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ANTTI KUUSISTO
COOPERATION AND CONTRACT MODELS IN COMPLEX
PROJECT NETWORKS

Master of Science Thesis

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Tässä diplomityössä on tutkittu yhteistyötä ja sopimusmalleja kompleksisissa projektiverkostoissa. Motivaatio tutkimuksen toteuttamiseen perustui kohdeyrityksen kokemuksiin haastavista projektitoteutuksista, jotka olivat sisältäneet vaikeuksia urakoitsijayhteistyössä. Kohdeyritys oli myös havainnut, että käytetyt sopimusmallit eivät aina kannusta urakoitsijoita olemaan yhteistyökykyisiä ja motivoituneita saavuttamaan asetetut projektin tavoitteet. Tämän takia tutkimuksen tavoite oli löytää toimintatapoja, joilla voitaisiin saavuttaa parempi suorituskyky projektitoteutuksessa kehittämällä urakoitsijayhteistyötä ja valitsemalla sopivat sopimusmallit urakoitsijoille.

Diplomityö toteutettiin case-tutkimuksena. Tutkimusprosessi koostui tieteellisen taustan tutkimisesta, projekteihin liittyvään materiaaliin tutustumisesta, haastattelujen toteuttamisesta, kerätyn aineiston analysoinnista ja toimenpide-ehdotuksista aikaisempien käytäntöjen kehittämiseksi. Valitut kuusi projektia sisälsivät onnistuneita ja haastavia projekteja, mikä mahdollisti laajemman näkemyksen vastata tutkimuskysymyksiin. Tutkimuksessa tehtiin yhteensä 12 semi-strukturoitua haastattelua, kun jokaisesta projektista valittiin kaksi haastateltavaa. Perusteltu vastaaminen tutkimuskysymyksiin mahdollistettiin vertailemalla tieteellistä taustaa ja empiiristä dataa.

Tutkimustulokset painottavat urakoitsijayhteistyön ja sopimusmallin soveltuvuuden tärkeyttä projektitoteutuksessa. Urakoitsijayhteistyön huomattiin kasvavan valitsemalla aikaisemmin hyvää yhteistyötä tehneitä urakoitsijoita, aikaisella yhteisellä suunnittelulla ja käyttämällä taloudellisia motivointikeinoja. Tiedonjaon määrän ja laadun huomattiin olevan enemmän riippuvaista sopimusmallin valinnasta. Tutkitut sopimusmallit olivat kiinteän hinnan sopimus, yksikköhintasopimus, kulukorvaussopimus, avoimen kirjan sopimus ja allianssisopimus. Tutkimus näyttää, että nykyinen enemmän hintaan perustuva sopimus ei takaa hyvää urakoitsijayhteistyötä, mikä korostaa yhteistyötä edistävien sopimuksien käyttöä. Sopimuksen hyvää toimeenpanoa edistävät urakoitsija-arviointi, aikainen suunnittelu, yhteistyön motivointikeinojen käyttö, yhteinen sopiminen projektin aikana ja projektin arviointi sen päätyttyä. Näiden tekijöiden toimeenpanon oletetaan olevan todennäköisempää yhteistyötä edistävillä sopimuksilla kuin nykyisillä sopimuksilla.

ABSTRACT

ANTTI KUUSISTO: Cooperation and contract models in complex project networks

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This thesis examined cooperation and contract models in complex project networks. The motivation to conduct this research originated from challenging projects that had included struggles with contractor cooperation and project execution. Additionally, the target company of this thesis had experienced that currently used contracts do not always encourage contractors to be cooperative and motivated to meet the mutual project objectives. Therefore, the research objective was determined to find practices that could enhance overall performance in project execution by improving contractor cooperation and selecting the most appropriate contract models for contractors.

This research was conducted as a case study. Research process consisted of analyzing scientific theory, examining target company's case materials, conducting interviews, analyzing the collected research data and suggesting improvements for future practice. The selected six projects consisted of successful and challenging projects, which enabled answering research questions in a comprehensive fashion. Two persons were selected from each project and thus 12 semi-structured interviews were conducted. By comparing scientific theory and empirical material, answers for the research questions were formed.

Research results emphasize the importance of contractor cooperation and suitability of the contract model on the success of project execution. Contractor cooperation in project network is improved by using familiar contractors, pursuing early planning together and using financial drivers. However, information sharing is more dependent on the selected contract model. Evaluated contract models in this research were fixed price contract, unit price contract, cost-reimbursable contract, open book policy and alliance model. Analysis regarding alternative contract models shows that the currently used price-oriented contracts do not ensure high level contractor cooperation consistently, which emphasizes the need of using cooperation-enhancing contract models. Implementing contract models into practice should consider contractor evaluation, early planning, providing drivers for cooperation, using relational governance methods in project execution and evaluating project thoroughly after completion. This research shows that implementing these factors is more likely with cooperation-enhancing contract models than the currently used price-based contract models.

PREFACE

This thesis work was a challenging process that has now reached its end after almost six months. Simultaneously, my studies at Tampere University of Technology are finished and a full-on shift to working life is ahead.

First, I want to thank the examiner of this thesis Professor Jussi Heikkilä for all guidance and helpful comments during this research project. In a similarly significant fashion, I want to thank my instructors from the target company, Suvi and Pekko, for all the support, advice and help throughout this process. Special thanks go also to all interviewees who participated in this research with great cooperativeness and enthusiasm. Lastly, I want to thank the people from my personal life, who supported me in the more challenging times too.

Overall, I am excited to pursue new challenges at work and have some thesis-free weekends again.

Tampere, 15.9.2018

Antti Kuusisto

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LIST OF TERMS AND ABBREVIATIONS

EPC	Engineering, Procurement and Construction
Construction	Construction activities that include erection, installation and assembly works
Fixed price contract	An arrangement where contractor accepts to meet the contract terms with a firm price that is agreed mutually with the buyer.
Unit price contract	An arrangement where contractor gets payment for every finished unit of work that is based on an estimate.
Open book policy	A policy of revealing all possible financial data from the supply chain among the parties in a contract.
Alliance model	An arrangement where risks, gains and fails are shared by defining an agreement that is suitable for all contractual parties.

1. INTRODUCTION

1.1 Background and motivation

Pursuing cooperative relationships is seen to be extremely rare in the construction industry (Jiang et al. 2012). Construction projects are often carried out in a project network, where multiple independent parties are forced to work together (Sydow & Staber 2002). Often it is seen that each contractor has their own reasons for participating in a project network, which might result in pursuing own objectives over the mutual project objectives (Tiwari & Gupta 2012). However, fostering cooperation has proved to be beneficial in carrying out projects in terms of cost reductions, schedule, quality and innovativeness (M. Cao & Zhang 2011). Therefore, more and more examination about possibilities of enhancing cooperation has been conducted in the construction industry (Pal et al. 2017).

Moeller et al. (2006) claim that the role of purchasing has changed into more strategic than before as the new approach consists of multiple relationship-developing elements. Thus, this research finds close cooperation between buyers and suppliers vital in order to be competitive. Hence, the target company of this thesis is looking for new cooperation-enhancing models and practices. By finding new approaches the target company could be more capable of meeting the determined project objectives.

Still, a successful execution of implementing a more cooperative relationship can be challenging and far from easy (Piercy 2009). For example, sharing gains from cooperation equally and fairly can be hard to fulfill, which may result in having negative effects on the buyer-supplier relationship (Lambert & Schwieterman 2012). Because of this, more focus should be put on contract management. It has been noticed in the research of this academic field that there is no information on how contracts could improve coordination and readiness towards adapting to sudden changes (Schepker et al. 2014). Consequently, it is relevant to investigate in this thesis if selecting the most appropriate contract model has a significant influence on improving contractor cooperation and at the same time contributes to a better project execution. Furthermore, finding answers to this could explain more thoroughly if factors not dependent on the most appropriate contract model have more significant impacts on the project outcome.

Motivation to conduct this research for the target company originates from executed complex projects, which contained challenges in cooperation with contractors. In addition to challenges in cooperation, there has been complexity associated with strategies how to make a contract that could be beneficial and motivating for both sides. These elements

related to project business have resulted in significant unexpected costs with project executions, which motivates the target company to react and plan preventive actions for these kinds of cases. Furthermore, target company's corporate strategy has stated that carrying out projects should be more transparent and predictable in the future. To meet this objective, more sustainable and effective supplier relationship management policies need to be implemented.

1.2 Research objective and expected results

The determined research objective is linked to the background of the target company. The main objective of this research is defined as:

The main objective of this research is to find practices how overall performance could be increased in project execution by developing contractor cooperation and selecting the most appropriate contract models for contractors.

Research objective is determined to be achieved by analyzing both scientific literature and case study based empirical material. The desired overall performance of the target company consists of several factors. Overall performance is determined to be increased by carrying out projects in schedule, within budget and with excellent quality. Additionally, increasing overall performance is defined to cover factors that improve communication, contribute to the ultimate goal of having no safety issues, increase innovativeness by being ready to sudden changes and result in sustainable long-term relationships with contractors. Thus, more competitive advantage can be achieved in the target company's market area.

Research results should also provide an action plan for the future. Thus, expected results of the research should determine guidelines that could enable a more fluent project execution. The created guidelines would possibly be used in decision-making with contractors in future projects.

1.3 Research questions

Three research questions are determined, which are linked to the objective of this research. The defined research questions are presented and explained below.

RQ1: How could cooperation be developed with contractors on complex project networks to positively influence on achieving project objectives?

With the first research question, the objective is to find characteristics and factors that could enhance cooperative behavior in target company's project network. Furthermore, answering this question sufficiently enables to have the information how contractors should be managed in the project network. Altogether, the found factors should encourage

contractors to a greater level of cooperativeness, which could contribute to having success in carrying out projects.

RQ2: What are the alternative contract models that could be used with contractors?

Answering the second research question enables having the information about contract models that could be used with different kinds of contractors. The objective is to find requirements, benefits and challenges related to all alternative contract models. Determined focus is set on evaluating contracts that are used currently but also contracts that could be viable options with future projects. Finally, the recommendations for using the evaluated alternative contract models are defined.

RQ3: What should be considered in implementing alternative contract models into practice to have positive effects on carrying out projects?

The third research question focuses on what factors should be considered in the implementation of suitable contract models. By recognizing the factors that have the greatest impacts, a higher likeliness of succeeding is enabled for a more fluent project execution.

1.4 Research context and limitations

The target company provides large scale technology solutions for the energy industry, which demands a wide range of skills in managing supplier base. To be successful in completing these projects on time and within budget, high levels of cooperation and coordination should be implemented in design, construction and completion phases. Projects are always customized based on customer needs and customers are located globally around the world, which results in additional levels of complexity for managing projects in line with expectations. Since these projects are always complex, proper planning and estimating is necessary for being successful.

As the first limitation, the focus is narrowed to target company - contractors interface. Therefore, this thesis has limited the clients outside the scope of research. Additionally, material suppliers and external engineering services are limited outside the scope of research. However, the effects of clients, material suppliers and engineering services should be kept in mind when the characteristics affecting the functioning of project network are evaluated. As another limitation, focus of this thesis is set on activities that affect work at construction site. The term construction in this thesis is defined to cover construction activities that include erection, installation and assembly works. This way the term construction is more applicable to the context of the target company. Figure 1 illustrates the network model that is present in all construction projects of the target company.

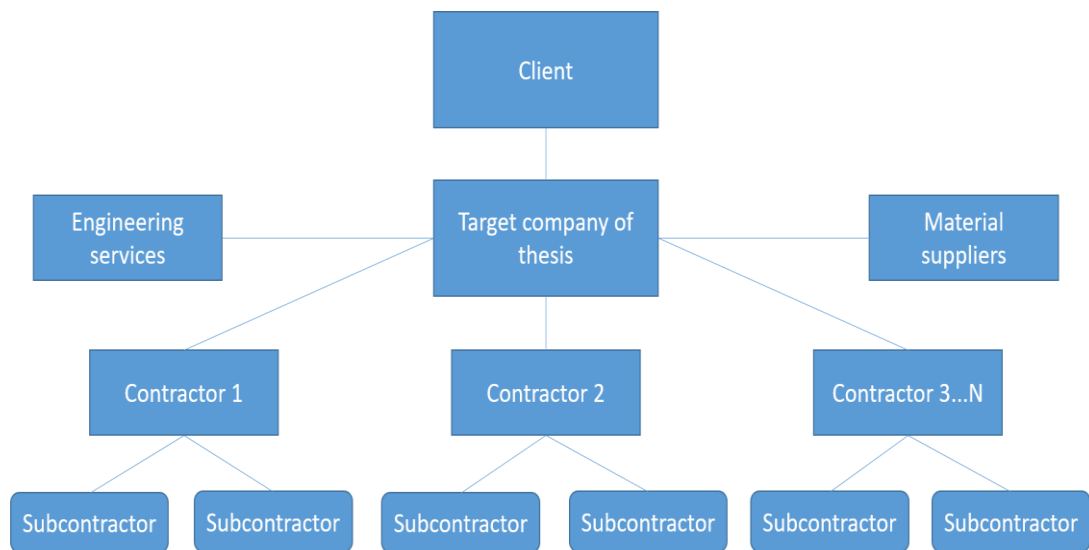


Figure 1. *Project network for the target company (altered from Naoum 1994).*

Figure 1 shows that the target company has multiple relationships to manage in every project, which increases the level of complexity in project execution from start to finish. Thus, the target company is participating in a project network, where multiple parties are working together and cooperating. The client has contracted the target company as the main contractor, who has the greatest responsibility of project outcome. The number of managed contractors and subcontractors in a project network is dependent on the individual characteristics of every project.

1.5 Structure of thesis

This thesis covers four chapters that are illustrated in Figure 2 below. The literature review part displays scientific theories linked to the research topic. In the chapter of research methodology part, the decisions and actions related to conducting this thesis work are explained. In the chapter of case study, the empirical findings are presented and explained clearly. Lastly, the chapter of discussion and conclusions is determined to compare the findings of literature review to the findings of this case study. The set research objective is determined to be met with this analysis. After Figure 2, the content of all chapters is explained in a more detailed fashion.

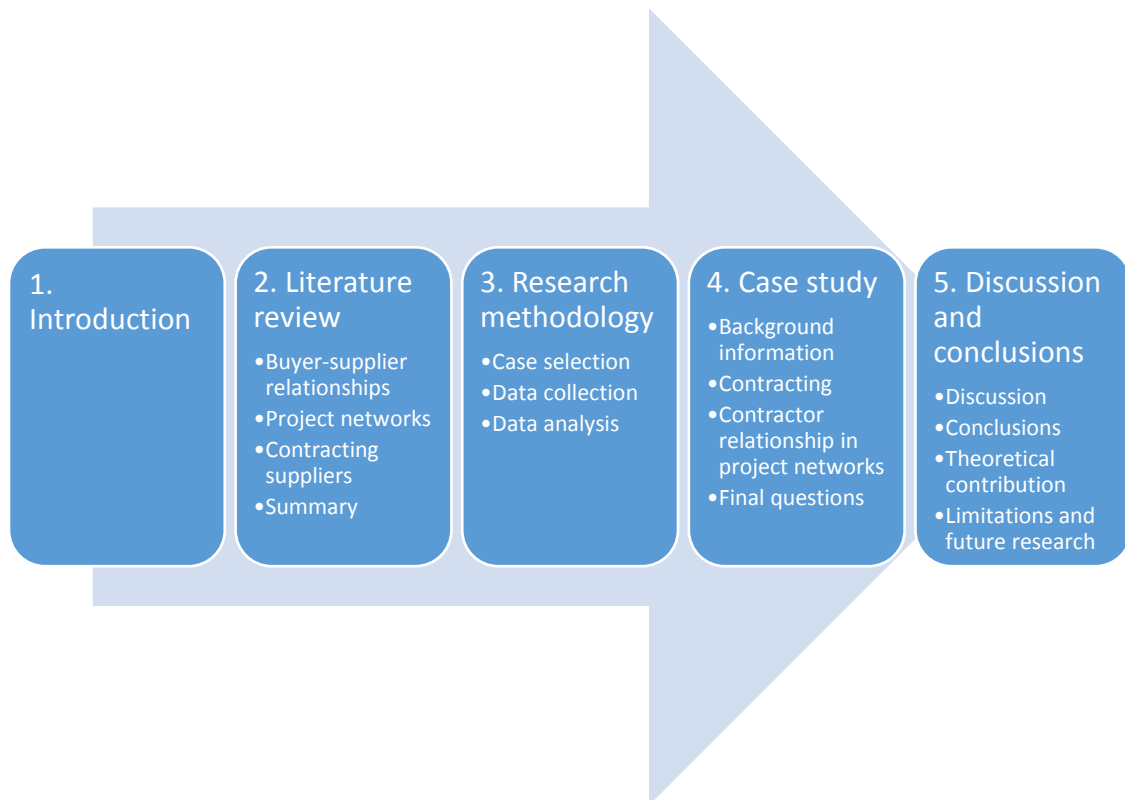


Figure 2. *Structure of the thesis*

Literature review consists of three separate parts that are buyer-supplier relationships, project networks and contracting suppliers. Each part consists of scientific articles that are selected to offer a theoretical viewpoint on answering the determined research questions. The covered topics in the part of buyer-supplier relationships are importance of purchasing, cooperation and characteristics affecting buyer-supplier relationships. The second part considers project networks where basics of project management, characteristics of construction industry and managing project networks in alternative ways are discussed. The third and last part of literature review is contracting suppliers, which covers themes of contract, contract management, selection criteria for contractors, alternative contracting approaches and alternative contract models. Each literature review part includes a summary that briefly wraps up the covered topics.

