network context and supplier network operations/creation were linked to each other.	All
The analysis from Harland et al.'s (2004) point of view has helped to understand why some development actions were failures and some were successful.	7,8,11,12,13,14,15,16,
Q(2): How we can develop Harland et al. (2004) model to gain better understanding of the supply network phenomenon?	
1. explicit scientific presumptions	All
2. consider the dynamic nature of the model, and pay extra attention to descriptions	All
3. supplier network context first, then supplier network activities	All
4. "conflict resolution is good starting point"	All

For the readers of this study, the value of Table 16 might be low or even anecdotal. The aim is still very important: to find a way to increase reliability in case study research. The logic in the table, to identify the connection between given statements and earlier findings, is the necessary base of the theoretical part of all kinds of studies. However, the same logic is surprisingly not in general use between the empirical part of study and the findings of a research study. Reliability plays such a critical role in a case study that it is important to find ways to increase it, and therefore the Table earns its place in this research. Table 16 is a

suggestion for increasing reliability that should be considered by future researchers as one possible way to increase the reliability of a case study.

Individual validity and validity of inferences from qualitative research

According to Sykes (1990a, 1990b), the most important distinction of validity is between its use in referring to the kind and accuracy of the information obtained from individual sample units and its use in debates about the status of qualitative findings. The first one, individual validity, concerns the extent to which a particular methodology produces not only relevant information from individual sample units but also information which is ‘plentiful’, ‘accurate’, ‘honest’, ‘illuminating’ or whatever are the specific criteria of ‘goodness’. The second one, validity of inferences from qualitative research, concerns the confidence with which any inferences can be made from qualitative data. A discussion of validity of the qualitative research must be preceded by a question about the purpose of the research. (Sykes 1990a, 1990b)

Internal validity

Firm's management decided to select an “outsider” to find out how the supplier network and Firm's employees see the situation of Firm's supplier network performance, and after that to develop the operations of the supplier network. From the individual validity point of view, the role of the outsider gave to the supplier network members and to Firm's employees an opportunity to “open up” and give more “plentiful”, “accurate” and “honest” opinions than Firm's employees could have received. Informants knew that the researcher did not have operational daily responsibilities or personal benefits in Firm's supplier network operations. This trust to an “outsider” was seen during the study: most informants were really open minded and willing to provide their opinions or statements. On the other hand the informants knew that the researcher had direct access to Firm's management and the information will eventually drizzle through to them. The informants saw also that there were actual and direct development actions derived from the interviews, for example the supplier network days. The researcher met most of the informants more than once, and they had the opportunity to correct or change their opinion if that was needed. At the beginning of the research the researcher worked in very close cooperation with Firm's network buyer and buyer engineer. Especially the supplier network buyer was a very highly respected person in Firm's supplier network. The supplier network buyer mostly introduced the researcher to the supplier network members, and this might have had an important role from an individual response validity point of view.

The validity of inferences from qualitative research

According to Sykes (1990a), there are two characteristic features of qualitative research, which are commonly discussed in this context; the nature of the samples on which such research is typically based, and the association with qualitative research of the inductive mode of discovery. These characteristics were under discussion in Chapter External validity.

Triangulation

Mentzer & Flint (1997) stressed the meaning of triangulation “future research should explore various methods to facilitate triangulation at all phases of the scientific process, but primarily within the testing of logistics theories”. According to Yin (2003) there are four types of triangulation: 1) data triangulation, 2) investigator triangulation, 3) theory triangulation, and 4) methodological triangulation.

The empirical part of the research includes data from interviews, Firm’s reclaim data, observations in Firm’s supplier network’s factories, observation from Firm’s product lines, marketing, purchasing, and R&D departments, observations from Firm’s customers stores and from supplier network meetings and common training sessions. All Yin's (2003) six sources of evidence for case studies thus have a role in this research.

As can be seen in the acknowledgements of this study, the researcher is very thankful to many colleagues and informants. Informants such as Firm’s employees and the supplier network members played a crucial role in the study, for without their unprejudiced attitude this study could not have been completed. Their motivation to be an investigator was real, fueled by concerns of how they will survive in the changing business environment. The research manager provided a wider view of the theoretical and practical situations. Conference paper writing and presentations were specific ways to gain investigator triangulation.

4.3 The third research question

This chapter answers to the third research question Q(3): What kind of a development ideas did the research produce to develop a logistic research process?

The first idea

A researcher has to document ontological and epistemological debate in an explicit manner, even the chosen model or concept or framework does not contain it.

The second idea

A logistic researcher should use guidance of logistic literature like theories or concepts or frameworks or methods or models to strength the contract validity. There is a good possibility that the use of a new point of view could depend the understanding of the logistic phenomenon.

The third idea

The logistic case study researcher should use a technique or method to strengthen the reliability of the research. The tool, which connects the research findings and empirical framework into the same table (see Table 16), might be one possibility for this purpose, if he/she can not find or invent any other tool.

5 DISCUSSION

The main purpose or global/general target of this study is to produce development ideas for logistic research process to help future researchers to gain better understanding of the supply network phenomenon. The Chapter “4.3. The third research question” presented three ideas how to help future researchers to gain better understanding of the supply network phenomenon.

5.1 Contribution of the study

The main contribution of the study is the answer to Q(3) What kind of a development ideas did the research produce to develop a logistic research process? Answer: 1) The first idea, “a researcher has to document ontological and epistemological debate in an explicit manner, even the chosen model or concept or framework does not contain it” 2) A logistic researcher should use guidance of logistic literature like theories or concepts or frameworks or methods or models to strength the contract validity. There is a good possibility that the use of a new point of view could depend the understanding of the logistic phenomenon. 3) The logistic case study researcher should use a technique or method to strengthen the reliability of the research. The tool, which connects the research findings and empirical framework into the same table (see table 16), might be one possibility for this purpose, if he/she cannot find or invent any other tool.