All activities regarding conducting this research are presented in the chapter of research methodology. First off, characteristics of this research are explained. After this, the research process is presented. This research process consists of case selection, data collection and data analysis. The choices regarding each research process stage are argued with scientific literature and other factors that affected conducting research.

Empirical material is discussed in the chapter of case study. This chapter covers four sections, which are background information, contracting, contractor relationships in project network and lastly summarizing final questions. Characteristics presented in these sections are categorized to successful and challenging projects.

The last chapter of discussion and conclusions is determined to summarize and analyze the covered research topic. The discussion part compares and analyzes the similarities and differences between literature review and empirical interview material. This discussion part seeks to answer the set three research questions in a thorough and reasoned fashion. After addressing the research questions, conclusions of this research are presented and theoretical contribution of this research is discussed. Lastly, the set research limitations and future research considerations are explained.

2. LITERATURE REVIEW

2.1 Buyer-supplier relationships

Three separate topics are discussed in this section of buyer-supplier relationships. After explaining the importance of purchasing, cooperation is defined and the characteristics affecting buyer-supplier relationship are covered. Lastly, a summary of covered themes is presented. In this thesis, a buyer-supplier relationship is defined to be between the target company and a contractor.

2.1.1 The importance of purchasing

Purchasing is stated to be of major importance for various organizations. By focusing strategically on purchasing, an organization makes gaining cost reductions possible and controls operations' costs in a better way. (Heikkilä et al. 2013, p. 8-9) According to Weele (2014, p. 3), the term of purchasing is defined below:

“The management of the company’s external resources in such a way that supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company’s primary and support activities is secured under the most favorable conditions.”

Weele (2014, p. 3) states that purchasing has received a major role in business management since the market conditions have become fiercer than before. Hence, proper cooperation with suppliers is needed as more than a half of total costs are stated to be purchased. Weele adds that handling purchasing activities enables an organization to be both profitable on short-term and achieve a stable competitive market position. (Weele 2014, p. 3) Heikkilä et al. (2013) state that purchasing can enable obtaining value for the purchasing organization in the form of innovativeness from suppliers, which can further support reaching a long-term position in the market regardless of the line of business. Based on this presented information, it can be assumed that purchasing has a major role in project business networks.

Managing purchasing activities in project networks and in the construction environment have some characteristics that are worth considering. According to Bemelmans et al. (2012) there has been a transition resulting in main contractors having a higher responsibility of completing the project as planned. However, main contractors might not always have all the skills and abilities to cope on their own. Thus, purchasing activities from other organizations is sometimes necessary. (Bemelmans et al. 2012) In addition, Martinsuo & Ahola (2010) see that a project execution linked to a high level of complexity requires the main contractor to purchase external expertise from suppliers.

One reason for a growing interest in developing buyer-supplier relationships is stated to be outsourcing (Krause et al. 2007). Outsourcing is described as a decision based on organization's strategy, where parts of current activities are performed externally. Thus, this organization relies on the external supplier to carry out these activities in line with set specifications and objectives. (Heikkilä & Ketokivi 2009, p. 138)

2.1.2 Cooperation

Currently, companies are having more and more intense competition in their own market segments. Thus, more efforts are made to enhance cooperativeness with other companies. Having proper cooperation with other parties might also lead to a more competitive position in long-term. (Naesens et al. 2009) There are multiple definitions for both cooperation and collaboration in scientific literature. However, the line between these two terms is seen unclear between different academic fields.

According to Dietrich et al. (2010), collaboration is defined as work towards mutual objectives, which mainly covers the elements of continuous information exchange and learning with the parties involved. However, this thesis finds cooperation to be a synonym for collaboration, which makes this definition valid for cooperation too. Practicing proper cooperative behavior in buyer-supplier relationships is stated to consist of seven important factors. This list is said to consist of exposing enough information, having mutual goals, joint decision-making procedures, determining fair incentives together, having joint resources, focusing on adequate communication among parties involved and lastly creating knowledge together. (M. Cao & Zhang 2011) In addition, both selecting the appropriate control mechanisms and commitment of directors or managers is seen vital, if cooperation is to be implemented properly (Gullett et al. 2009).

Scientific literature has found many benefits associated with managing buyer-supplier relationships in a cooperative fashion. By concentrating on the earlier listed seven factors, a buyer-supplier relationship could benefit from a higher level of effective communication, a lower likeliness of cost overruns and new innovative ideas for running operations (M. Cao & Zhang 2011). This supports the earlier presented claim of cooperation being something to go for in the purchasing activities too.

However, establishing a more cooperative relationship may not always be the best option for doing business, which has been evident in some attempts of pursuing partnerships (Lambert & Knemeyer 2004). It has been noticed that the desired level of cooperation and gains are not always met in a satisfactory manner. One explanation for this is seen to be the feeling of not benefiting similarly from the relationship as the other party involved. (Nyaga et al. 2010) Embarking on a partnership is often seen to be a high cost process, since it is often demands more than expected. Thus, a successful cooperative relationship should provide more benefits to the organization than the previously established relationship. (Lambert & Knemeyer 2004) As barriers for cooperation are claimed to be

a lack of organizational support, insufficient management skills and poor arrangements done in the buyer-supplier relationship (Patel et al. 2011). Thus, the characteristics having significant effects on the success and cooperation of buyer-supplier relationships are discussed next.

2.1.3 Characteristics affecting buyer-supplier relationships

In this part, characteristics affecting the success of buyer-supplier relationships are discussed. The discussed factors linked to cooperativeness are trust, commitment, communication, innovativeness and contextual factors, which are presented in Figure 3.

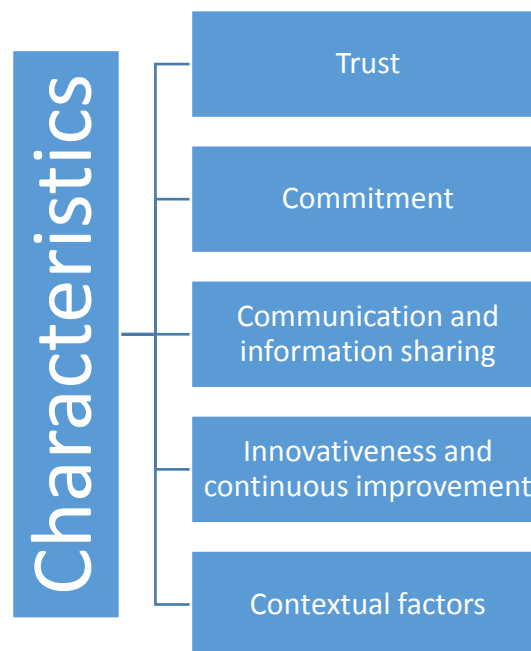


Figure 3. Characteristics affecting cooperation in buyer-supplier relationships.

Trust

Creating trust is claimed to be significant in managing buyer-supplier relationships. *Trust* is defined as buyer's expectation of supplier acting in the desired and agreed fashion, where neither party tries to exploit another unknowingly. (Sako & Helper 1998) Another definition says that trust is a perception of how parties see each other to have belief in one another and present good-natured behavior (Nyaga et al. 2010, originally Ganesan 1994). There are two forms of trust, which are inter-personal and inter-organizational trust. Recent academic literature has seen that business-oriented organizations are interested in both forms. (Sako & Helper 1998) Going for trust is also seen vital for the functioning of project networks (Sena Ferreira et al. 2012). The major risks of having too high a level of trust are the leaks of vulnerable business information and failures to meet the expected performance. Often these concerns are avoided with legal matters. (McCutcheon & Stuart 2000)

Still, there are multiple benefits related to establishing trust in buyer-supplier relationships. By putting more efforts in creating trust may lower the risks of failing in supplier governance. This study claims that trust can affect one's reputation, which accordingly should result in reducing supplier opportunism. (Johnson & Houston 2000) Furthermore, Ian Stuart et al. (2012) state that a good level of trust enables performance development in terms of gaining a better position in the market, achieving a higher level of customer satisfaction and enabling more profitable results.

In the construction sector, achieving trust between a client and a contractor is often a challenging process. The major reason for this challenge is the fact that unfamiliar organizations should cooperate and work together in projects that consist of great uncertainties with being successful. (Laan, Noorderhaven et al. 2011) Another notice of trust-building in the industrial sector is that the quality of products and consistency in delivering goods on time are major contributors to building trust (Ian Stuart et al. 2012).

Nyaga et al. (2010) see that the buyer usually experiences trust to influence more significantly on the satisfactoriness of a buyer-supplier relationship than suppliers do. In addition, trust is said to enable a situation, where hierarchical behavior is not needed in a large extent with managing suppliers. As a prerequisite for this is that there cannot be any signs of opportunism, when organizations are planning for business activities that require trust. (Sako & Helper 1998) Simultaneously, a successful relationship needs mutual respect for each other's opinions (Gullett et al. 2009).

Commitment

Commitment in this thesis is defined as continuous motivation towards maintaining and respecting the established relationship and the agreed specific characteristics (Graca et al. 2015, originally Moorman et al. 1993). Martinsuo & Sariola (2015) state that commitment is one factor having an influence on developing a cooperative relationship. Commitment of parties in a buyer-supplier relationship is significant in terms of lessening the amount of non-value added activities and boosting performance. This approach applies also to project business networks. (Mele 2011) Still, Gadde et al. (2010) point out the fact that in the construction sector it is not too common to make commitments to significantly cooperative relationships.

A steady relationship is stated to be vital in achieving long-term benefits from buyer-supplier relationships. The way parties see each other is extremely important in meeting the desired level of commitment. If one party feels like the other is not having the same objective, the level of satisfaction is claimed to drop significantly. Hence, both commitment and trust have significant roles in the likeliness of success. (Yang et al. 2008) Establishing a greater level of commitment to a buyer-supplier relationship might need a longer time than just one single project, which is seen as a typical issue with practicing business in the area of complex projects. Especially in a commitment-based relationship

cooperation is said to play a key role in the project execution stage. (Martinsuo & Ahola 2010)

A greater level of commitment is claimed to be an obvious consequence from having an optimal level of trust in a buyer-supplier relationship (Jiang et al. 2012). By having multiple positive encounters with one another, parties commit in a stronger way towards understanding each other's viewpoint and objectives. This approach includes taking possible varying cultural elements into account with decision-making procedures. Additionally, this kind of thinking is a majorly linked to so called relational social capital, which is seen as one way to manage buyer-supplier relationships. (Villena et al. 2011) Concentrating on enhancing the degree of social capital is usually linked to developing long-term relationships (Krause et al. 2007).

Communication and information sharing

Communication can be defined as the transfer of different forms of data, ideas and experiences that are discussed with project partners. This definition is present especially with construction projects, which applies very well to the context of the target company. (Hui et al. 2017, originally Tang et al. 2006)

Paulraj et al. (2008) state that a proper level of communication is a key element in achieving collaborative work and improved performance in buyer-supplier relationships. This article adds that communication may also lead to practices enabling better quality and readiness towards adapting to sudden changes. However, the earlier discussed trust does not always obligate one party to provide all the information in a buyer-supplier relationship. This approach is discussed later with the open book policy, where the amount of shared information variates based on the specific characteristics of a buyer-supplier relationship. (Romano & Formentini 2012).

Still, it is stated the level of information exchange should be open enough to achieve cooperation and the benefits it entails (Martinsuo & Sariola 2015). As an example, establishing a strategic alliance demands for several information channels, since the expected collaboration-related benefits from the relationship are higher (McCutcheon & Stuart 2000). The importance of open information exchange is discussed further with project networks in chapter 2.2.4, where the importance of communication and complexity rise in a significant fashion (Ruuska et al. 2009).

Innovativeness and continuous improvement

In the industrial sector, the constantly changing environment forces companies to be innovative. This approach is also stated to be a relevant source of gaining more competitiveness in any business environment. (Sena Ferreira et al. 2012) However, traditionally in the construction environment the level of innovativeness is recognized to be low (Scheublin 2001). Still, more and more clients are asking for innovative solutions

from contractors (Bemelmans et al. 2012). It has been noticed that the supplier's knowledge on their customer's processes and objectives enables a higher possibility to be innovative, which at the same time needs continuous and coherent communication in the buyer-supplier relationship (Pihlajamaa et al. 2016, originally Un et al. 2010). *Innovativeness* in buyer-supplier relationships is defined in this thesis as the scope of buyers working with suppliers to come up with new processes, products and services (M. Cao & Zhang 2011). Based on these articles, it can be stated that innovativeness may have effects on continuous improvement especially in terms of coming up with new better processes. Innovativeness in terms of continuous improvement is also one relevant element of lean thinking (Erik Eriksson et al. 2010), which is discussed more thoroughly in chapter 2.2.2.

According to Kim et al. (2015) the major limitation for being innovative is the lack of proper resources inside the organization. Thus, collaboration with suppliers is claimed to be essential in carrying out innovative solutions for processes, products or services (M. Cao & Zhang 2011). Patel et al. (2011) add that innovativeness is more likely to occur, when new ideas are shared in a collaborative working environment. Furthermore, concentrating on trust plays a key role for the generated innovativeness in buyer-supplier relationships (Sako & Helper 1998). Typically, the not so traditional contracting models with the nature of incompleteness are said have more positive effects on the amount of innovativeness (Sumo et al. 2016).

Contextual factors

Contextual factors are seen to have varying effects on project execution. Ruuska et al. (2013) see that contextual factors affecting buyer-supplier relationships can be categorized into four sections, which are the effect of clients, the effects of other suppliers, project-specific characteristics and the existing situation in the market. In this literature part the focus is on the dominant culture, the longitude of a buyer-supplier relationship and the amount of complexity involved in the situation.

Culture is seen to have a significant impact on buyer-supplier relationships. Especially culture-specific values and behaviors modify actions in practices and business operations. For example, in Asian cultures being loyal and putting more effort on long-term relationships is far greater than in Western cultures. (Hwang et al. 2013) Ruuska et al. (2011) see that the practices used for governing suppliers vary in different countries, which supports the importance of the dominant culture.

The *longitude of a buyer-supplier relationship* is seen to have an influence on the success of project execution. It is stated that the knowledge got from previous projects should be utilized in future projects to be more successful. (Ruuska et al. 2011) Furthermore, working together becomes more fluent as dominant practices become more familiar with a relationship that lasts longer (Gadde et al. 2010).