One part of the contribution of this research comes from the fact that the abductive research approach might be one choice to answer the call for more theory building in logistics (Spens & Kovács 2006). According to Spens & Kovács (2006) logistics literature knows only a few research which has the abductive research approach (see for example Uusipaavalniemi (2009)), and therefore is a clear need for descriptions how the abductive research approach could be executed.

The answers to research third question, the development ideas, are produced through pragmatic observations and the model of Harland et al. (2004). The research contains three levels of research questions. The first or the lowest level is pragmatic and local research questions, for example “ why researcher failed or was successful during the work as a development engineer”. The second level discusses the chosen model and the third level deals with the development of a logistic research process in general. The value of the lowest level – the pragmatic findings of this research can be questioned, because the empirical framework is quite old. The second level of questions Q(1) How useful is the model of Harland et al. (2004) to increase our understanding of the supply network phenomenon?

and Q(2): How can we develop the Harland et al. (2004) model to gain a better understanding of the supply network phenomenon? are concerning the model of Harland et al. (2004).

According to answer of Q(1): Harland et al.'s model (2004) provides a good basis by which to study the development actions at Firm during the years 1998–2002. It also provides strength for the structural validity of the analysis. The analysis from Harland et al.'s (2004) point of view has helped to understand why some development actions were failures and some were successful. It shows how deeply the different elements of the supply network context and supplier network operations/creation were linked to each other. The model of Harland et al. (2004) has both a loose and tight nature of a framework. It is tight, because it describes exactly what to study such as, for example resource integration, information processing and knowledge capture. The model is loose and emergent, because it does not give precise instruction of how to analyse them. The tight nature gives the researcher confidence that a certain structural validity has been achieved, when all the mentioned parts of the model have been studied. The loose nature gives the researcher the ability to design a theoretical framework to fit into the actual empirical world.

Research found four development ideas of the model of Harland et al. (2004)

The first finding: The model should include explicit statement, for example, this model is based on “these scientific presumptions” or “ when the model is used by “these scientific presumptions” it has “these kinds of limitations and advantages”.

The second finding: The model's dynamic nature is a strength, but it also leads to specific requirements. The user of the model has to pay extra attention to how the supplier network context, activities, actual analysis and the researcher's own background is defined or demonstrated. Another researcher should be able to follow the user's logic and find out how useful the model is for him/herself.

The third finding: Study and analyse the supplier network context before the supplier network activities.

The forth finding:

Requirement 1 (see the first research finding): When the scientific presumptions are convergent with this research and

Requirement 2 (see the second research findings): when the supplier network context and activities definitions and their analysis, and the background of the researcher are convergent with this research, then conflict resolution is a good start-

ing point of the supply network creation/operation phase and essential to realize the learning levels needed in the network conflict resolution.

5.2 Implications

Implications can be divided into two groups theoretical and managerial implications. The main theoretical implications were introduced as the contribution of the study. The main managerial implication comes from the fact that without Harland et al. (2004) model the researcher/development engineer was lost, he could not find the proper explanations why he failed or succeeded in his work as development engineer. The managerial implication concerning a supplier network engineer work recommends the use of the model of Harland et al. (2004). The model demands two explicit descriptions of the supplier network phenomenon, first how the supplier network context is structured and then what kind of supplier network activities it has. By this tight and loose representing process, a supply network development engineer is likely to gain wider and deeper view from phenomenon.

5.3 Evaluating the research

The Chapter “4.2.2 The quality of the using the model” presented validity and reliability of the use of Harland et al. (2004) model. This chapter analyses the quality of the ideas, which were produced as answers to the third research question Q(3).

The third question seeks external validity of the research, findings that can be generalizable beyond the model of Harland et al. (2004). As said in earlier chapter the term – external validity – is unambiguous. For example, Lukka & Kasanen (1995) found three different views of external validity, where the first one denied the possibility of generalization in case studies and the second one denied the rationale of the aim to generalize in case studies. This research has adopted the third definition of external validity of Lukka & Kasanen (1995), whereby the high quality case studies can produce generalizable research results, but not to be based to the statistical inference typical to modernism, but rather would be, in one way or another, “theoretical” or “analytical”. This research recommends three ideas to develop the logistic research and to help future researchers to gain better understanding of the supply network phenomenon.

The first idea

The Chapter “1.1. Background” presented two logistic academic literature themes 1) the need for theory development research in logistic and 2) need for explicit and careful ontological and epistemological debate. The findings of this research collaborated the statements of Spens and Kovacs (2006) – logistic literature knows articles where research approach is not documented in an explicit manner. For example the chosen model, the model of Harland et al. (2004), didn’t contain the explicit ontological or epistemological debate. The fact that a model has no explicit ontological or epistemological debate does not lower the value of it. A user of the model or framework or concept has to clarify scientific presumptions, even the ontological or epistemological debate is not documented in the original description of the model or framework or concept. The potential user group is wider, when a model or concept or framework does not document the ontological or epistemological debate – basically every researcher can premise presumptions so that they fit to his or hers own study.

The first idea, “a researcher has to document ontological and epistemological debate in an explicit manner, even the chosen model or concept or framework does not contain it” may seem to be anecdotic, because the value of explicit presumption is so obvious. However, logistic literature knows many models, frameworks, concepts, theories and methods without explicit and careful ontological and epistemological debate, that an inexperienced researcher might forget the value of ontological and epistemological debate.

The second idea

According to literature review of this study, it is difficult to find Finnish IEM dissertations or logistic literature articles, which aims to development theory or model of framework or concept written by another writer. The balance between the quantity of theory development research and the number of the research, which aims to develop new concepts or theories or frameworks or methods or models, does not support the logistic research development.

This study gain a lot of the aim “development of the model of Harland et al. (2004)”. First, without the model researcher could not understand the reasons why he succeeded or failed during this work as a development engineer of Firm. Secondly, the model gave strength to the construct validity.