The *amount of complexity* sets guidelines for the practices that should be used in governing a buyer-supplier relationship. When the level of complexity gets higher more focus should be put on coordinating suppliers' activities. Mainly coordination is about sharing information in the buyer-supplier relationship. Especially utilizing and sharing tacit knowledge for both parties is vital, since finding mutual understanding is seen necessary in complex circumstances. Thus, a more close and cooperative relationship is often needed with the supplier. One way of lessening the amount of complexity is claimed to be using significant efforts on the documentation of organization's tacit knowledge. (Heikkilä et al. 2013, p. 135-136)

2.1.4 Summary

Managing buyer-supplier relationships has been a clear interest in the academic field in recent years. The inability of main contractor to possess all the information needed for project execution has resulted in a surge in purchasing activities externally from other organizations. Consequently, managing these relationships is vital for achieving the mutual project objectives. As the contextual factors of the target company are extremely complex, proper cooperation and coordination is needed. Pursuing higher levels of trust, commitment, communication and innovativeness are something to go for as they all are seen to theoretically contribute to carrying out projects in an improved fashion.

However, improving all the levels of characteristics affecting buyer-supplier relationships is far from easy because contractors might have their financial objectives in mind. Opportunistic behavior plays a huge role in making a beneficial cooperative relationship possible. In addition, trust and commitment are strongly linked to each other, where the achieved levels of both are dependent on the actions practiced by contractors. If opportunistic behavior occurs, trust and commitment in the relationship are damaged and simultaneously cooperative behavior decreases in a drastic way between parties involved. Furthermore, it can be claimed that pursuing opportunistic behavior may also diminish the openness of information exchange and communication. As being innovative needs close cooperation, having low levels of trust, commitment and information exchange can lead to being unsuccessful with producing innovative products, processes and procedures. Lastly, contextual factors such as culture, longitude of relationship and complexity of the situation add their own contribution to the level of facing difficulties.

As an assumption, there should be a clear motivation for contractors to pursue cooperative activities that could override the need for opportunism. The level of difficultness in managing buyer-supplier relationships rises significantly when the target company must monitor multiple parties simultaneously. Therefore, the importance of improving trust, commitment, communication, innovativeness and recognizing contextual factors in these relationships surge as the amount of complexity is greater.

2.2 Project networks

The second section to be discussed in this literature review is project networks. This part is determined to cover four parts, which are the basics of project management, characteristics of construction industry, managing project networks, alternative approaches for project network governance and lastly a summary of the introduced themes.

2.2.1 Project management

There are multiple definitions for a project in the academic field. An old definition describes a project to be a direct and clear concept that aims for achieving a specific goal by using significant coordination in human interaction (Bennett 1983). A more recent definition by Mele (2011) claims a project to be an event linked to handling products, services and work in a complex environment, where the ultimate goal is to deliver the wanted outcome to the end customer in terms of time and budget. Accordingly, projects are often considered to be temporary organizations, which seem to have an inter-organizational environment (Sydow & Braun 2018).

In literature, multiple objectives for project management are described. Already in the 1980s, the objectives of successful project management were based on aspects associated with time, financial outcome and quality that means performance in technical matters (Bennett 1983). In a supporting way, another study claims that staying in budget and keeping up with the determined schedule are seen to be the key traditional objectives of project management (Çebi & Otay 2015). Furthermore, one objective is to ensure a sufficient level of client satisfaction (Naoum & Egbu 2016). The person in charge should also be conscious of the fact that budget and schedule objectives need to be considered in decision-making simultaneously. However, coping with the hectic nature of a project execution might make this approach less likely to be achieved. (Çebi & Otay 2015)

Still, managing projects is noticed not to be an easy task because of various factors affecting the project execution stage. Organizations may confront difficult occasions because of the project's individual characteristics, uncertainties in the environment, scarce amount of resources, the scope of project and a high level of complexity. (Çebi & Otay 2015) In management literature, identifying key success factors for project completion has been a common research topic for a long time. The top factors having effects on a successful project execution are stated to be proper project control, adequate planning and having the client present in all stages of the project. (Toor & Ogunlana 2009) Pal et al. (2017) state that managing international construction projects should include well-working supply management procedures, a solid level of delivery reliability and capabilities of solving problems in a continuous flow.

2.2.2 Characteristics of construction industry

Projects in the construction industry are described to have some specific characteristics that separate them from typical projects. EPC project is defined as a project covering activities of engineering, procurement and construction activities that enable executing the project in a lump sum turnkey basis (Tahir 2004). In addition, there has been a lot of research on project networks in the construction industry (Dietrich et al. 2010). The characteristics to be covered are summarized in Figure 4.

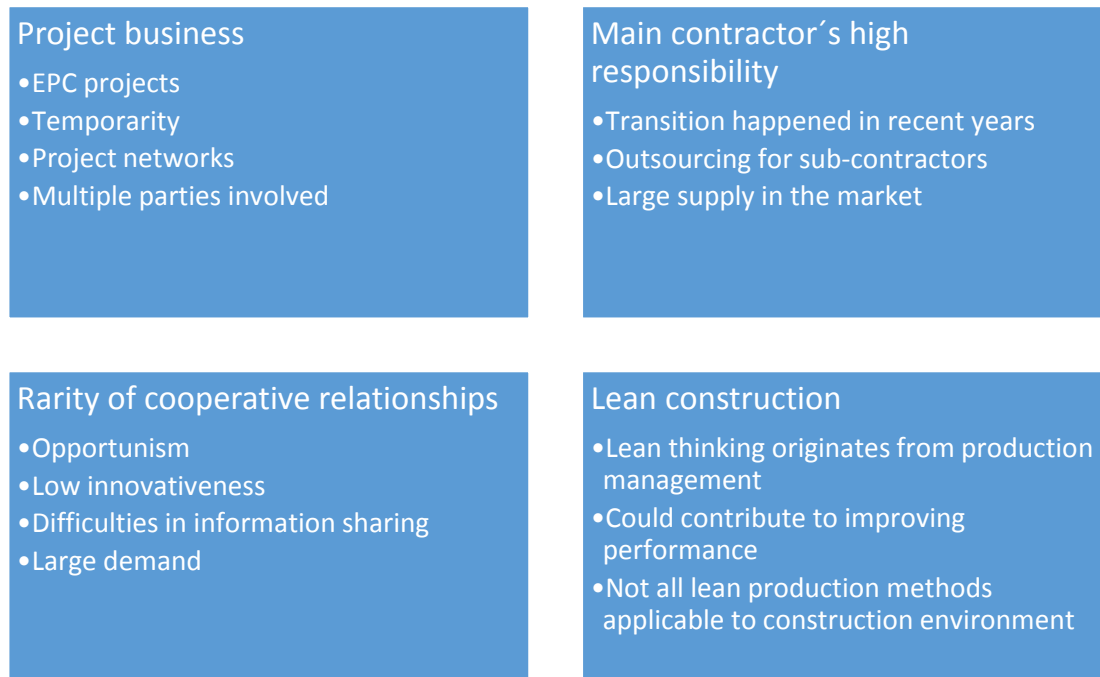


Figure 4. *Characteristics of the construction industry.*

In the construction sector, there has been a relevant change in the sharing of responsibilities in projects, since the main contractors are outsourcing more and more of their activities. This change is almost opposite to the traditional construction activities in the past, where the main coordination and decision-making was often the responsibility of the client. Since main contractors are said not to possess all the needed information and skills, outsourcing proves to play a key role in managing projects. Consequently, this increases the importance of the main contractor to sufficiently concentrate on handling supplier relationships. (Bemelmans et al. 2012) Every project entails multiple parties, which supports the significance of proper supplier relationship management (Pihlajamaa et al. 2016). However, the transition of focusing on more cooperation-enhancing activities is not noticed to be extremely fast (Pal et al. 2017). Typical struggles with construction progress are seen to be the distance between designing and implementing, insufficient level of communication and changes that lead to more complexity in the project environment (Naoum & Egbu 2016).

According to Jiang et al. (2012), establishing a full-scale long-term cooperative relationship is not extremely common in the construction industry. Moreover, the level of adequate information exchange during a construction project might not always be enough between the involved parties (El-Saboni et al. 2009). As the most common fashion, relationships in the construction industry are occasional and temporary. Still, there are some examples, where buyer-supplier relationships are established for a longer time. This occasion is mostly based on the fact that the construction industry is considered to be in a project business environment, where parties have worked together in multiple past projects. (Gadde et al. 2010) As one construction project is quite a short event, innovativeness is not that likely to be achieved during one single project (Erik Eriksson et al. 2013). Furthermore, a few factors explain the small interest in launching a long-term cooperation-involving relationship. The large demand of alternative suppliers results in a competitive situation among possible suppliers, which also lessens the interest of the buyer to concentrate largely on one specific supplier. (Gadde et al. 2010) Still, the challenge of parties to be opportunistic is seen relevant in the construction industry. Furthermore, this opinion is stated to be applicable to other industrial sectors too. (Ruuska et al. 2011)

Introducing the lean construction method provides some further insight on the characteristics of the construction industry. As one approach for achieving a successful project execution is to focus on lean project management. (Erik Eriksson et al. 2010) Lean thinking and its methods originate from production management. The idea of lean is to install a clear and straightforward process, which focuses on diminishing waste, maintaining high quality and providing synergic benefits to the parties involved. (Shah & Ward 2003) Implementing the Lean construction methods is noticed to result in staying in budget, being ahead of schedule and providing more satisfaction to the subcontractors. Furthermore, the amount of safety issues was stated to be lower than with other similar kinds of projects. (Salem et al. 2006) The essential elements of lean construction are stated to be: (Erik Eriksson et al. 2010)

- *Reduction of non-added value,*
- *concentrating on the end customer,*
- *establishing a culture of continuous improvement,*
- *encouraging on having cooperative relationships.*

However, it is stated that all lean production methods can not be implemented into the construction environment. Firstly, in this context manufactured items are not delivered to the end customer by using logistics. Furthermore, all projects are unique and therefore need continuous communication with the client, if changes are made to the instructions. Lastly, the amount of complexity is higher than in manufacturing, since there are no repeated activities like in the production environment. In addition, high complexity results from having multiple subassemblies, which involve interaction with multiple

contractors and other parties. (Salem et al. 2006) Thus, it is relevant to analyze project networks in the next chapter.

2.2.3 Managing project networks

Managing projects in the environment of a network has been gaining relevant interest in the academic field for a long time (Çebi & Otay 2015). Accordingly, there are multiple definitions and characteristics described for project business networks. Sydow & Staber (2002) define project networks as “an organizational form of production and exchange among functionally interdependent but legally autonomous firms and individuals.” Another study adds that project networks are stated to be constantly changing and temporal (Larson et al. 2007). Sydow & Staber (2002) state that even though the duration of a project is only temporary, the actions of participants in the network are affected by experiences of previous projects and possible future businesses. These projects carried out in a project network are claimed to be highly complex. Therefore, projects carried out in a project network are sometimes called even major or giant projects. (Ruuska et al. 2009)

Typically, the project network approach is used with circumstances that are associated with large scale projects or high technology related knowledge (Tiwari & Gupta 2012). Especially with knowledge requiring tasks, the project network approach is said to enable increasing the likeliness of being successful by searching, analysing and developing knowledge from the network. Furthermore, this kind of action could result in the best case to more innovativeness from network members who possess various skills. (Cummings & Pletcher 2011) However, the concrete benefits of project network approach and the ways to achieve them have not always been clearly defined in the academic field (Jones et al. 1997, originally Uzzi 1996).

Project network approach consists of two phases, which are designing and implementing. Designing a project network takes usually a lot of time as objectives are being aligned. On the other hand, the implementation phase is noted to be a straightforward process and relevantly easier to control, because the activities consist mainly of allocating and controlling resources inside the project network. (Hellgren & Stjernberg 1995) Multiple participants are stated to participate in a project network, which often entails main contractors, suppliers and various stakeholders (Martinsuo & Sariola 2015). Tiwari & Gupta (2012) are stating that a project network could also include various authorities, which cover especially legal and political authorities. These parties work together for a temporary period, which contains planning and control during the project execution (Manning 2008).

2.2.4 Alternatives approaches for project network governance

In this part, various theories for project network governance are introduced. According to Jones et al. (1997), the definition for the term network governance is described below:

“Network governance involves a select, persistent, and structured set of autonomous firms (as well as non-profit agencies) engaged in creating products or services based on implicit and open-ended contracts to adapt to environmental contingencies and to coordinate and safeguard exchanges. These contracts are socially-not legally-binding.”

Furthermore, this research states four factors that affect the governance models for project networks. The complexity involved in the project execution stage, asset specificity, uncertainty with demand and the frequency of needed interaction are stated to be the factors worth considering with choosing the suitable governance model. Finding a suitable level of so-called structural embeddedness in a project network may prove to be a difficult process, as some relationships should have more cooperation than expected. Moreover, the number of organizations in a project network is stated to affect the right level of aligning activities and having mutual decision-making procedures. (Jones et al. 1997)

One aspect in governing a project network is related to power sharing, which is determined between project network members. In the first option, one specific organization has most of the decision-making power. Usually, the reason for this approach is the fact that this organization has more capabilities, resources and responsibilities than other organizations. Alternatively, in a so-called non-hierarchical mode of network governance, the power for decision-making and solving issues is shared in a more equal way among the member organizations. The behavior related to this second approach is linked to cooperation-enhancing activities. (Sena Ferreira et al. 2012) Another study states that there can be differences among member organizations in tangible and intangible resources, which is mostly based on the level of formality and legal matters in the network. Furthermore, this results in some parties being more distant from each other, while at the same time some are embarked on a closer cooperation. (Hellgren & Stjernberg 1995)

Relational governance mechanisms are stated to be one alternative for governing project networks. Larson et al. (2007) describes project networks to have two alternatives for relational governance, which are legitimate and consent-based networks. Legitimate project networks concentrate on negotiation-based cooperation, while consent-based networks are characterized by blurry terms that enhance relational capabilities among project members. This way, project network participants have different kinds of governing methods, which focus either on developing commitment among parties, where the process is unclear, or on negotiations that are more formal. (Larson et al. 2007)

Challenges and success factors in governing project networks

Key challenges in governing a project network are the opportunistic objectives of project network members, which may differ significantly from the mutual objectives. This factor was noticed to result in a significant amount of issues in building a complex facility. Furthermore, these individual objectives may be prioritized differently during the project execution stage, which makes success less likely to be achieved with large projects. (Ruuska et al. 2011) Hence, it can be said that organizations have different reasons for participating in a project network. Accordingly, one organization might not see the project outcome as the best outcome for themselves. (Hellgren & Stjernberg 1995) This factor of differing objectives could lead to disputes and conflicts among members, which also leads to a greater amount of complexity. This study defines a conflict as a confrontation that is based on the lack of mutual agreements on opinions, behaviors and goals. Surprisingly, these conflicts can have either positive or negative effects on the desired project outcome. (Mele 2011)

Another challenge in governing a project network is measuring the performance of each project participant. The performance should be evaluated continuously, which is often seen to be challenging. Since project networks are complex, measuring the financial outcome is not always enough. (Sena Ferreira et al. 2012) From the buyer's perspective, pursuing the project network approach does not ensure strategic benefits, but gaining a more effective communication is seen more probable in the project execution stage (Paulraj et al. 2008).

The major reason for using project business networks is to create a situation where all parties achieve benefits in a fair way. To pull this off in line with expectations, trust and commitment should be established thoroughly in the project network. (Sena Ferreira et al. 2012) However, there should be enough focus on the contractual arrangement in order to manage network members efficiently (Ruuska et al. 2011). In any case, possible disputes should be solved in a constructive way. Hence, more value can be co-created among network participants. (Mele 2011)

Concentrating on cooperation is noticed to be a key factor in managing project execution in line with expectations (Sena Ferreira et al. 2012). Ruuska et al. (2011) have described four cooperation-related factors that should be thought through, when a multi-firm project is governed. This study has noticed that governing a project network successfully should include less hierarchical contractual governance, encourage network members to solve disputes with self-regulating methods, utilize valuable knowledge from previous projects and concentrate on having open communication thoroughly in the project network. Tiwari & Gupta (2012) support that knowledge integration mechanisms can play a vital role in implementing plans to action in the project network. The major reason for using these approaches is seen to be the high level of complexity, which is described to be a common phenomenon in governing a project network (Ruuska et al. 2011).

2.2.5 Summary

The significance of being able to diminish opportunistic behavior increases greatly when multiple parties are working together in a project network. The project network approach is noticed to be practiced widely in the construction sector. Figure 5 summarizes the challenges and governance mechanisms covered in this literature section of project networks.

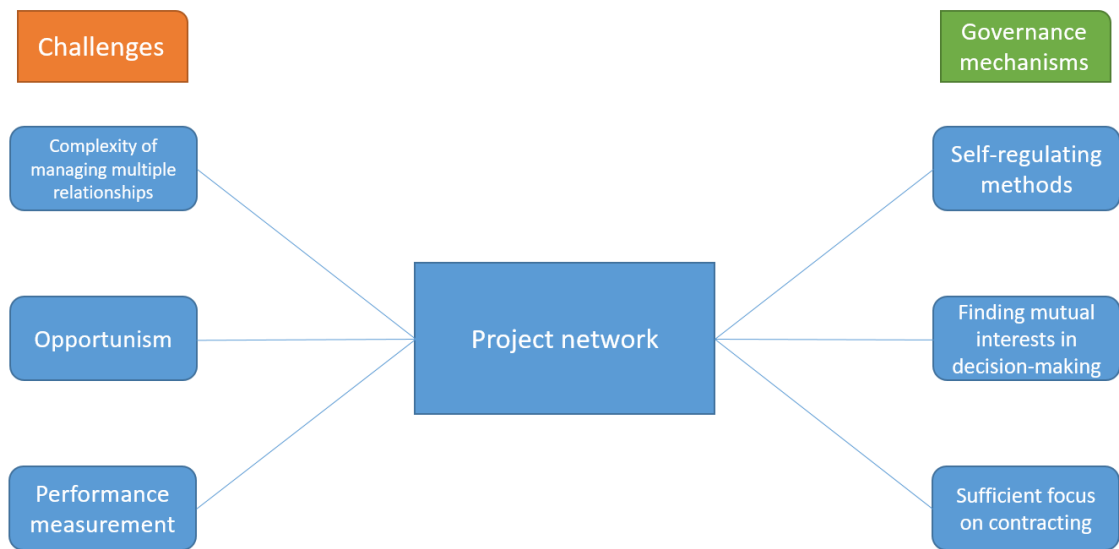


Figure 5. *Challenges and governance mechanisms for project networks.*

Each contractor is noticed to have their own reasons for participating in a project network, which may make meeting the objectives of budget, schedule, quality and client satisfaction less possible. Consequently, project management may turn out to be an extremely challenging process. As the complexity rises it is seen to be difficult to get a grip of the performance level of each project network participant. Thus, practicing suitable governance mechanisms and methods are essential if fluent cooperation and the desired project execution are to be achieved.

As common features for being successful in project network governance were noticed to be encouraging cooperation and mutual decision-making. When parties are communicating openly with each other, regulating suitable solutions together is enabled. In any case, there should be enough focus on having suitable contracts to enable these cooperation-enhancing governance mechanisms, which is discussed in the next literature review section.

2.3 Contracting suppliers

This chapter covers topics associated with contracting suppliers. Firstly, the terms contract and contract management are defined and explained. After this, the covered topics are selection criteria, alternative contracting methods and alternative contract

models. The alternative contract models discussed in this chapter are lump sum, fixed price, unit price, cost-reimbursable, open book policy and alliance model. Lastly, a summary of covered topics is displayed.

2.3.1 Contract

The definition for a contract is presented below:

“Contracts specify the terms of an agreement between two parties and represent the transaction or work to be done in a variety of forms (Schepker et al. 2014).”

Still, there can be some variations in the design of contracts. This variation is defined in the level of formality, specificity of contract terms and strictness of instructions in completing activities. (Schepker et al. 2014) Contracting is stated to include four stages: the pre-contractual stage covering planning, the actual contracting stage that entails negotiating, the stage of implementing the required activities and lastly the post-contractual stage that evaluates the received outcome (Weele 2014, p. 97-99).

2.3.2 Contract management

Weele (2014, p. 93) defines contract management as a comprehensive process, which makes sure that involved parties comply with the contractual requirements. Multiple factors should be considered in the contract management process in order to have success. Furthermore, the significant elements to be determined with defining a contract are pricing methods, terms of payment, penalty arrangements and warranties. (Weele 2014, p. 104-109) Additionally, a specific service level agreement has to be defined with service-based contracts, which describes the required level that the supplier has to meet (Heikkilä et al. 2013, p. 40).

Occasionally a bonus system is implemented into the contract. This kind of approach of incentives is relevant, when a high-level performance is needed from the supplier. Typically, the need of high performance is dependent on the complexity that the buyer is experiencing with their products or processes. It is claimed that a bonus system enforced through a formal contract is the most optimal solution for situations that require suppliers to come up with various innovative ways. (MacLeod 2007) Laan et al. (2011) support this by stating that implementing a bonus system is acknowledged to reduce contractors' opportunistic behavior in the construction environment.

A theory about arranging a service supply contract is discussed in this thesis, because the contextual factors of the construction industry are highly relatable to purchasing services (Heikkilä et al. 2013, p. 40-41). One example of buying services for a construction project is choosing main contractors to carry out the defined scope (Singh & Tiong 2006). Heikkilä et al. (2013, p. 40-41) describe four alternative approaches on how a service

contract can be determined and specified, which are input, process, output and outcome. Figure 6 illustrates these alternative focus approaches, where the level of difficultness for determining the service contract gets higher when the focus is moved to the right. (Heikkilä et al. 2013, p. 40-41)

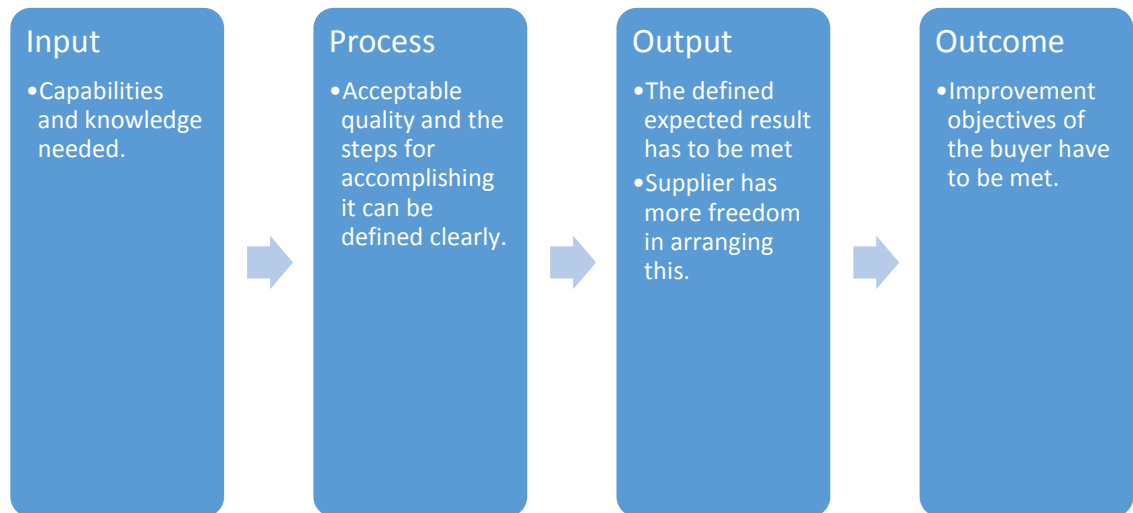


Figure 6. *Alternative ways of determining a service contract (adapted from Heikkilä et al. 2013, p. 40-41).*

Traditionally, focusing on input emphasizes the knowledge and capabilities that are needed due to lack of resources. One example of this is described to be purchasing technical advisory for research and development activities, where the insufficient amount of knowledge must be fulfilled. The second approach, process, is valid to be chosen when the buyer knows the acceptable level of service quality and the needed steps to achieve it. For example with the process of office cleaning, it is easy to define the acceptable service level and the requirements for execution. The third focus approach of output is more open, since the supplier is freer to find the practices for meeting the requirements as long as the specified output is achieved. As an example, the buyer's main interest could be snow-free roads, when the buyer has less interest in the way the supplier provides the output. The last approach is outcome, where the main idea is to ensure some kind of contribution. For example, with this approach a consulting company should ensure that the specified performance improvements of the buyer are achieved. (Heikkilä et al. 2013, p. 40-41).

However, proper contract management procedures are not always stated to be enough for enabling cooperativeness and the best possible outcome (Ertel 2004). Negotiations are often needed when parties have differing objectives, which may lead to a conflict of interest. In a conflict, both parties are said to have the objectives of cost savings in mind, which makes a more collaborative approach difficult. (Weele 2014, p. 96-97) Two alternative approaches of negotiating deals are defined. It is seen that the selected

approach has significant impacts on the outcome of an upcoming relationship. Thus, sufficient preparation for negotiation is majorly important, if a company desires to succeed in line with expectations. (Ertel 2004)

The first approach is the “dealmaker” approach, which emphasizes the importance of making as many financial contractual agreements as possible. In addition, this approach does not significantly concentrate on the activities that happen after signing the deal. Opposite to the first approach, the implementation-minded approach focuses in a larger way on achieving the best outcome from the mutually agreed deal. This approach is seen to be highly recommended, when the realization of the desired outcome is a necessity and a proper implementation is far from being easy. (Ertel 2004) This framework by Ertel is also a relevant approach to keep in mind, when traditional and relational contracting methods are discussed. Before that, the topic of selection criteria is discussed.

2.3.3 Selection criteria

Scientific literature has recognized the need of choosing the right suppliers. The most common factors related to this are stated to be risk sharing and determining the responsibilities of a buyer-supplier relationship. (Martinsuo & Ahola 2010) Lee (2009) adds that choosing the right suppliers for long-term cooperation might be an extremely challenging thing to execute. Thus, classifying and categorizing suppliers has been acknowledged to be a common practice in purchasing. Hence, the buyers usually choose different levels of cooperativeness in their supplier base. Classification is seen necessary as similar kinds of relationships should not be pursued with all suppliers. (Hudnurkar et al. 2016) Therefore, pursuing a strategic viewpoint on contractor selection might be vital for a company’s seek for a better performance. Executing sourcing activities should consider three elements with selection. Quality, a well-executed supplier partnership management and alignment of strategies with suppliers are seen to have positive effects on meeting customer expectations, gaining more competitiveness and enabling fluent cooperation with various stakeholders. (Kotula et al. 2015)

Academic field has recognized specific selection criteria for the construction industry, where the focus is on contractors and material suppliers. Common challenges in construction projects are claimed to be the inability to proceed before the current stage is passed and lack of resources to proceed (Aretoulis et al. 2010). Figure 7 illustrates the typical criteria for selecting both contractors and material suppliers.

Selection criteria for construction projects	
Contractor <ul style="list-style-type: none"> • Basic information • References from past projects • Financial situation • Probability of succeeding • Project-specific requirements 	Material supplier <ul style="list-style-type: none"> • Acceptable quality • Price • Possibilities of offering discounts • Guarantee period • Satisfactory terms of payment

Figure 7. Selection criteria for contractors and material suppliers (Singh & Tiong 2006; Aretoulis et al. 2010).

Choosing a right contractor is stated to have a major impact on achieving the desired project objectives. The sectors that should be thought thoroughly with contractor selection are described to fall into the basic information of the contractor (e.g. age, financials), references from past projects, contractor's current financial situation, likeliness of providing at least satisfactory results (e.g. experience, knowledge and resources) and lastly the criteria that are more project-specific. (Singh & Tiong 2006)

From another point of view, it is stated that the role of material supplier in a construction project is not dependent on the progress at construction site. Still, the role of material supplier is significant, since they can contribute to meeting the schedule objectives. The top five criteria for material supplier selection are stated to be an acceptable quality, price, possibilities of discounts, capabilities of assuring guarantees and enabling satisfactory terms of payment. (Aretoulis et al. 2010) It can be noticed that quality is the only factor similar to the findings of Kotula et al. (2015), but the activities of aligning strategies or focusing on supplier relationship management are not important with selecting material suppliers.

2.3.4 Traditional and relational contracting

Projects in the construction environment are stated to have multiple characteristics of the project network approach. In this context, the buyer should take a good care of all buyer-supplier relationships, since commitment and embeddedness are not too common a phenomenon. (Gadde et al. 2010) There are stated to be two factors having impact on choosing the right contract type with governing a multi-firm project. The amounts of risk and uncertainty linked to the buyer-supplier interface are seen to be the two vital things to consider. (Ruuska et al. 2011, originally Turner & Simister 2001) Furthermore, these

factors are considered in varying way with alternative contracting approaches and contract models.

There are two alternative approaches for contracting suppliers (Sumo et al. 2016). The first viewpoint is based on strict governance in form of contracts, while the other focuses on relational governance that enhances trust and cooperativeness in the work environment (Schepker et al. 2014). The factors affecting the outcome, with either contractual or relational approach, are stated to be the existing environment, the nature of established relationships, the amount of mutual history and the preciseness with performance measurement during the relationship (Z. Cao & Lumineau 2015). The first approach, traditional contracting, is categorized by its formal nature and discussed further next (Sumo et al. 2016).

Traditional contracting, that is based on the approach of contractual governance, focuses on contract terms. Having strict and clear terms are seen to provide safeguarding, which protects the buyer against supplier's attempts of achieving benefits via opportunism. These attempts might also produce a larger number of disputes in a buyer-supplier relationship. (Z. Cao & Lumineau 2015) However, a single study states that implementing a traditional contractual governance approach into construction projects led to a better outcome than by solely focusing on creating trust between the project members. Still, it was noticed that this approach did not encourage cooperative working during the project. (Ke et al. 2015) Naoum (1994) shows how the amount of complexity is linked to the suitability of using traditional contracting methods. This research found out that projects with low or medium level of complexity were carried out well with the traditional approach. However, a poor performance was seen to occur, when the level of complexity grew. (Naoum 1994)

Traditional contracting is claimed to have some specific characteristics in the construction sector. The coordinating role is usually pointed to the client or and even more often to the main contractor. (Bemelmans et al. 2012) Moreover, involvement of project members is said typically to be in a later phase (Lahdenperä 2012). Hence, it can be hard for the main contractor to encourage others to work in cooperative way with traditional contracting. If some detail is not dealt or properly agreed with both parties, disagreements and disputes are seen to occur. These kinds of occasions might even end up to practicing legal actions. (Scheublin 2001) In these arrangements, contractors may embark on opportunistic behavior as the client or the main contractor is carrying most risks. This kind of possibility may also lead to a higher level of distrust. (Laan et al. 2011) Based on transaction cost economics theory, opportunistic actions from suppliers are diminished with more complete contracts. However, this approach may have negative effects on the supplier's ability to find the best practices for completing activities innovatively and fluently. (Sumo et al. 2016)

Weele (2014, p. 97) describes pursuing a cooperative system as one way of contracting, which encourages each member to work towards a mutual goal. Moreover, this can be seen as an element of *relational contracting*. Koolwijk (2006) states that the objective of relational contracting is to go and search for mutual interests. This applies also to the situations of possible disputes. Therefore, trust is often seen as a fundamental element in relational contracting. Moreover, contracts are usually defined to be more incomplete, which shows trust from the buyer to the supplier. In the best case, the specified service is provided to the buyers according to the agreed plan. (Sumo et al. 2016) Still, three factors should be considered before totally concentrating on this alternative contracting approach in a project network. These three described factors are the amount of time, the level of legitimacy and the way how decision-making power is divided among project members. (Larson et al. 2007)

Traditional contracting and related models are claimed to differ significantly from relational contracting. With traditional contracting, the client is recognized to make separate contracts with different members involved in a project. (Scheublin 2001) Thus, traditional contracts are not always linked to enhancing cooperation (McCutcheon & Stuart 2000). This can be also explained with the fact that traditional contracts are more complete than contracts that encourage cooperativeness (Sumo et al. 2016). According to Lahdenperä (2012), with traditional approach project members do not have as significant role with decision-making as in the approach of relational contracting.