Based to the twisted balance of logistic research scope and the experiences of this study the second idea is presented as follows: A logistic researcher should use guidance of logistic literature like theories or concepts or frameworks or methods

or models to strength the contract validity. There is a good possibility that the use of a new point of view could depend the understanding of the logistic phenomenon.

As the first idea, the second idea may seem to be anecdotic, because the value of “tested” point of view is so obvious. However, there are only a few logistics research papers, which are aimed at developing a framework or theories or concepts or methods or models by previous researchers.

The third idea

The third idea: the logistic case study researcher should use a technique or method to strengthen the reliability of the research. The tool, which connects the research findings and empirical framework into the same table (see Table 16), might be one possibility for this purpose, if he/she can not find or invent any other tool.

Reliability is s precondition for generalization (Lukka & Kasanen 1993, 1995), however there is a little to guide logistic researcher in how to strengthen the reliability of the research. This research introduced a tool for gaining better reliability in case study research (see table 16), even the value of the tool was not yet proven in the proper way, the logic of it is successfully and broadly used in other contexts of the academic literature.

6 CONCLUSIONS

This research started in fall 1999, when the researcher was hired to work as a development engineer. His tasks were to identify, prioritize and solve Firm's supply network challenges. After the work as a development engineer, the researcher had the opportunity to analyse what was done and, the researcher was especially interested in to find out why some of the development actions were successful and some were not. The researcher studied academic network literature, and in 2006 he found a model "A conceptual model for researching creation and operation of supply network" written by Harland et al. (2004). The model gave a rich new view of the case. The model fit with the development actions and provide a method by which researcher could understand why some of the development actions were successful and some were not.

The main purpose of this abductive descriptive case study is to produce ideas to the development of the logistic research process and to help future researchers to gain better understating of the supply network phenomenon. The development ideas are generated through pragmatic observations and the model of Harland et al. (2004). There are three levels of research questions. The value of the lowest level – the pragmatic findings of this research can be questioned, because the empirical framework is quite old.

The second level research questions Q(1) and Q(2) are dealing with the model of Harland et al (2004). The third level of research question seeks the external validity of the research, findings what are generalizable beyond the finding of use and analysing of the model of Harland et al. (2004).

Q(1): How useful is the model of Harland et al. (2004) to increase our understanding of supply network phenomenon?

Q(2): How can we develop the Harland et al. (2004) model to gain better understanding of the supply network phenomenon?

Q(3): What kind of a development ideas did the research produce to develop a logistic research process?

The answers of the first and second research questions

The thesis includes two descriptions of the researcher's phase of "work as a development engineer", the first one is chronological description of what happened in Firm's supply network during the years 1998–2001 and the second one is describing the same phenomenon from the Harland et al (2004) model point of

view. The first description demonstrates how the researcher saw the phenomenon before he used the model, and the second description emphasizes the issues that were produced by the model. The use of these two points of views brings forth the contributions that the model of Harland et al. (2004) can bring to research.

The model has a two-part nature. It is tight, because it determinates (exactly) four supplier network context factors and nine supplier network activities. The researcher had to rethink the phenomenon from a new point of view and this re-analysis was the most valuable contribution of the model. By this rethinking process, the researcher found one reason why he was sometimes able to reach the goal during the work as a development engineer, and why he sometimes failed to achieve his aims. The loose and emergent nature of the model gives to the researcher an opportunity to design the model's supplier network context and activities definitions so that they will fit well with the researcher and the studied supplier network. This loose and emergent or dynamic nature of the model brings certain requirements for the use of the model. The first two development ideas are convergent with these requirements.

The first development idea: The model should include an explicit statement, for example, this model is based on "these scientific presumptions" or "when the model is used by "these scientific presumptions" it has "these kinds of limitations and advantages"

and **the second development idea:** The model's dynamic nature is a strength, but it also leads to specific requirements. The user of the model has to pay extra attention to how the supplier network context, activities, actual analysis and the researcher's own background are defined or demonstrated. Another researcher should be able to follow the user's logic and find out how useful the model is to him/herself.

This stresses the fact that without proper scientific statements and supplier network definitions, the value of the dynamic model is only hypothetical.

The third development idea suggests that the supplier network context, as "the rules of the game", should be studied before the supplier network activities commence.

The fourth development idea demonstrates how the first and second research findings actually work.

Requirement 1 (see the first research finding): When the scientific presumptions are convergent with this research

Requirement 2 (see the second research findings): and when supplier network context and activities definitions and their analysis, and the background of the researcher are convergent with this research,

then conflict resolution is a good starting point of the supply network creation/operation phase and essential to realize the learning levels needed in the network conflict resolution.

The answer of the third research question

This research recommends three ideas to develop a logistic research process and to help future researchers to gain better understanding of the supply network phenomenon. The first idea: when a logistic research theory development is concern, a researcher has to document ontological and epistemological debate in an explicit manner, even the chosen model or concept or framework does not contain it. The second idea: A logistic researcher should use guidance of logistic literature like theories or concepts or frameworks or methods or models to strength the contract validity, even if the main purpose of the research is a development of a new theory. It has a good possibility that the use of a new point of view could depend on the understanding of the logistic phenomenon. The third idea: the logistic case study researcher should use a tool to strengthen the reliability of the research. The tool, which connects the research findings and empirical framework into the same table (see Table 16), might be one possibility for this purpose, if he/she cannot find or invent any other tool.

Suggestions for future research

The role of the scientific presumptions of the model needs to be studied in a more detailed manner. What kinds of pros and cons and limitations different scientific presumptions will adduce to research of supply networks need to be considered?

This research studied the views that were provided by the Harland et al. (2004) model. It is important to study what kinds of new views the other models and tools can provide to the mentioned model.