2.3.5 Alternative contract models

In this part, the selected alternative contract models for further examination are introduced. Figure 8 illustrates the alternative contract models that are to be discussed with scientific material.

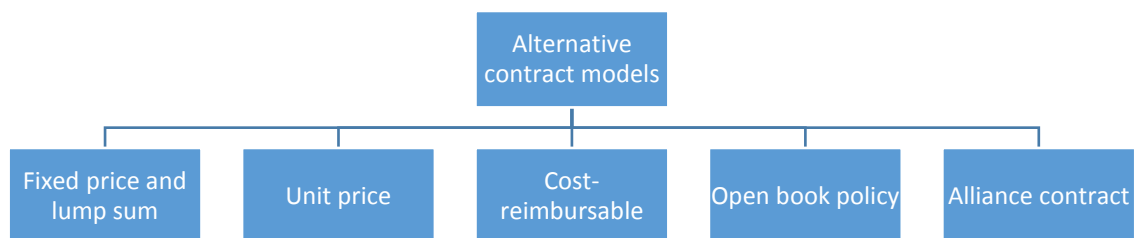


Figure 8. *Alternative contract models.*

With all alternative contract models, the definitions, strengths and risks are covered. First the focus is on fixed price, lump sum, unit price and cost-reimbursable contracts. After

that, the open book policy linked to contracting is discussed. As the last contract model, the alliance model is introduced and evaluated.

Fixed price and lump sum contracts

Fixed price contract is an arrangement, where supplier accepts to meet the contract terms with a firm price that is agreed mutually with the buyer (Weele 2014, p. 97). The definition by Weele (2014, p. 182) for a lump sum contract is quite similar, which defines it as a contract that requires executing specified actions on a fixed price and on a certain period of time. Thus, this thesis recognizes fixed price and lump sum contracts to be almost similar. Therefore, these contract models are called as fixed price contracts in chapters 4 and 5.

There are a few requirements related to lump sum and fixed-price contracts, which should be thought in a wide way before signing one. With these kinds of contracts, the terms should be very clear between both sides. The completion of activities should also have a stable environment, where only minor changes are acceptable to occur. In addition, there should be enough options in the supply market, when lump sum and fixed price contracts are considered. (Tahir 2004) However, these contracts might be more difficult and versatile in practice than just the set price. Thus, a fixed price contract should be selected when mistakes are unlikely to occur. (MacLeod 2007)

It is stated that the fixed price pricing method is suitable for elements, which are not of most importance for the business (Løedre et al. 2006). Tahir (2004) states that the typical advantages of fixed price contracts are the low need of supervision and the knowledge of total price already in the start of work. As a challenge, the members sign an agreement for the total sum only before start of work, which does not enable a quick start and therefore delays may occur (Løedre et al. 2006). On the other hand, Xia et al. (2016) point out that the contractor is taking most of the risks with exceeding the estimated budget by choosing this contract model.

Unit price contracts

A unit price contract is seen to be a relatively common contract model in the construction industry. This contract model is based on estimates, where the supplier receives the desired payment from the actual completed amount of work. (Hyari et al. 2017) Weele (2014, p. 97) supports this by defining this type of arrangement to be a unit-rate contract, where the supplier gets payment for every finished unit of work. The payments are sent to contractors in an agreed period of time if the completed work is in line with the defined contract terms (Picornell et al. 2016). Unit price contracts are often chosen when the buyer wants to decrease own financial risks in the case of experiencing an unclear scope (Gransberg & Riemer 2009).

The situation of coming up with false estimates is seen to have clear impacts on the outcome. The most common reason for false estimates is claimed to be the engineering department of an organization. (Gransberg & Riemer 2009) False estimates often lead to risks for both the buyer and the contractor, which might result in both parties to pursue opportunistic behavior. Consequently, multiple long negotiations over quantity disputes might be needed to find a mutual agreement on determining price adjustments to unit prices. (Hyari et al. 2017) Furthermore, the buyer is might not always be aware of the fact that unit rates do not always cover contractor's total costs, which leads to the contractor's need of pursuing safeguarding activities. In practice, the attempts of safeguarding lead to a situation where the contractor adds an extra margin to the price of work due to a greater uncertainty. (Gransberg & Riemer 2009)

One obvious way of reducing contractors' attempts of safeguarding is stated to be offering as accurate and transparent estimates as possible. This action is stated to lead to a smaller need for contractor to ensure a better profit margin. (Gransberg & Riemer 2009) Another way of reacting to this is to define contract terms that enable wider possibilities of changing the scope and making price adjustments. Thus, the risk of contractor's opportunistic behavior can be reduced and a more satisfactory relationship is made more likely. (Hyari et al. 2017)

Cost-reimbursable contracts

According to Weele (2014, p. 97), a cost-reimbursable contract is an arrangement, where "contractor agrees to work based upon compensation of all actual costs incurred plus profit margin." This way, a cost-reimbursable contract is another way of compensating the supplier, where the accurate price is not agreed in the beginning. The final price is known only, when the work is finished. (Lœdre et al. 2006) As a common practice with this type of contract is to determine firm hourly rates for machines and workforce that are going to be used (Weele 2014, p. 36).

This type of contract has some characteristics, which should be considered in the project completion. As an advantage, the agreed work is possible to start immediately, because less time is needed for cost estimations. However, as a disadvantage the buyer might end up in a non-profitable situation due to carrying most of the risks. (Weele 2014, p. 104-106) With one form of this contract model, the cost-plus contract, the buyer carries all the risks related to the quantities that are specified in the scope of work (Gransberg & Riemer 2009). Additionally, the buyer might not be aware of the details that have effects on the cost structure. This results in a higher level of uncertainty, which does not always encourage buyers to use cost-reimbursable contracts. The suitable reaction method for cost uncertainties is claimed to be practicing constant cost estimation during the execution phase with reporting tools. (Weele 2014, p. 104-106)

If the implementation happens optimally in line with the mutual expectations, the nature of cost-reimbursable contracts can turn into a situation, where the contract functions in an open book way. (Weele 2014, p. 104-106) This open book model is seen to deviate a little bit from the traditional contracts, since the level of exposed transparent data between the parties differs in a drastic fashion (Kumra et al. 2012).

Open book policy

Open book accounting has been noticed as an effective way to manage costs in relationships between buyers and suppliers. Furthermore, it is stated that the open book policy can develop cooperative relationships into even better by implementing it thoroughly. (Windolph & Moeller 2011) Thus, using open book accounting in supply chain management is a common practice in multiple industries. The main idea of open book accounting is to reveal all possible financial data from the supply chain among the contractual parties. (Romano & Formentini 2012) This way an improvement in efficiency can be achieved in the entire supply chain (Agndal & Nilsson 2008). However, an absence of proper rules for proper implementation has been acknowledged in this academic field (Romano & Formentini 2012). Moreover, there has been only little research on how implementing an open book policy affects the satisfactoriness of a buyer-supplier relationship (Windolph & Moeller 2011).

Using open book accounting is stated to enable multiple benefits for a buyer-supplier relationship (Agndal & Nilsson 2008). Firstly, a larger amount of transparent cost data is claimed to enable success in managing supply chain (Agndal & Nilsson 2010). For the buyer, open accounting data enables identifying those key parts, where development with cost-effectiveness could be made (Agndal & Nilsson 2008). In addition to evaluating cost data of products and services, using open book policy can boost the performance of administrative functions in a buyer-supplier relationship (Agndal & Nilsson 2010). The possible options for usage according to Agndal & Nilsson (2008) are claimed to be the stages of supplier selection, planning and execution.

Open book policy is noticed to require data exchange between buyers and supplier in supply chain (Romano & Formentini 2012). Thus, Agndal & Nilsson (2008) state that implementing the open book policy requires and displays trust in a buyer-supplier relationship. The amount and nature of exposed data can variate in open book policy. Moreover, open book practices can variate in three different ways, which are the course of information exchanged, nature of data and limitations for openness (Windolph & Moeller 2011). According to Kumra et al. (2012), there are many options for exposing data. Firstly, open book data can be very detailed. In this option, data consists for example of cost components or parties' profit margins. On the other hand, the less specific data can for example be summaries of operational activities. Alternatively, data can be presented in percentages or rations, when the precise costs are not available for all members. Furthermore, factors like quality or environmental performance are possible

sources of data that can be monitored with the open book policy. (Kumra et al. 2012) Based on the presented information, it can be stated that there is plenty of information that can be exposed about the members' supply chain performances. To conclude, Romano & Formentini (2012) state that choosing a wrong partner for an open book policy based contract can have negative effects on achieving the desired benefits.

Open data exchange can be also seen as a challenge for pursuing a successful relationship, because it makes supply chain members more vulnerable due to a larger amount of transparency (Agndal & Nilsson 2010). The most common problem regarding the implementation of open book policy is seen to be the opportunistic behavior of the buyer. This study states that eliminating waste can transfer more value to the customers of the buyer. As a result, the supplier can see this as the buyer's opportunity to put the prices down. (Romano & Formentini 2012) Additionally, Windolph & Moeller (2011) found that open book policy has negative effects on suppliers' satisfaction, which strengthens the perception of it not ensuring success in all cases.

However, the concerns of the buyer increasing its bargaining power can also be avoided. Kumra et al. (2012) state that there are more reasons to implement the open book approach than just constantly evaluating the supplier's performance in an opportunistic way. Agndal & Nilsson (2008) see that suppliers can also seek for benefits by implementing open book policy based contracts with buyers. Open book policy is often established in collaborative relationships, where both parties are conscious of the benefits that can be achieved. For example, the implementation of open book policy could enable benefits for the supplier, when current operations do not deliver the expected financial results. In this occasion, the buyer can offer guidance on decreasing the struggles with the current situation. (Agndal & Nilsson 2008)

Alliance model

Currently more and more buyer-supplier relationships are having a transition from traditional arm's length relationships towards different types of closer supplier cooperation (Lee 2009). Already in the 1990s was acknowledged a surge in moving towards alliances that need closer cooperation (Heide & John 1990). According to Pihlajamaa et al. (2016) most of the business carried out in the construction environment is through projects and by forming a temporary organization. These temporary projects consist of multiple parties collaborating, which concerns clients, contractors, designers and various suppliers (Pihlajamaa et al. 2016, originally Davies & Harty 2013). Scheublin (2001) adds that the alliance model is an optimal choice, when a project is large and involves complexity.

As the context is linked to project networks, the focus of different modes of alliances is in the project alliance contract. This approach is an emerging approach for project procurement (Pihlajamaa et al. 2016, originally Lloyd-Walker et al. 2014). Koolwijk

(2006) sees that a short-term cooperation characterized in a project where risks, gains and fails are shared by defining an agreement that is suitable for all contractual parties, should force parties to cooperate desirably. This cooperativeness is also supported by placing an incentive structure into the contract (Laan et al. 2011). Still, every project should have different amounts of integration, which is based on the individual characteristics of a project (Hietajärvi et al. 2017).

The alliance model has characteristics of relational contracting, which is stated to require cooperativeness between contractual parties. Another relational characteristic in the alliance model is the principle of not blaming each other for challenges during the project execution stage. Furthermore, a proactive approach is said to be present in the alliance model, which enables seeking for optimal solutions for disagreements between contractual parties. This aspect pursues an approach, where all members gain benefits in a fair way. (Koolwijk 2006) To enable these kinds of characteristics, all the members should be involved to mutual decision-making procedures in an early stage (Pihlajamaa et al. 2016).

The use of an alliance model is stated to enable a more successful project execution. Thus, in recent years the construction industry has embarked on more attempts of achieving the benefits of the alliance model, which could provide cost reductions and lead to realizing better procedures for executing a project. (Pihlajamaa et al. 2016) As process innovation is claimed to not be too common a phenomenon with traditional contracts, using a project alliance represents as a viable option for gaining innovativeness. Still, an organization should recognize that reaching a great level of trust is essential in order to achieve the benefits of this contract model. (Scheublin 2001)

Disappointedly, almost every contract involves some amount of disagreements between the alliance partners (Koolwijk 2006). Therefore, even a proper alliance contract may not always result in a fluent cooperation (Laan et al. 2011). Contractor & Ra (2000) point out that forming a payment structure formally can be seen as a major challenge in designing an alliance contract. Therefore, conflicts are said to arise because of attempts of profit maximizations or other strategic decisions, which do not provide benefits to all contractual parties. If one party in the alliance has different objectives than others, the alliance is not that likely to provide the expected results (Scheublin 2001).

However, there are a few ways, which can enable avoiding these challenges. Laan et al. (2011) state that opportunistic behaviors can be minimized by forming a well-planned incentive structure. Additionally, a well-planned selection of alliance members is vital to accomplish the expected results. Furthermore, the team dynamics of an alliance group should be tested before making the final decision of signing an alliance contract. (Koolwijk 2006) This kind of testing should assure that exceptions in the project execution stage do not occur (Laan et al. 2011). Proper information exchange has also been acknowledged to diminish the risks of not succeeding. Hence, the nature of

information exchange should be continuous during the whole project lifecycle. (Hietajärvi et al. 2017) One option for executing information exchange is to use electronic communication systems, which is stated to enable a more fluent project completion (El-Saboni et al. 2009).

2.3.6 Summary

Managing contracts and selecting suitable contract models can be claimed to have great effects on the success of a project. Agreeing on a contract leads to commitment as the defined requirements must be met, but the ways of managing contractors are seen to differ. There are two alternative approaches for contracting, which are traditional and relational contracting. The traditional approach is founded on formality and contractual terms, while the relational approach is based on the incompleteness of contractual terms and fostering cooperativeness. This topic was briefly covered in the literature section of project networks, where it was noticed that selecting a suitable contract has a key role for completing activities in a project network. However, as the level of complexity is great in a project network, all-involving decision-making processes is needed. Consequently, the need for finding a solution of mutual interests increases the importance of using relational contracting in a significant way.

It is seen essential to find the most appropriate contract models for the parties involved in a project network. As noticed with classifying contractors, different practices should be used for contractors of different importance. Since the introduced contract models require differing levels of cooperation, it can be assumed that contractors should be treated differently with the contract model selection too. The buyer should simultaneously consider if a contract model will enable fulfilling the defined requirements in practice. In Table 1, the requirements, risks and benefits associated with selecting a contract model for contractors are summarized. The alternative contract models that are evaluated in Table 1 are the combination of fixed price and lump sum contracts, unit price contracts, cost-reimbursable contracts, open book policy based contracts and the alliance model.

Table 1. Summary of alternative contract models.

Contract model	Requirements	Risks	Benefits
Fixed price and lump sum	<ul style="list-style-type: none"> • Clear terms • Stable environment • Multiple supply options • Mistakes are unlikely • Insignificant activities. 	<ul style="list-style-type: none"> • Since agreement must be done before the start of work, there may be delays. 	<ul style="list-style-type: none"> • Contractor carries most risks • Predictable total cost • Low need of supervision.
Unit price	<ul style="list-style-type: none"> • Difficult to determine the scope. 	<ul style="list-style-type: none"> • Estimates and actuals differ significantly • Challenging future negotiations. 	<ul style="list-style-type: none"> • Optimally fair • Option for new measurement • Risk-sharing with the contractor.
Cost-reimbursable	<ul style="list-style-type: none"> • Difficult to determine total costs • Reporting tools available. 	<ul style="list-style-type: none"> • Buyer carries most risks • Buyer not aware of cost structures. 	<ul style="list-style-type: none"> • Work can be started immediately.
Open book policy	<ul style="list-style-type: none"> • Agreeing on the level of exposed data • Trust • Collaborative relationship. 	<ul style="list-style-type: none"> • Insufficient trust between parties • Opportunistic behavior • No guidelines for implementation. 	<ul style="list-style-type: none"> • Transparency • Noticing inefficiencies • Improving performance.
Alliance model	<ul style="list-style-type: none"> • Complex and large project • Trust • Commitment • Right partners. 	<ul style="list-style-type: none"> • Challenges with forming a contract • Differing objectives resulting in disputes. 	<ul style="list-style-type: none"> • More cooperation • Reactiveness in the project execution stage • Innovativeness.