Every supply network is a unique case. The model of Harland et al. (2004) is not described in a detailed way, and this “not so detailed description” gives to a researcher space to discover the best way to study his or her supply network. However, from a young researcher’s point of view, this discovering-around might be quite challenging. There are two generalizable findings in this study concerning the use of the model of Harland et al. (2004): the order of studying the context of the supply network before the supply network creations/operations, and that a

good starting point of the research is conflict resolution, when the aim of the research is action research oriented. In the future, other more detailed instructions should be developed and studied closely, for example, how the aim of the research will affect the order of the studied supply network creations/operations, and whether constructive, layered theories such as Schein's (1992) (Figure 20) could give guidance to the efficient use of the models. Figure 47 demonstrates the logic of the Firm's supply network conflict resolution; the generalizability of this logic should also be under closer study in the future.

Table 16 demonstrates a tool for gaining better reliability in case study research, but the value of the tool was not yet been proven in the proper way. The logic of the tool is successfully and broadly used in other contexts of this research, and there might be a possibility to gain better reliability through it in a general case study context. Reliability plays such a crucial role in a case study that every way to increase the reliability of a case study should be studied more closely.

Finnish IEM dissertations have a tradition of following a structure, which has its basis in positivism. This structure does not describe an inductive or abductive research process, where a research study starts with empirical observations. A non-traditional IEM-dissertation structure, which integrates an empirical and theoretical framework might give a more solid and coherent view. However, this non-traditional way is rarely used in IEM dissertations, and it should be studied more deeply to find out whether it could give a more solid and coherent view of how research process proceeded.

REFERENCES

- Aastrup, J. & Halldórsson, Á. (2008). Epistemological role of case studies in logistics: A critical realist perspective. *International Journal of Physical Distribution & Logistics Management* 38 (10), 746–763.
- Alajoutsijärvi, K. Möller, K. & Tähtinen, J. (2000). Beautiful exit: how to leave your business partner. *European Journal of Marketing* 34(11), 1270–1290.
- Alasoini, T. (2000). *Suomalainen Työelämän Kehittämiskokeilu 1996–1999. Kokemuksia, Näkemyksiä ja Tuloksia. Kansallisesta työelämän kehittämisohjelmasta*. Helsinki, Työministeriö, raporteja 11.
- Alvarstein, V. & Johannesen, L. (2001). Problem-based learning approach in teaching lower level logistics and transportation. *International Journal of Physical Distribution & Logistics Management* 31(7/8), 557–573.
- Anderson, L., Krathwohl, R., Airasian, R., Cruikshank, K., Mayer, R., Pintrich, P., Raths, J. & Wittrock, M. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Addison Wesley Longman, Inc.
- Ang, L. & Taylor, B. (2005). Managing customer profitability using portfolio matrices. *Journal of Database Marketing & Customer Strategy Management* 12(4), 298–304.
- Appelqvist, P. (2005). *Matching Customer Demand, Offering Portfolio and Operations System in Technology-Intensive Industries*. Doctoral Dissertation Series No 5, Helsinki University of Technology, Department of Industrial Engineering and Management.
- Arbnor, I. & Bjerke, B. (1997). *Methodology for Creating Business Knowledge*. Sage Publications.
- Arlbjorn, J. & Halldorsson, A. (2002). Logistics knowledge creation: reflections on content, context and processes. *International Journal of Physical Distribution & Logistics Management* 32(1), 22–40.
- Arlbjorn, J. & Halldorsson, A. (2008). Epistemological role of case studies in logistics. A critical realist perspective. *International Journal of Physical Distribution & Logistics Management* 38(10), 746–763.
- Argyris, C. & Schön, D. (1978). *Organizational Learning: A Theory of Action Perspective*. London: Addison-Wesley.
- Argyris, C. & Schön, D. (1996). *Organizational Learning II.: Theory, Method and Practice*. London: Addison-Wesley.

- Auramo, J. (2006). *Implications of Supply Chain Visibility: Benefits in Transaction Execution and Resource Network Management*. Doctoral dissertation series No 2, Helsinki University of Technology, Department of Industrial Engineering and Management.
- Bessant, J., Kaplinsky, R. & Lamming, R. (2003). Putting supply chain learning into practice. *International Journal of Operations & Production Management* 23(2), 167–184.
- Blacker, F., Crump, N. & McDonald, S. (1998). Knowledge, organizations and competition. In G. Von Krogh, J. Roos & D. Kleine (Eds), *Knowing in Firms: Understanding, Managing, and Measuring Knowledge*, 26–66. Thousand Oaks, CA: Sage.
- Bloom, B., Engelhart, M., Furst, E., Hill, W. & Krathwohl, D. (1956). Taxonomy of educational objectives: The classification of educational objectives. *Handbook I: Cognitive Domain*. New York: David McKay.
- Calabrese, G. (2000). Small -medium supplier-buyer relationships in the car industry: evidence from Italy. *European Journal of Purchasing and Supply Management* 6, 59–65.
- Carr, A. & Pearson, J. (1999). Strategically managed buyer-seller relationship and performance outcomes. *Journal of Operation Management* 17(5), 497–519.
- Christopher, M. (2000) The agile supply chain. *Industrial Marketing Management* 29, 37–44.
- Cigolini, R., Cozzi, M. & Perona, M. (2004). A new framework for supply chain management. *International Journal of Operations & Production Management* 24(1), 8–41.
- Coase, R. (1937). The nature of the firm. *Economica* 4(16), 386–405.
- Collin, J. (2003). *Selecting the Right Supply Chain for a Customer in Project Industry. An Action Research Study in the Mobile Communications Infrastructure Industry*. Phd thesis, Helsinki University of Technology, Department of Industrial Engineering and Management.
- Cousins, P. (2001). A conceptual model for managing long-term inter-organizational relationships. *European Journal of Purchasing & Supply Management* 8, 71–82.
- Cousins, P. (1999). Supply base rationalisation: myth or reality? *European Journal of Purchasing and Supply Management* 5, 143–155.
- CSCMP (2009). *CSCMP's Definition of Logistics Management*. Cited in April 2009 <http://cscmp.org/aboutcscmp/definitions.asp>.