It can be stated that fixed price, lump sum, unit price and cost-reimbursable contracts are linked more to the approach of traditional contracting. By setting contract terms, the buyer and contractor can decide the procedures for sharing risks. This is also seen as one critical factor when risks and benefits are evaluated in Table 1. Fixed price and lump sum contracts reduce buyer's risks, with unit price contracts risk sharing is dependent on the rightfulness of estimates and with cost-reimbursable contracts the buyer carries most risks. Since the theory is mostly based on the financial objectives with these contract models, a search for cooperation and a fluent project execution are not in the central of examined scope.

The elements of cooperativeness and fluency are more evident with relational contracting. Open book policy based contracts and the alliance model are stated to contain the characteristics that emphasize cooperativeness. The objective of both contract models is to improve efficiency and boost performance. Optimally with an open book contract, contractual parties can react to possible inefficiencies together if the buyer has no interests in increasing its bargaining power. Alternatively, the alliance model is recognized to encourage multiple parties working together towards mutual goals with its innovative and reactive nature. These kinds of elements can be assumed to match with the characteristics that are needed in managing a project network. Altogether, partner selection is an essential part of implementing these two cooperation-enhancing contract models into practice. Furthermore, the covered factors having effects on individual buyer-supplier relationships and on the whole project network should be considered thoroughly to understand the requirements for selecting a suitable contract model.

3. RESEARCH METHODOLOGY

3.1 Research characteristics

This thesis work is an exploratory study. The nature of this kind of study is stated to enable investigating new ideas, understanding the phenomena in a more complete way and evaluating the research topic from an alternative point of view. A typical characteristic of an exploratory study is to have an iterative process during research work as the scope of research gets limited along the way. (Saunders et al. 2009, p. 139-140)

Saunders et al. (2009, p. 108) has defined a model that includes all alternative actions that could be made with conducting a research. With this model, a researcher is forced to make decisions with selecting the most appropriate research philosophy, approach, strategy, choice, time horizon and techniques. The first decision is about being aware of the practiced research philosophy and its possible effects on the research results. The research philosophy in this thesis is acknowledged to be realism, which means that the researcher has an objective approach with conducting the research but at the same time realizes the possible effects of contextual factors on the analysis (Saunders et al. 2009, p. 119).

Another chosen action in conducting a research is choosing the research approach. In this research work, the existing scientific theories are put to test with a deductive approach. With this approach a hypothesis is created and tested. (Saunders et al. 2009, p. 124-125) The hypothesis in this thesis is determined to be the literature review part, which is compared to the empirical material in the last chapter of discussion and conclusions.

The research strategy for this thesis is selected to be a case study. One strength of this research strategy is the ability of analyzing organizational behavior. (Yin 2003, p.1) Because the context of this research is linked to a business environment and organizational behaviors, selecting a case study for this thesis' research strategy is justified. Furthermore, this research strategy is seen possible to be implemented into an exploratory study, which focuses on answering the questions "how" and "why" (Yin 2003, p. 5). A part of this case study was to conduct interviews, which is explained later in this chapter.

In the model of Saunders, the term choice refers to the methods that are used for gathering data. In this research, the conducted interviews and examined case materials were the main sources of gathering qualitative data. (Saunders et al. 2009, p. 151-152) The time horizon in this thesis work is stated to be cross-sectional. By using this time horizon, the research focuses on a certain short period of time. Thus, no major continuous analysis of events is done when the cross-sectional time horizon is used. (Saunders et al. 2009, p.

155) The selected techniques for data collection and analysis are explained and introduced later in this chapter's sections of data collection and data analysis.

3.2 Research process

The research process consisted of three separate parts, which were the stages of case selection, data collection and data analysis. The decisions related to the used methods are mainly based on the scientific theory of this academic field and on the received advice from the supervisors of this thesis.

The research process lasted almost six months. Two months in the beginning consisted of getting more familiar with the research topic, selecting cases and conducting the literature review. The next two months were dedicated to planning and conducting interviews, analyzing empirical data and writing the chapter 4 of empirical results. The last two months of the research process consisted of writing conclusions by comparing empirical data on literature review and preparing thesis work ready for sending. All in all, the research process was iterative since the knowledge on the research topic grew along the project.

3.2.1 Case selection

This thesis selected six cases for further investigation, which were target company's recent complex projects. The first approach in selecting cases was to select six challenging cases for further examination. However, selecting this approach was realized not to offer an all-round perspective of the characteristics having positive effects on project execution. Hence, supervisors from the target company selected four successful and two challenging projects for further investigation. This decision was assumed to enable finding the practices that might have contributed to the success of a project, which would have been missing in the first approach of selecting six challenging cases. A project was defined to be successful, if the financial result was positive and the end customer's expectations were met well.

In addition to the type of cases, the criteria for the number of selected cases was defined. The selected number is based on two factors, which are the scientific theory of conducting a case study and the limited scope of resources with a typical master's thesis project. The first criterion for selecting this number of cases is explained with scientific theory. Voss et al. (2002) state that there are two alternative ends when the number of cases are selected. With a single case a more specific analysis is often gained, but the research results are not seen that significant to the academic field due to a smaller scope. With a larger number of cases a larger amount of validity is achieved, but the analysis is less specific and at the same time requires more time. (Voss et al. 2002) Therefore, a middle ground was selected for this research where both factors, a more specific analysis and validity of results, could be achieved in a satisfactory fashion. Secondly, as the set number

of credits for this kind of thesis work is thirty credits, the scope of investigating cases was determined to be in line with this limitation.

3.2.2 Data collection

The material for this research consists of selected scientific literature, target company's internal database and empirical data of semi-structured interviews. All materials were supposed to complement each other and thus enable a better understanding for the researcher during this thesis project.

Literature review

The literature review part consisted of both articles and books that are related to the research-specific academic field. Guidance from supervisors' of the thesis and experiences of previous studies at the university resulted in selecting the books that are used in the literature review of this thesis. The articles were searched consistently from Andor, which is the internal search engine of Tampere University of Technology's library. Table 2 illustrates the most typical search words that were used with conducting the literature review.

Table 2. Key search words for conducted literature review.

Key search words for literature review		
Chapter 2. Buyer-supplier relationships	Chapter 3. Project business networks	Chapter 4. Contracting suppliers
<ul style="list-style-type: none"> • Buyer-supplier relationship • Cooperation • Collaboration • Challenges • Success factors • Construction 	<ul style="list-style-type: none"> • Project network • Project management • Large project • Governance • Construction 	<ul style="list-style-type: none"> • Contracting • Construction • Fixed price • Lump sum • Unit price • Open book • Alliance

These presented key search words for conducting the literature review part were also connected in various ways by using commands "AND" and "OR". Furthermore, these searches were altered slightly, where one example could be changing the term "cooperation" into "cooperative". As the criteria for selecting the scientific material, it was determined that the articles should be scientific, peer-reviewed and recently published. These criteria were seen to enable an analysis that is reasoned well.

Case materials

To gain a more complete understanding of the selected cases, it was seen relevant to examine more project-specific data. The required data for this examination was found from the internal database of the target company.

There were two relevant parts that needed more thorough investigation in order to enable a more fluent interaction in the interviews. The first required part was the project-specific information that entailed financial outcome, schedule, product, location and the number of contractors involved in the project. The other required part was to analyze the contracts that were used with contractors. This way, a mutual understanding of discussed topics between the interviewer and the interviewees was enabled in the interviews.

Empirical research

The terms empirical material, empirical finding and empirical data in this thesis are referred to the information received from the conducted interviews. The conducted interviews were semi-structured interviews, which are characterized to have both a clear structure and openness that enable a more thorough analysis during an interview. This approach is pointed out to give more freedom for conducting an interview than the stricter structured interviews that are used more often with questionnaires. (Saunders et al. 2009, p. 320-321) The desired duration for this type of interview was determined to be 60 minutes, which was estimated to enable a deeper concentration on the research topic. This decision is based on the fact that semi-structured interviews are often needed, when a research topic is complex and the desired answers for the research problem are more achievable by asking open questions (Saunders et al. 2009, p. 324).

The selected themes and interview questions for the interviews are based on the literature review. The literature review was completed before choosing the most appropriate interview questions, which enabled investigating the topics linked to the research questions instead of interviewing irrelevant elements. Accordingly, the themes covered in the interviews are contracting suppliers, buyer-supplier relationships and project business networks. In addition to the covered themes, the beginning of the interview involved probing questions and the ending consisted of summarizing questions that were determined to enable more accurate answers to the defined research questions. In addition to these questions, extra questions were presented to interviewees if more clarification on any of interview questions was needed. The question form used in the interviews is found in Appendix A.

The two options for carrying out the interviews were face-to-face meetings and meetings on Skype. Before each interview a brief cover letter was sent to the interviewee. In the beginning of each interview, a request was presented if interviewee agreed on recording the interview. At the same time was mentioned that the recorded data is used only for transcribing and making the researcher's work easier. All interviewees agreed on

recording, which enabled a more accurate transcribing. Additionally, a possibility of having a copy of the transcribed data was enabled to all interviewees. This approach of sending interview enabled each interviewee to view and make comments on the transcribed notes, which was assumed to increase the reliability of data. Moreover, transcribing was done briefly after conducting an interview, which is seen as a recommended practice in the academic field (Saunders et al. 2009, p. 333). Saunders et al. (2009, p. 341) claim that the advantages of recording are a better concentration on interviewee's answers and an increased accuracy while the main weakness is the possibility of interviewees changing answers due to putting too much focus on recording. As back-up, some brief notes were written on a printed paper during the interviews, which is also seen to be a good practice, as it shows the interviewer's interest in the answers received from the interviewee (Saunders et al. 2009, p. 333).

The determined group of interviewees were target company's employees, who have contributed to carrying out the selected complex technology projects. The execution of interviews and details associated with them are presented in Table 3.

Table 3. *Information about interviews and interviewees.*

Project	Interviewee	Title	Length of interview
A	A1	Project manager	45 min
	A2	Site manager	1 h 22 min
B	B1	Project manager	43 min
	B2	Site manager	1h 2 min
C	C1	Project manager	57 min
	C2	Site manager	1 h 2 min
D	D1	Project manager	45 min
	D2	Site manager	44 min
E	E1	Project manager	1 h 10 min
	E2	Site manager	55 min
F	F1	Project manager	1 h 10 min
	F2	Site manager	57 min

The conducted interviews are linked to the six selected cases, which makes a more diverse analysis possible. The desired interviewee group for one project consisted of one site manager and one project manager, who both were seen to be significantly involved in the construction activities and contracting procedures during project execution. Hence, it was assumed that these two persons are highly aware of the characteristics that had influenced on the activities associated with the research topic. The project engineer associated with the specific project was determined to be in the role of a back-up interviewee. However, no back-up interviewees were needed in this research. The objective was to interview different persons in the interviews to achieve as versatile perceptions as possible. This goal was achieved quite well since only one person was interviewed twice (the interviews A1 and C1). The target company saw interviewing this person in both projects important because of the intriguing information the interviewee was supposed to have.

3.2.3 Data analysis

A thorough evaluation and analysis was conducted after gathering all needed empirical material. As the first step of data analysis was transcribing the data from interviews. The duration of transcribing one interview took roughly 3 hours. The main objective of transcribing was to find key data that could provide answers to the defined research questions. All interview data was brought to Excel, which was the key instrument for data analysis in this thesis.

After transcribing interview data, a thorough process of analyzing data was done on Excel. The interview questions were placed on rows while the interviewees were put on columns. By using filters a comprehensive understanding and analysis was produced from the interview data. The objective was to find elements that could have contributed to a project outcome in terms of cooperation and financial results.

The discussion part of this thesis was created by comparing the literature review to empirical findings. The objective was to find how the existing scientific literature agrees and disagrees with the gathered empirical findings. This approach is essential when a deductive approach is used, where the existing theory is put to a test. Lastly, the conclusions of this research were determined by analyzing the discussion part.

4. CASE STUDY

4.1 Background information

The beginning of interviews examined background information of interviewees and selected projects. Most interviewees were noticed to have long working careers at the service of the target company. Therefore, it can be assumed that all site managers and project managers have sufficient knowledge on the research topic of cooperation and contract models in complex project networks. In Table 4, the background information of the selected six projects are presented. This presented information is discussed and explained next.

Table 4. Selected cases.

Project	Financial result	Location	Summary
A	Negative	Domestic	<ul style="list-style-type: none"> • An underestimated scope • Challenging contractors • A new challenging customer
B	Negative	Abroad	<ul style="list-style-type: none"> • A wide scope (major schedule delays) • Challenging contractors • A challenging customer
C	Positive	Domestic	<ul style="list-style-type: none"> • A wide scope (planning partially late) • Familiar main contractors • A controlling customer
D	Positive	Domestic	<ul style="list-style-type: none"> • A small scope • Familiar contractors
E	Positive	Domestic	<ul style="list-style-type: none"> • A small scope • A new main contractor • A good customer relationship
F	Positive	Abroad	<ul style="list-style-type: none"> • A challenging scope • Contractors in the project network familiar with each other • A new customer

Both successful and challenging cases were selected for further investigation. Projects A and B are determined to be challenging projects, while projects C, D, E and F are

acknowledged to be successful projects. The success of a project was defined earlier in the chapter of research methodology, where the definition covered having positive financial results and the satisfactoriness of the end customer.

Table 4 illustrates that there is some variation in the location of the selected cases. Most projects were domestic while projects B and F were carried out abroad. The term domestic in this thesis refers to the country where most of target company's corporate decision-making, knowledge and resources are located. It can be noticed from Table 4 that the location of a project is not linked to the financial result since projects B and F are different in terms of meeting financial objectives.

Being successful in contractor cooperation can be noticed to be a significant factor in meeting the project objectives such as budget and schedule. In addition, it can be noticed that the ordered product has some kind of effect on how complex the project execution will turn out to be. Challenges with contractor cooperation may have led to struggles with meeting budget and schedule in projects A and B, while other projects had no significant difficulties and accomplished the set objectives. Similarly, the level of satisfactoriness in a customer relationship may have an influence on project execution, which was evident in projects A and B. With project C, it is extremely hard to evaluate if the controlling nature of the customer has affected project execution as one finding can not be considered enough for drawing conclusions. At the same time with projects D, E and F, no struggles regarding the customer were pointed out and simultaneously financial results turned out to be positive.

4.2 Contracting

An essential part of the empirical research was to investigate alternative contract models, contracting procedures and contract management with the selected cases. Some variation was noticed in the knowledge of interviewees towards contracting processes and contract models. The project managers were noticed to have more information on contracting processes while the site managers expressed their lack of knowledge with not being significantly present in these processes. However, knowledge of governance methods can be claimed to be similarly familiar to both project managers and site managers. Furthermore, extra questions were occasionally presented to receive proper answers to the topics associated with contract models, contracting procedures and contract management.

4.2.1 Contract models

Each contract was noticed to be individual and independent from other contractors in all examined cases. To achieve a better focus on key contractors, the focus was narrowed down to the most critical contracts. A critical contract was referred to be a contract that was either known to be critical before the project execution or was noticed to turn critical

in the project execution stage. Empirical material showed that criticality was mainly referred by interviewees to those contractors that were known to be vital for success before start of work at construction site. Typically, the interviewees found two key areas of construction work critical in terms of meeting project objectives.