- Danese, P. (2006). The extended VMI for coordinating the whole supply network. *Journal of Manufacturing Technology Management* 17(7), 888–907.
- Disney, S. & Towill, D. (2003). Vendor-managed inventory and bullwhip reduction in a two-level supply chain. *International Journal of Operations & Production Management* 23(6), 625–51.
- Dupois, A. & Gadde, L-E. (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research* 55, 553–560.
- Eisenhardt, K. (1989). Building Theories from case study research. *Academy of Management Review* 13(4), 532–550.
- Ellram, L., Tate, W. & Carter, C. (2007). Product-process-supply chain: an integrative approach to three-dimensional concurrent engineering. *International Journal of Physical Distribution & Logistics Management* 37(4), 305–330.
- Feller, J. (2004). *Essays on Process Learning in R&D Alliances*. Doctoral Dissertation Series 2. Helsinki University of Technology, Department of Industrial Engineering and Management.
- Fine, C. (1998). *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*. Massachusetts: Perseus Publishing.
- Fine, C. (2000). Clockspeed-based strategies for supply chain design. *Production and Operation Management Society* 9(3), 213–221.
- Finnish IEM Research School (2004). *Mitä on tuotantotalous?* Cited in April 2007 from: <http://www.tuta oulu.fi/tuta/mitaon.html>.
- Fisher, M. (1997). What is the right supply chain for your product? *Harvard Business Review*, 105–116.
- Ford, N. (2004). Towards a model of learning for educational informatics. *Journal of Documentation* 60 (2), 183–225.
- Gadde, L. & Snehota, I. (2000). Making the most of supplier relationships. *Industrial Marketing Management* 29, 305–316.
- Garg, D., Narahari, Y. & Viswanadham, N. (2006). Achieving sharp deliveries in supply chains through variance pool allocation. *European Journal of Operational Research* 171(1), 227–254.
- Garver, G. & Mentzer, J. (1999). Logistics research methods: employing structural equation modelling to test for construct validity. *Journal of Business Research* 20(1), 33–57.

- Giunipero, L., Handfield, R. & Eltantawy, R. (2006). Supply management's evolution: key skill sets for the supply manager of the future. *International Journal of Operations & Production Management* 26(7), 822–844.
- Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal* 38(1), 85–112.
- Gulati, R., Nohria, N. & Zaheer, A. (2000). Strategic networks. *Strategic Management Journal* 21, 203–215.
- Gummesson, E. (2000). *Qualitative Methods in Management Research*. 2nd ed. London: Sage Publications.
- Gunasekaran, A. & Ngai, E. (2004). Information systems in supply chain integration and management. *European Journal of Operational Research* 159, 269–295.
- Haapalainen, P. (2007). *Learning within Projects. A Qualitative Study of How Learning Contributes to Knowledge Management in Inter-organizational Construction Projects*. Acta Wasaensia No 179. Industrial management 14.
- Hagel III, J. & Singer, M. (1999). Unbundling the corporation. *Harvard Business Review* 77 (2), 133–41.
- Halinen, A. & Törnroos, J. (2005). Using case methods in the study of contemporary business networks. *Journal of Business Research* 58, 1285–1297.
- Halldorsson, A., Kotzab, H., Mikkola, J. & Skjøtt-Larsen, T. (2007). Complementary theories to supply chain management. *Supply Chain Management: An International Journal* 12(4), 284–296.
- Handfield, R. & Nichols, E. (2004). Key issues in global supply base management. *Industrial Marketing Management* 33, 29–35.
- Harland, C. (1996). Supply chain management: relationship, chains and networks. *British Journal of Management* 7(1), 63–80.
- Harland, C., Caldwell, N., Powell, P. & Zhen, J. (2007). Barriers to supply chain information integration: SMEs adrift of eLands. *Journal of Operation Management* 25(6), 1234–1254.
- Harland, C., Lamming, R. & Cousins, P. (1999). Developing the concept of supply strategy. *International Journal of Operations and Production Management* 19, 650–673.
- Harland, C., Lamming, R., Zheng, J. & Johnsen, T. (2001). A taxonomy of supply network. *The Journal of Supply Chain Management* 37(4), 21–27.

- Harland, C., Zheng, J., Johnsen, T. & Lamming, R. (2004). A conceptual model for researching the creation and operation of supply networks. *British Journal of Management* 15(1), 1–21.
- Hines, P. (1996). Purchasing for Lean Production: The new Strategic Agenda. *International Journal of Purchasing and Materials Management* 32(1), 2–10.
- Holmen, E., Pedersen, A-C. & Jansen, N. (2007). Supply network initiatives – a means to reorganise the supply base? *Journal of Business & Industrial Marketing* 22(3), 178–186.
- Holmen, P., Håkansson, H. & Pedersen, A-C. (2003). *Designing and Monitoring a Supply Network*. Lugano: 19th Annual IMP conference.
- Holmström, J. (1998). Implementing vendor-managed inventory the efficient way: A case study of partnership in the supply chain. *Production and Inventory Management Journal* 39(3), 1–5.
- Huemer, L., Von Krogh, G. & Roos, J. (1998). Knowledge and the Concept of Trust. In G. Von Krogh, J. Roos & D. Kleine (Eds), *Knowing in Firms: Understanding, Managing, and Measuring Knowledge*, 123–145. CA: Thousand Oaks, Sage.
- Håkansson, H. & Ford, D. (2002). How should companies interact in business networks? *Journal of Business Research* 55(2), 133–139.
- Håkansson, H. & Snehota, I. (1995). *Developing Relationships in Business Networks*. Hampshire: John Wiley & Sons.
- Iskanius, P. (2006). *An Agile Supply Chain for a Project-oriented Steel Product Network*. Oulu: Acta Universitatis Ouluensis. Series C 250. Oulu University Press.
- Johnson, M. & Selnes, F. (2004). Customer portfolio management: Toward a dynamic theory of exchange relationships. *Journal of Marketing* 68(2), 1–17.
- Johnson, M. & Selnes, F. (2005). Diversifying your customer portfolio. *MIT Sloan Management Review* 46(3), 11–14.
- Jokinen, T. (2004). *Managing Quality Inside a High-Technology Project Organization*. Oulu: Acta Universitatis Ouluensis. Series C 200. Oulu University Press.
- Karagiannopoulos, G., Georgopoulos, N. & Nikolopoulos, K. (2005). Fathoming Porter's five forces model in the internet era. *Info – The Journal of Policy, Regulation and Strategy for Telecommunications* 7(6), 66–76.
- Kasanen, E., Lukka, K. & Siitonen, A. (1991). Konstruktiivinen tutkimusote liiketalous- tieteessä. *Liiketaloudellinen aikakauskirja* 40, 301–329.