However, an essential surprising finding was that all critical contracts used with contractors are a combination of fixed price and unit price contracts. The main drivers for using this kind of contract model is to commit contractor to the set schedule and estimated costs. This contract model used with all projects is called in this thesis as the currently used contract model. Additionally, cost-reimbursable and open book contracts were not used with critical contractors at all. In practice, using the current contract model means estimating the needed amount of resources such as quantities and setting a price for work. However, only a part of the scope is determined to be a fixed price while other parts are arranged to be based on unit prices. Still, even the part of scope that has the fixed price is possible to change if strong reasons for that are determined together with the contractor. Thus, it can be stated that the currently used contract model used is closer to unit price contracts than fixed price contracts. Both contract models are still discussed later in this chapter as interviewees had opinions on having either a pure unit price contract or a pure fixed price contract.

It was noticed that determining a clear difference between fixed price and unit price sum contracts is challenging. Therefore, the possibility of measuring and determining the scope, which is not present in the definition of fixed price contract, was determined to be the distinctive element between these contracts. A contract was evaluated be a unit price contract when the interviewee clearly stated the possibility of changing the scope. However, it was noticed that the site manager and the project manager from the same project seemed to occasionally have opposite opinions on the used contract model. In these occasions one claimed the used contract to be a unit price contract while the other acknowledged the contract to be a fixed price contract.

Evaluating other alternative contract models was noticed to be more difficult than expected as all contracts used with contractors are similar. Thus, evaluating the effects of selected contract model on having success is not possible. Therefore, it is important to analyze how these contracts have functioned in practice and if minor contractual changes have had wider effects on the success of the project execution stage. Still, some discussion was done about alternative contract models in interviews to enable a better analysis.

It was stated that using the current contract model does not relevantly influence the level of cooperation at construction site. One way to explain this was stated to be the lack of interest of site personnel and contractors in the chosen contract model and its effects on the more important daily work. The interviewees had a struggle with determining a proper answer for this, since the interviewees claimed to have insufficient knowledge of comparing the current contract model to other alternative ones. Since the longitude of

using the current contract model is great, the contractors are used to it and are expecting the buyer to propose it to them. However, choosing the current contract model does not disallow contractors from being cooperative. As the contract terms define the consequences of not meeting the set requirements, a contractor may pursue cooperative behavior in order to meet own objectives simultaneously with the mutual project objectives. This kind of cooperative behavior that requires contractor to pay attention on others can also be implemented into the contract, which was also carried out in the successful project F.

Empirical research investigated whether other alternative contract models were considered for contractors in the selected projects. However, most site managers were not able to answer this question properly since they claimed to not have taken part in the process of contract model selection, while the project managers emphasized the long-term habit of using the current contract model. Thus, no major considerations were made on using other contract models, but some thoughts were put on having cost-reimbursable contracts with additional works. The use of an open book contract had been proposed with one project, but it was quickly sidelined from considerations to choose it.

The criteria for selecting the used contract model was also covered in interviews. An interesting comment was noticed regarding the criteria with selecting a suitable contract model, which points out the factor that the target company considers to be important:

“Complexity adds the amount of risk and selecting the most appropriate contract model responds to that.”

In the same way as described in the citation, the level of complexity and its effect on the amount of financial risk have key roles in selecting the appropriate contract model, which results in using the current contract model. Additionally, some interviewees pointed out that the contract model selection is dependent on target company’s knowledge of the contractor.

Table 5 summarizes information from interviewees about requirements, strengths and challenges of alternative contract models. As all contract models except an alliance contract were visible for interviewees, some discussion was done on the strengths and challenges of other alternative contract models too. The interviewee group was expected to have no knowledge of alliance contracts. Therefore, the alliance contract was not discussed in the conducted interviews and is not included Table 5.

Table 5. Empirical data on alternative contract models.

Contract model	Requirements	Challenges	Strengths
Fixed price	<ul style="list-style-type: none"> • High knowledge of scope • Low uncertainty. 	<ul style="list-style-type: none"> • Overpaying with a false estimate • Contractor adds risk margin • A reduced cost structure knowledge • Low flexibility from contractors. 	<ul style="list-style-type: none"> • Clear expectations • Reduces extra works • Predictability • Low need for supervision.
Unit price	<ul style="list-style-type: none"> • A lower knowledge of scope than with a fixed price • Accurate estimates. 	<ul style="list-style-type: none"> • Negotiations over scope changes • Challenging to provide accurate estimates of the scope. 	<ul style="list-style-type: none"> • Optimally clear expectations • Risks can be moved to contractors in a case of uncertainty • Enables a more positive atmosphere than a fixed price.
Cost-reimbursable	<ul style="list-style-type: none"> • Uncertainty • Small scope • A need for completing the work quickly. 	<ul style="list-style-type: none"> • Too kind for contractors • All risks at buyer • Opportunistic behavior. 	<ul style="list-style-type: none"> • Additional works can be done quickly.
Open book	<ul style="list-style-type: none"> • Uncertainty • Sufficient trust • Early implementation • Familiar contractor. 	<ul style="list-style-type: none"> • Contractor being afraid of buyer's bargaining power • Contractor not familiar with open book. 	<ul style="list-style-type: none"> • Optimally fair for both parties • Cost reductions • Focusing on key activities.

Fixed price contract

In this part, empirical findings on pure unit price contracts are discussed. The most essential requirement with fixed price contracts was stated to be the buyer's high knowledge of the required scope. When the buyer is aware of the correct amount of needed quantities and resources, a negative financial outcome was not seen likely to occur. However, unprofitable situation occurs when the calculated estimate is false and the activity is bought with a too high price. As a challenge, contractors were said to have the tendency of adding risk margin to the price of work if the scope was experienced to be unclear. Additionally, disputes were claimed to arise if the scope becomes drastically larger. This situation was said to result in a lower satisfactoriness of a contractor

relationship as more resources are needed to complete the required work. As another challenge, target company's knowledge of the required scope was claimed to be decreased if only fixed price contracts are offered to contractors in a consistent way. Thus, evaluating unfamiliar future projects accurately might be more challenging and false estimates of costs may occur.

With the challenging project A, a low level of flexibility from the contractor was noticed to be a challenge. This insufficient flexibility was linked to a lack of cooperative actions at construction site. In practice, the contractors completed the things that were mentioned in the contract and nothing else if no payments for possible additional activities were offered. Interviewees saw that the best way to avoid this situation is to put a special emphasis on defining contract terms.

The strengths of fixed price contracts are associated with the predictability of results. Optimally the buyer receives the purchased activities in schedule and in the agreed price. However, this was stated to be possible if the buyer knows the scope well. Furthermore, contractors' attempts of seeking extra payments is diminished if the contract is complete and formed well. This way, the performance of a contractor does not need to be supervised because the contract terms force to complete the required work desirably.

In the current contracts that had more characteristics of fixed price contracts, an incentive structure was implemented in contract terms. With the successful project F, most project objectives were met and consequently bonuses were paid for contractors. However, with the challenging project B, an incentive structure was implemented for a single contractor in the middle of the project and the bonus milestones were not achieved. Thus, it is difficult to evaluate the impact of an incentive system to the outcome of a project. As a slight assumption, it can be stated that the earliness of implementing incentives into contract might have an influence on the outcome.

Unit price contract

The pure unit price contracts were discussed in interviews too. Unlike with fixed price contracts, unit price contracts include the possibility of measuring the scope again. Still, scope changes should be based on clear reasons, which are determined together between the target company and the contractor. Empirical data states that by using this contract model, financial risks can be moved to the contractor when the scope is unclear for the target company. Therefore, a pure unit price contract is seen suitable to situations where the target company faces uncertainties in the project planning stage.

Empirical data states that the main challenge of unit price contracts is evaluating the needed scope correctly, which was also evident with fixed price contracts. As there is the possibility of measuring the scope again, disputes and negotiations over financial issues may occur. A comment from a successful project claims that these negotiations increase

contractors' needs to be opportunistic due to greater possibilities of cost savings. This empirical finding was seen to support the importance of having accurate estimates.

The strengths of unit price contracts were noticed to be optimally in line with the strengths of fixed price contracts. This finding might be a result of the challenge with making a clear distinction between unit price and fixed price contracts, which was noticed earlier in this chapter. Since the scope can be changed, multiple interviewees saw this contract model friendlier to contractors than fixed price contracts. This was said to result in a more positive atmosphere in the project network than a pure fixed price contract. If no major changes to the determined scope are made, the expected results can be predicted well already in the beginning of a project.

Cost-reimbursable contract

Empirical findings state that using cost-reimbursable contracts should be avoided with contractors in the context of the target company. However, when the target company is forced to use this contract model, there was noticed to be an uncertainty in the scope of work and a need for completing the desired actions quickly. An example where this contract model could be used beneficially is a small scope of additional works that could be done quickly without long contract negotiations. Furthermore, this contract model should be used when the scope is small.

Target company's typical cost-reimbursable contracts were told to be hourly based, because it can be hard to determine the amount of needed resources. Empirical data claims that using cost-reimbursable contracts is too kind for contractors as the buyer is carrying most financial risks. Moreover, it was stated that this type of contract does not encourage contractors to complete work on time since every extra hour is beneficial for the financial situation of a contractor. Therefore, no clear time pressure is placed at contractor's end, which was stated to negatively affect the actions and schedule objectives of other project network participants. Additionally, the target company has noticed that measuring and monitoring the agreed performance level is challenging. Thus, a major risk of opportunistic behavior was said to be clearly present with cost-reimbursable contracts. A single comment from project F states that contractors are in a better position of pursuing opportunistic behavior with cost-reimbursable contracts than with open book contracts that expose more cost data about the key activities.

Open book contract

The interviewee group had differing opinions on the applicability of an open book contract to contractors, which was not dependent on the success of a project. Furthermore, this contract model was not seen possible with contractors that are unfamiliar to the target company. All interviewees stated that open book policy has never been practiced in the relationships between the target company and contractors. In practice, using this contract was stated to mean implementing a more transparent open book policy into the currently

used contract model. A higher level of uncertainty and disbelief from the buyer were seen to be the major requirements and reasons for opening the books. Alternatively, more positive factors were also seen to be reasons for using open book contracts. Either a long relationship or a great level of established trust were also stated to be requirements for an open book policy, which could enable a beneficial relationship for both parties.

Empirical material stated that the strengths open book contracts are the possibility of achieving cost reductions and the ability of prioritizing key activities. In the optimal situation of no opportunism, the possible benefits can be gained in an equal way, which was defined by multiple interviewees to be a fair play for both the target company and a contractor. The transparency of open book could have provided a more objective viewpoint in managing challenging contractor relationships in project B, where an open book could have reduced the contractors' fears of not meeting the defined schedule objectives. An individual comment from project C stated that the desired benefits of the open book contract are to be achieved only if it is implemented already to the project planning stage.

The most significant challenge with an open book contract was stated to be the situation where a contractor is afraid of the target company increasing its bargaining power. In practice, this would mean that the target company seeks for possible cost reductions by analyzing contractor's cost structure. Furthermore, some interviewees claimed that proposing an open book contract to contractors would lead to some kind of resistance regardless of the good intentions of the target company. The comments from project E support this approach since contractors are always said to have their objectives for meeting profit margins, which may differ from the mutual project objectives. Secondly, having cultural differences may block an open book implementation if contractor has no previous experience or knowledge of this kind of contract type. The third factor, based on a single comment from project C, having influence on establishing an open book contract was stated to be the requirements from the end customer. The focus activities determined between the target company and a contractor might not be in line with the expectations of the end customer and therefore challenges may occur.

Alliance contract

As told earlier in this chapter, the alliance contract was not discussed in the interviews due to the assumption of interviewees having insufficient knowledge on this contract model. The applicability of an alliance contract to contractors is evaluated in a more thorough way in the chapter of discussion and conclusions. The analysis of alliance contract's suitability is evaluated based on the all-round perception that covers the currently used contracts, the used project network governance methods and how project networks functioned in practice.

4.2.2 Contractor selection

The topic of contractor selection was discussed since it was seen important to examine how the importance of contractor cooperation was evaluated before the project execution stage. Thus, an analysis about the dependency of contractor selection to a project being successful was enabled. Interviewees were asked to choose the three most significant contractor selection criteria from given options, place them in order and explain their selection. The alternative criteria for examination were determined to be quality, price, knowledge, the fluency of cooperation, the alignment of strategies and the likeliness of succeeding. In general, the interviewees prioritized either the likeliness of succeeding or price as the top criterion while quality, fluency of cooperation and knowledge were the latter selected criteria. No interviewee selected the alignment of strategies to be in the top three criteria. The interviewees stated that quality, knowledge and the fluency of cooperation are highly linked to the likeliness of succeeding. Therefore, the most significant criteria for further evaluation were chosen to be price and the likeliness of succeeding.

Overall, in the successful projects the likeliness of succeeding was the top criterion for contractor selection while the price of work was only needed to be within a specified range. The contractor was said to be likely to succeed if all needed resources and knowledge for completing the work were possessed. By possessing these, a higher quality of work was stated to be achieved simultaneously. On the contrary, the challenging projects were noticed to choose the criterion of price over the likeliness of succeeding. The differences of this prioritization between the projects B and D illustrate the effects of selection criteria on the success of the project execution stage. The project D prioritized the likeliness of succeeding first while the price of work was stated to have a smaller impact on the final decision. With project B, the price of work was considered to be more important as the total savings gained from the contractor selection were estimated to sufficiently cover all possible risks with the project execution. A single explanation for the prioritization between the likeliness of succeeding and the price of work was stated to be the number of viable contractors in the supply market, which was also discussed further.

Opinions on the supply market of contractors were noticed to be similar inside the interviewee group. Nearly all opinions stated that finding contractors who fulfill all contractor selection criteria is difficult, which was explained with the rarity of finding suitable contractors from the supply market. The market was claimed to not always have suitable contractors, if multiple projects are in progress at the same time on behalf of either the target company or a competitor. Hence, the target company is sometimes forced to test new contractors in a smaller project, which was present with one main contractor in the successful project E. If a new contractor carries out one project well, more challenging and larger scopes were stated to be offered for this kind of contractor in the future too.

Still, evaluating the capabilities of a contractor to complete the required work can be extremely difficult as thorough evaluation is needed with every project. One main contractor used in the successful project F was used later in the challenging project A, where the lack of knowledge and schedule delays were too great objects to complete the determined scope desirably. Explanations for this pitfall were stated to be an unfamiliar culture and a scope that was too complex for them to handle. Interviewees from project A stated that more criticism should have been practiced with this contractor selection. Additionally, the target company should evaluate the contractor's capability of performing more thoroughly, if the contractor is taking part in multiple projects simultaneously. Thus, the target company could put more criticism on the likeliness of succeeding in a new project if most of the contractor's resources are already placed on another ongoing project.

Consequently, a clear finding based on the information presented earlier was that the target company should explore the supply market in a more thorough way. About half of the interviewees stated a belief that the supply market includes more viable contractors. One example of this belief is the fact that one recently found main contractor had been working with a competitor in multiple projects. Thus, some interviewees saw that sourcing activities should be done more globally and open-mindedly than before. In a supportive fashion, the pricing has become fiercer in target company's market area and thus more viable options are needed. A special focus should be put on finding those critical contractors that are required to have a larger scope of activities. Interviewees noted two critical areas with construction work that require more exploration in the supply market. This was referred to be critical as the required scopes with these areas are significantly larger and accordingly the effects on the project execution stage are greater.

The objectives of contract negotiations with contractors were also discussed, which is greatly linked to the literature review's theory of negotiation approaches. This part examined if the target company was searching for a contract with low financial risks, a contract that emphasizes the importance of having a fluent project execution or something in between. The most common first comment from interviewees was that both a low financial risk and a fluent project execution were considered in the contractor negotiations. However, some differences were noticed between challenging and successful projects.