Kasanen, E., Lukka, K. & Siitonen, A. (1993). The Constructive Approach in Management Accounting Research. *Journal of Management Accounting Research* Fall, 243–264.

Kaski, T. (2002). *Product Structure Metrics as an Indicator of Demand-supply Chain Efficiency: Case Study in the Cellular Network Industry*. PhD thesis, Helsinki University of Technology, Department of Industrial Engineering and Management.

Kasvi, J. (2003). *Knowledge Support in Learning Operative Organizations*. PhD Thesis, Helsinki University of Technology, Department of Industrial Engineering and Management.

Kekäle, T. (2001). Construction and triangulation: weaponry for attempts to create and test theory. *Management decision* 39(7), 556–563.

Kim, D., Cavusgil, S. & Calantone, R. (2005). The role of information technology in supply-chain relationships: does partner criticality matter? *Journal of Business & Industrial Marketing* 20(4/5), 169–178.

Kleemola, A. (2005). *Group Benchmarking as a Model for Knowledge Creation in Supply Management Context*. PhD Thesis, Tampere: Tampere University of Technology. Publication 555.

Knoppen, D. & Christiaanse, E. (2007). Supply chain partnering: a temporal multidisciplinary approach. *Supply Chain Management: An International Journal* 12(2), 164–171.

Kocabasoglu, C. & Suresh, N. (2006). Strategic sourcing: An empirical investigation of the concept and its practices in U.S. manufacturing firms. *The Journal of Supply Chain Management* 42(2), 4–16.

Kotabe, M., Martin, X. & Domoto, H. (2003). Gaining from vertical partnerships: knowledge transfer, relationship duration, and supplier performance improvement in the U.S. and Japanese automotive industries. *Strategic Management Journal* 24(4), 293–316.

Kovács, G. & Spens, K. (2005). Abductive reasoning in logistics research. *International Journal of Physical Distribution & Logistics Management* 35(2), 132–144.

Krathwohl, D., Bloom, B. & Masia, B. (1964). *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook II: The Affective Domain*. New York: David McKay.

Krause, D. (1999). The antecedents of buying firms, efforts to improve suppliers. *Journal of Operations Management* 17(2), 205–224.

- Kulmala, H. (2003). *Cost Management in Firm Network*. PhD Thesis. Tampere: Tampere University of Technology. Publication 418.
- Lambert, D. & Cooper, M. (2000). Issues in supply chain management. *Industrial Marketing Management* 29, 65–83.
- Lambert, D., García-Dastugue, S. & Croxton, K. (2008). The role of logistics managers in the cross-functional implementation of supply chain management. *Journal of Business Logistics* 29(1), 113–132.
- Lambert, D. & Pohlen, T. (2001). Supply chain metrics. *International Journal of Logistics Management* 12(1), 1–19.
- Lamming, R., Johnsen, T., Zeng, J. & Harland, C. (2000). An initial classification of supply networks. *International Journal of Operations & Production Management* 20 (6), 675–691.
- Lancioni, R., Schau, H. & Smith, M. (2003). Internet impacts on supply chain management. *Industrial Marketing Management* 32(3), 173–175.
- Larson, P. & Halldorsson, A. (2002). What is SCM? And, where is it? *The Journal of Supply Chain Management* 38(4), 36–44.
- Lehtinen, U. (2001). *Chancing Subcontracting – A Study on the Evolution of Supply Chains and Subcontractors*. Acta Universitatis Ouluensis. Series G 9.
- Lewin, K. (1945). The research centre for group dynamics a massachusetts institute of technology. *Sociometry* 8(2), 126–36.
- Li, M. & Gao, F. (2003). Why Nonaka highlights tacit knowledge: a critical review. *Journal of Knowledge Management* 7(4), 6–14.
- Liliecreutz, J. (1998). Orchestrating resource base, role and position: a supplier's strategy in buyer-dominated relationships. *European Journal of Purchasing and Supply Management* 4, 73-85.
- Lukka, K. (1991). Laskentatoimen tutkimuksen epistemologiset perusteet. *Liiketaloudellinen aikakauskirja* 40 (2), 161–186.
- Lukka, K. & Kasanen, E. (1993). Yleistettävyyden ongelma liiketaloustieteessä. *Liiketaloudellinen aikakauskirja* 42(4), 348–381.
- Lukka, K. & Kasanen, E. (1995). The problem of generalizability: anecdotes and evidence in accounting research. *Accounting, Auditing & Accountability Journal* 8(5), 71–90.
- Lytras, M. & Pouloudi, A. (2006). Towards the development of a novel taxonomy of knowledge management systems from a learning perspective: an integrated

approach to learning and knowledge infrastructures. *Journal of Knowledge Management* 10(6), 64–80.

Lytras, M., Pouloudi, A. & Poulymenakou, A. (2002). Dynamic e-learning settings through advanced semantics: The value justification of a knowledge management oriented metadata schema. *International Journal on E-Learning* 1(4), 49–61.

Maaloe, E. (1997). *Case Studier – af og om Mennersker I Organisationer*. Aarhus: Akedemisk Forlag.

Mabert, V., Soni, A. & Venkataramanan, M. (2003). Enterprise resource planning: managing the implementation process. *European Journal of Operational Research* 146(2), 302–314.

Maguire, S., Koh, S. & Magrys, A. (2007). The adoption of e-business and knowledge management in SMEs. *Benchmarking: An International Journal* 14(1), 37–58.

Maunu, S. (2003). *Supplier Satisfaction: The Concept and a Measurement System. A Study to Define the Supplier Satisfaction Elements and Usage as a Management Tool*. Acta Universitatis Ouluensis. Series C 190.

McElroy, M. (2003). *The New Knowledge Management: Complexity, Learning, and Sustainable Innovation*. Boston: Butterworth-Heinemann.

McGee, J. & Thomas, H. (2007). Knowledge as a lens on the jigsaw puzzle of strategy. Reflections and conjectures on contribution of knowledge – based view to analytic models of strategy management. *Management Decision* 45(3), 539–563.

McGinnis, F. & McCarty, L. (1998). Strategic account management in the new procurement environment. *Supply Chain Management* 3(1), 12–17.

McIvor, R. & Humphrey, P. (2004). The implications of electronic B2B intermediaries for the buyer–seller interface. *International Journal of Operations and Production Management* 24 (3), 241–269.

Mentzer, J. & Flint, D. (1997). Validity in logistics research. *Journal of Business Research* 18(1), 199–216.

Mentzer, J., DeWitt, W., Keebler, J., Min, S., Nix, N., Smith, C. & Zacharia. Z. (2001). Defining supply chain management. *Journal of Business Logistics* 22(2), 1–25.

Mentzer, J. & Kahn, K. (1995). A Framework of logistics research. *Journal of Business Research* 55, 553–560.

Min, S. & Mentzer, J. (2004). Developing and measuring supply chain management concepts. *Journal of Business Logistics* 25(1), 63–99.

Montgomery, A., Holcomb, M. & Manrodt, K. (2001). *Visibility, Tactical Solutions, Strategic Implications*. Year 2002 Report on Trends and Issues in Logistics and Transportation; Cap Gemini Ernst & Young, Georgia Southern University and University of Tennessee.

Neilimo, K. & Näsi, J. (1980). *Nomoteettinen tutkimusote ja suomalaisen yrityksen taloustiede: Tutkimus positivismin soveltamisesta*. Tampere: Tampereen yliopiston julkaisuja. Sarja A 1 2:12.

Nonaka, I. & Takeuchi, H. (1995). *The Knowledge-creating Company: How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press.

Ogden, J. (2006). Supply base reduction: An empirical study of critical success factors. *Journal of Supply Chain Management* 42(4), 29–39.

Olkkonen, T. (1993). *Johdatus teollisuustalouden tutkimustyöhön*. Otaniemi: Helsinki University of Technology.

Paliszkievicz, J. (2011). The knowledge management processes in medium enterprises in example of Polish enterprises. *International Journal of Innovation and Learning* 9(4), 435–450.

Paulraj, A. & Chen, I. (2007). Strategic buyer-supplier relationships, information technology and external logistics integration. *The Journal of Supply Chain Management* 43(2), 2–14.

Pidduck, A. (2006). Issues in supplier partner selection. *Journal of Enterprise Information Management* 19(3), 262–276.

Pihlanto, P. (1994). The action oriented approach and case Study method in management studies. *Skandinavian Journal of Management* 10(4), 369–382.

Pikka, V. (2007). *A Business Enabling Network. A Case Study of a High-tech Network; Its Concepts, Elements and Actors*. Acta Universitatis Ouluensis. Series C 267.

Porter, M. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: The Free Press.

Rahe, M. & Morales, C. (2005). Reducing resistance to change through knowledge management: A conceptual approach. *Research and Practice in Human Resource Management* 13(2), 49–64.

Rajagopal, & Rajagopal, A. (2006). Trust and cross-cultural dissimilarities in corporate environment. *Team Performance Management* 12(7/8), 237–252.

Robinson, L. & Bawden, D. (2002). Distance learning and LIS professional development. *Aslib proceedings* 54(1), 48–55.

Sahin, F. & Robinson, E. (2002). Flow coordination and information sharing in supply chains: review, implications and directions for future research. *Decision Sciences* 33(4), 505–536.

Samaranayake, P. (2005). A conceptual framework for supply chain management: a structural integration. *Supply Chain Management: An International Journal* 10(1), 47–59.

Sambasivan, M. & Yen, C. (2010). Strategic alliances in a manufacturing supply chain: Influence of organizational culture from the manufacturer's perspective. *International Journal of Physical Distribution & Logistics Management* 40(6), 456–474.

Sanchez, R. & Sanches, R. (2005). Analysis of customer portfolio and relationship management models: bridging managerial dimensions. *Journal of Business & Industrial Marketing* 20(6), 307–316.

Schein, E. (1992). *Organizational Culture and Leadership*. 2. Edition. San Francisco: Jossey-Bass.

Seggie, S., Kim, D. & Cavunsgil, S. (2006). Do supply chain IT alignment and supply chain interfirm system integration impact upon brand equity and firm performance? *Journal of Business Research* 59 (8), 887–895.

Senge, P. (1990). *The Fifth Discipline*. New York: Doubleday.

Sha, D. & Che, Z. (2006). Supply chain network design: partner selection and production/distribution planning using a systematic model. *Journal of the Operational Research Society* 57, 52–62.

Sistonen, H. (2006). *Information Sharing in R&D Collaboration – Context-dependency and Means of Governance*. Dissertation thesis. Lappeenranta: Lappeenranta University of Technology. Research papers 248.

Skjoett-Larsen, T., Threnoe, C. & Andersen, C. (2003). Supply chain collaboration, theoretical perspectives and empirical evidence. *International Journal of Physical Distribution & Logistics Management* 33(6), 531–549.

Småros, J. & Holmström, J. (2000). Viewpoint: reaching the consumer through e-grocery VMI. *International Journal of Retail & Distribution Management* 28 (2), 55–61.

Småros, J. (2005). *Information Sharing and Collaborative Forecasting in Retail Supply Chains*. Doctoral dissertation series 3, Helsinki University of Technology, Department of Industrial Engineering and Management.

- Snowden, D. (2000a). Organic knowledge management. *Knowledge Management* 3(7), 14–17.
- Snowden, D. (2000b). Organic knowledge management. *Knowledge Management* 3(9), 11–14.
- Snowden, D. (2000c). Organic knowledge management. *Knowledge Management* 3(10), 22–25.
- Spekman, R., Spear, J. & Kamauff, J. (2002). Supply chain competency: learning as a key component. *Supply Chain Management* 7(1), 41–55.
- Spens, K. & Kovács, G. (2006). A content analysis of research approaches in logistics research. *International Journal of Physical Distribution & Logistics Management* 36(5), 374–390.
- Spens, K. & Bask, A. (2002). Developing a framework for supply chain management. *International Journal of Logistics Management* 13(1), 73–88.
- Svensson, G., Slåtten, T. & Tronvoll, B. (2008a). “Scientific identity” and “ethnocentricity” in top journals of logistics management. *International Journal of Physical Distribution & Logistics Management* 38(8), 588–600.
- Svensson, G., Slåtten, T. & Tronvoll, B. (2008b). “Empirical characteristics” and “geocentricity” in “top” journals of logistics management. *The International Journal of Logistics Management* 19(3), 436–450.
- Stock, J. & Boyer, S. (2009). Developing a consensus definition of supply chain management: a qualitative study. *International Journal of Physical Distribution & Logistics Management* 39(8), 690–711.
- Sykes, W. (1990a). Validity and reliability in qualitative market research: a review of the literature. *Journal of the market research society* 32(3), 289–328.
- Sykes, W. (1990b). Taking stock: issues from literature on validity and reliability in qualitative research. *Journal of the market research society* 33(1), 3–12.
- Tikkanen, H. & Alajoutsijärvi, K. (2002). Customer satisfaction in industrial markets: opening up the concept. *Journal of Business & Industrial Marketing* 17(1), 25–42.
- Tokar, T. (2010). Behavioural research in logistics and supply chain management. *The International Journal of Logistics Management* 21(1), 89–103.
- Trim, P. & Lee, Y-I. (2006). Vertically integrated organizational marketing systems: a partnership approach for retailing organizations. *Journal of Business & Industrial Marketing* 21(3), 151–163.

Turnbull, P. & Zolkiewski, J. (1997). Profitability in customer portfolio planning”, in Ford D (Ed.) *Understanding Business Markets*. 2nd ed., London: The Dryden Press.

Uusipaavalniemi, S. (2009). *Framework for Analysing and Developing Information Integration: a Study on Steel Industry Maintenance Service Supply Chain*. Acta Universitatis Ouluensis. Series C 331.

Uusitalo, H. (1991). *Tiede, tutkimus ja tutkielma johdatus tutkielman maailmaan*. Juva: WSOY.

Uzzi, B. (1997). Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly* 42(1), 35–67.

Vance, C. & Paik, Y. (2005). Forms of host-country national learning enhanced MNC absorptive capacity. *Journal of Management Psychology* 20(7), 590–606.

Wang, D., Ip, W. and Yung, K. (2001). A heuristic genetic algorithm for subcontractor selection in a global manufacturing environment. *IEEE Transactions on Systems, Man, and Cybernetics – Part C* 31, 189–198.

Wang, L. (2007). *The Key Activities of Partnership Development in China – a Study of Sino-Finnish Partnerships*. Acta Universitatis Ouluensis. Series C 271.

Wankat, P. & Oreovicz, F. (1993). *Teaching Engineering*. NY: McGraw Hill.

Warkentin, M., Bapna, R. & Sugumaran, V. (2001). E-knowledge networks for inter-organizational collaborative e-business. *Logistics Information Management* 14(1/2), 149–163.

Venzin, M., Von Krogh, G. & Roos, J. (1998). Future research into knowledge management. In Von Krogh G, Roos J & Kleine D. (Eds.), *Knowing in Firms: Understanding, Managing, and Measuring Knowledge*, 26–66. CA: Thousand Oaks, Sage.

Williamson, O. (1983). Credible commitments: Using hostages to support exchange. *American Economic Review* 73(4), 519–540.

Virolainen, V-M. (1998). *Motives, Circumstances, and Success Factors in Partnership Sourcing*. Lappeenranta: Lappeenranta University of Technology. Dissertation thesis. Research papers 71.

Yee, C. & Tan, K. (2004). A process and tool for supply network analysis. *Industrial Management & Data Systems* 104(4), 355–363.

Yin, R. (2003). *Case Study Research. Design and Methods*. CA: Sage Publications.

York, D. & Droussiotis, G. (1994). The use of customer portfolio theory, an empirical survey. *Journal of Business & Industrial Marketing* 9(3), 6–18.

Zgodavová, K., Kosc, P. & Kekäle, T. (2001). Learning before doing: utilising a co-operative role play for quality management in a virtual organisation. *Journal of Workplace Learning* 13(3), 113–119.

Zheng, J., Harland, C., Johnsen, T. & Lamming, R. (1999). Methodological issues in inter-organisational supply networks research. In: E. Bartezzaghi et. al (Eds) *Managing Operations Networks* Venice: EUROMA 111–119.