The price-oriented approach that focuses on having low financial risks was noticed to be slightly more important with the challenging projects, which can be linked to the importance of price in contractor selection. The low number of viable contractors in the supply market was noticed to increase the importance of focusing on a low price in these projects. Other alternative contractors were noticed to be well over budget with the challenging projects, which made the low price more intriguing in the contractor selections. In the successful projects, the target company was said to be more capable of estimating a realistic price for the scope of work. Thus, those contractors well under

budget were withdrawn from the list of viable contractors since these too inexpensive contractors did not probably possess enough knowledge of the needed resources to execute the required scope. In addition, more alternative contractors were available in these successful projects, which decreased the importance of concentrating on the price of work.

The cooperation-enhancing approach was stated to be part of contractor negotiations to some extent in all examined projects. However, the successful projects emphasized the importance of fluent contractor cooperation more than the challenging projects. The significance of showing enough information about the requirements and resources for completing the work was seen essential to enable success. This presented transparent information was said to consist mainly of clarifying activities related to the elements of scope, responsibilities, schedule, quality and safety. Multiple interviewees from successful projects stated that more transparency can be achieved already in the beginning of a project by explaining these requirements clearly. As a result, the increased transparency was said to enable a situation where a contractor is willing to decrease the possible risk margin in the price of work. In practice, this change is made possible as contractors may realize the more cost-effective ways for executing the required activities. A comment from a successful project illustrated that if transparency is not properly achieved and focus is too strongly on lowering prices in the negotiation, at least a similar amount of additional costs may occur in the project execution stage.

4.2.3 Governing contractors

Contract management and governance methods for contractors were another area of investigation. In the literature review the alternative methods for contracting, traditional and relational, were discussed and therefore examined in the conducted interviews. The governance methods for contractors are summarized in Table 6. Furthermore, this table illustrates the elements that were found to be in line with the success of a project. These findings are discussed next.

Table 6. *Governing contractors.*

Governance methods	Successful projects	Challenging projects
Decision-making	<ul style="list-style-type: none"> - Joint, but approval needed from the target company - The target company guides towards good solutions. 	<ul style="list-style-type: none"> - Objective of having joint decision-making and approval needed from target company - Reluctance towards target company's proposed actions - Occasionally strictness was needed from the target company.
Change management	<ul style="list-style-type: none"> - Frequent use of relational methods - Low use of contractual governance methods. 	<ul style="list-style-type: none"> - Objective of using relational methods - Frequent use of contractual governance methods.
Problem-solving	<ul style="list-style-type: none"> - Constructive approach - Finding mutual understanding with contractors was necessary. 	<ul style="list-style-type: none"> - Objective of having constructive approach - Unsatisfactory situations with contractors as opportunism interfered.

Decision-making

The nature of having cooperativeness in decision-making processes was a clear objective in all six projects. During construction works, multiple regular meetings are held with contractors. The goal of these coordination meetings is to enable an overview for all project network participants about the current circumstances and future actions. As a common policy, it was noted to that the contractor must have an approval from the target company before conducting exceptional activities. Still in most projects was claimed that the contractors have a freedom to plan and present their ideas on carrying out challenging activities. A single comment states that these propositions should be as early as possible to result in a larger impact.

The successful projects seemed to have a characteristic where the target company guides contractors towards the most appropriate solutions. As the target company has a versatile experience from multiple similar projects, recommendations were given to enable cost reductions to the benefit of all project network participants. Still, the contractors have a freedom to propose other alternative ways of conducting needed activities as their knowledge is expected to be on a high level. Based on this information, it can be assumed that the good practices were found mutually with cooperativeness and by respecting each other's opinions.

However, with the challenging projects a mutual understanding was not always achieved and more strictness was needed from the target company. In these projects, single contractors were noticed to be reluctant towards carrying out proposed actions because of two reasons, which were stated to be a lack of knowledge to conduct the needed activities and the possibilities of negative financial effects. Especially with the challenging project B, more coordination and strictness was needed from the target company to manage sudden unexpected changes because the contractor had insufficient skills to respond. Thus, the interviewees from the challenging projects emphasized the importance of a sufficient emphasis on contractor selection to avoid these kinds of issues in decision-making.

Change management

Change management was noticed to be handled differently between the successful and challenging projects. Working in the environment of a project network was claimed to need proper change management procedures due to complexity, individual financial objectives of contractors and sudden changes. The typical drivers for a need of pursuing change management procedures were noticed to be financial risks and changes in the estimated schedule. A single comment change management procedures in a project network states:

“It would be great if there was no need to look at contract terms during project execution.”

This finding was evident in multiple cases regardless of the outcome of a project. Even though this situation is recognized, achieving it entails struggles in a project network. Therefore, this occasion is characterized to be the optimal situation, which is not always achievable. In all projects, the use of relational methods that encourage finding a suitable solution for both parties was the main objective. This approach was fulfilled better in the successful project than in the challenging ones. Similarly, the need of looking at contract terms was more frequent with the challenging projects than with the ones that met the defined objectives.

However, contractual governance methods were occasionally used even in the successful projects if the financial risks associated with needed changes grew. To clarify, the interviewees stated that contractual governance methods were used only if it was seen necessary. A thorough contractual governance process was said to involve more powerful people from both parties since there is a high interest in gaining as much financial benefits as possible. If this process grows too enormous, negative effects on the fluency of the project execution stage were claimed to occur. Having proper documentation was stated as the key approach for negotiations that include opposite opinions between the parties involved. Thus, it was seen more likely to stand behind own arguments and achieve the desired outcome from these kinds of situations.

Problem-solving

Answers regarding *problem-solving* were significantly linked to the change management procedures, but the focus was more on the satisfactoriness to continue in the best possible way after facing problems and solving them with change management procedures. Therefore, the constructive approach towards problem-solving was examined. All cases were noticed to pursue a constructive approach towards finding a mutual understanding. However, only the successful projects succeeded in executing this approach consistently with contractors.

In the challenging projects, contractor relationships were occasionally said to reach a toxic level that led to dissatisfaction. Nearly all problem-solving processes were linked to financial issues, which increased the needs of pursuing opportunism. Most interviewees saw that the missing elements in the contract had the greatest effect on these kinds of situations occurring. A single comment from a challenging project states that the target company should not be afraid of ending relationships with some contractors, but at the same time no excess power should be used with them in the problem-solving processes. This approach is quite opposite to the ways of successful projects where finding a suitable approach was seen necessary to continue work.

As stated briefly, the successful cases were noticed to have a throughout constructive way towards problem-solving and at the same time enable higher likeliness of succeeding after agreeing a solution. A significant factor with this was pointed out to be the fluency of the more personal relationships in a project network. This approach emphasized the need of succeeding in communication and interaction between target company's supervisors and contractors' supervisors.

The effects of previous cooperation on governance methods

Earlier in the part of background information was noticed that the familiarity of a contractor could be a factor in having a successful project execution. In general, the longitude of a contractor relationship was stated to have a positive influence on how a contractor was governed. When the target company had cooperated with some contractor frequently in multiple previous projects, more knowledge of each other's procedures and ways of working were already achieved. Thus, a higher level of trust was present as no major surprises were expected in the project execution stage. Additionally, less strictness was present in the governance methods if the target company was interested in cooperating with the specific contractor again. From a contractor's point of view, less risk margin might be put in the price of work when a better knowledge of the target company exists. Still, the target company should be conscious of the resources that a contractor possesses to expect the same results as in previous projects. This aspect was not achieved properly in the challenging project A.

Furthermore, the importance of construction site's management personnel being familiar to each other was noticed to be a key factor in pursuing cooperativeness. When especially site managers from different organizations know each other, a greater amount of fluency is expected to be present during construction activities. Therefore, the target company is often probing about the persons who are going to arrive to the construction site. Some interviewees pointed out that a higher likeliness of succeeding is achieved when the best compatible site personnel team is chosen.

However, the longitude of a contractor relationship was not always the deciding factor in how governance methods were carried out. In the successful project E, a totally new main contractor was well prepared for the project execution stage. Consequently, a higher level of trust was achieved early on with the target company. Thus, the procedures that were used with more familiar contractors were practiced with this new contractor. It was also stated that a well-performing new contractor can be treated in a less strict way in possible future projects too.

4.3 Contractor relationships in project networks

Another essential part of empirical research was determined to be contractor relationships in project networks. This part was determined to be carried out after discussing the topic of contracting, which was seen to enable a deeper analysis on how the characteristics that affect working in project networks are dependent on the selected contract model and the used contract management methods.

Opposite to the part of contracting, the project managers seemed to have less information about construction activities and contractor relationships in project networks. This can be explained with the smaller amount of time spent at construction site where analyzing and observing is significantly easier than from an office. Consequently, some interview questions were noticed to be challenging for project managers and more explanations were needed from the interviewer to receive proper answers. In line with the part 4.2 of contracting, some extra questions were asked to achieve a better understanding on contractor cooperation in the typical project network of the target company.

4.3.1 Project network in practice

It was noticed that contractors do not currently pursue major cooperativeness with each other in the project network. Therefore, it was seen difficult to evaluate if an increased cooperativeness of contractors with each other could lead to better results. In most projects, cooperativeness between contractors was stated to be limited since the target company wants to know what activities and procedures are planned to be carried out. The need for coordinating contractors was stated to be smaller when one contractor covers a larger amount of the defined scope, which at the same time results in a smaller number of contractors in this project network. The coordination of contractors was conducted

typically in regular meetings that were held either daily, weekly or monthly. This approach applied to all projects. However, no limitations were set on contractors to create propositions for future activities together and present them to the target company for approval. Thus, a proactive approach of contractors towards future activities was not present in these selected projects as no clear drivers for that were set.

Still, some interviewees saw that contractors being more cooperative and proactive with each other could be beneficial. Thus, more fluent decision-making was claimed to be probable. Especially in projects C and F, those contractors who shared the same cultural background worked more cooperatively, which led to a more fluent project execution. The core challenge blocking cooperation was said to be the opportunistic financial objectives of contractors. An example of this kind of behavior is to conduct an activity immediately against the set plan. This action is done as it is seen as the most cost-effective way for themselves, which results in this contractor to not care about the negative effects on the works of other project network participants. Thus, a sufficient level of coordination is always needed from the target company due to this possible opportunism. Multiple interviewees stated that the main driver for cooperativeness with each other should be a financial incentive. As another driver was stated to be possible future considerations, which could lead to a situation where a contractor wants to prove their capabilities of succeeding in the form of being more cooperative.

Another factor affecting to the functioning of project network was stated to be the engineering department. The importance of engineering plans being compatible to the plans of other departments was stated to be essential in terms of having success. A single comment pointed out a situation that happens frequently in most projects:

"The plans of engineering department were late but that is quite typical to some extent in most of our projects."

Although the engineering department is not especially part of the research scope, the effects of having plans late were clear with the challenging projects. In these projects, delays in schedule occurred as the contractors did not have sufficient instructions for completing the required construction activities. Typically, a more fluent execution was said to be achieved if all needed engineering documents had a high quality and were sent on time. These factors were seen to be enabled better with a less tight schedule. Providing engineering plans was said to be occasionally challenging because needed information to proceed might be located at the client. Still, having enough time for this was stated to provide a greater likelihood of succeeding.

Decision-making procedures in a complex project network were stated to be challenging processes as multiple contractors must be governed at the same time. Two alternative approaches of dividing decision-making power with contractors were covered, which were increasing the responsibility area of the target company on decision-making and

directing more power to contractors from the target company. A single idea from a challenging project states:

“It is challenging to estimate the optimal level of sharing decision-making power with contractors.”

This comment illustrates that the target company does not know for sure, whether the currently used policy is good or not. The target company taking more responsibility of decision-making in the project execution stage was mostly seen as a bad option because more resources are needed and more risks are carried at the same time. Additionally, this kind of approach could harm the good practices of contractors and the quality of work as a contractor might not be too familiar with the proposed actions and procedures. Still, a minimum level of supervision is needed as purchasing specific activities does not directly enable a fluent project execution.

On the other hand, when the target company directs more power towards contractors, it was seen likely that the largest contractor takes more responsibility in the project network. Thus, simultaneously the largest contractor might have a larger tendency towards pursuing opportunistic actions. Overall, it can be stated that a middle ground should be found between hierarchical governance by the target company and all-involving relational governance. Additionally, a key element for project network governance was stated to be enabling balance among contractors, which means governing all project network participants equally. Atmosphere in the network was said to be damaged if the objectives of a single contractor are fulfilled and handled better than other contractors' objectives. Altogether, the end customer was said to have a clear impact on the fluency of operations as the end customer's requirements might differ from those that are agreed at construction site. Therefore, involving the client into the decision-making processes was stated to be highly important.

As an intriguing finding was noticed how the target company forms project network currently and what is the main reason for this decision. Currently, the target company has three or four main contractors since this way project network governance is seen to be easier than with for example ten main contractors. As noted earlier, this was claimed to result in less needed coordination during project execution. Two alternative options for project network governance based on a single interview comment are presented in Figure 9. The picture above presents the current way of organizing a project network while the picture below presents the alternative way that is not practiced currently but was noted as an alternative for the future. The approaches differentiate based on the fact of having contractors at the same level or multiple levels.

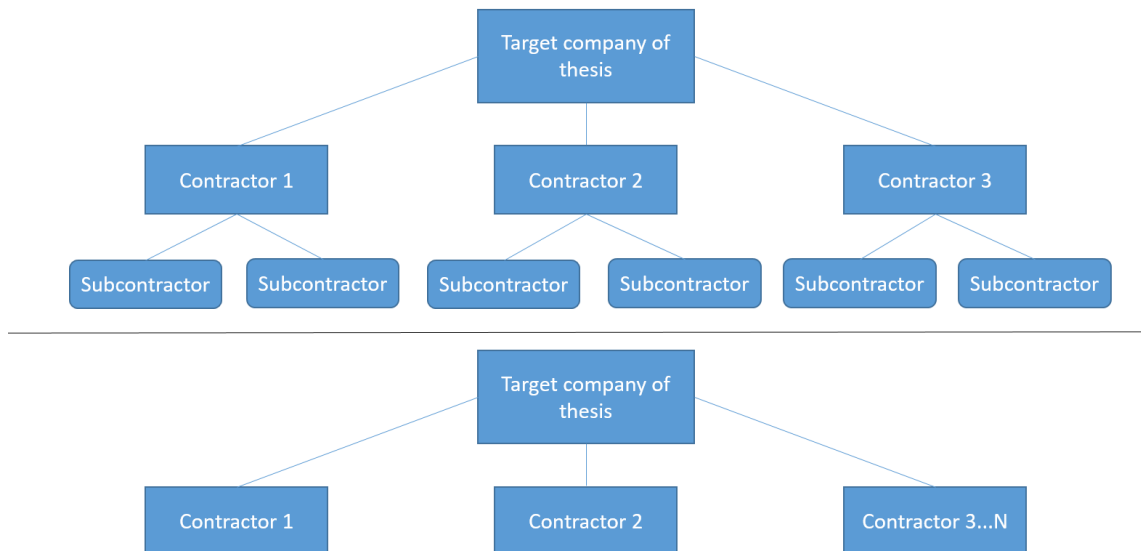


Figure 9. *Alternative approaches for organizing the project network.*

However, the current approach of organizing is not seen to enable sufficient knowledge integration in the whole project network. Furthermore, the interviewee added that with the current approach the target company does not always know about the activities of subcontractors. Therefore, it was claimed that this position of not knowing all facts related to project network participants' situations may lead to difficulties in the project execution stage.

4.3.2 Characteristics affecting contractor relationships

The cooperative abilities of contractors were analyzed in a more comprehensive way after covering the part of contracting in the interviews. A summary of empirical material on the characteristics affecting contractor relationships and cooperativeness are presented in Table 7. All characteristics related to both the successful and challenging projects are explained thoroughly after this visual summary.

Table 7. Characteristics affecting contractor cooperation.

Characteristics	Successful projects	Challenging projects
Trust	<ul style="list-style-type: none"> - Overall a high level of trust - Mostly familiar contractors - Motivation to gain trust - Openness. 	<ul style="list-style-type: none"> - Variation in trust among contractors. - Single contractors proved to be extremely challenging.
Commitment	<ul style="list-style-type: none"> - Contractual terms drove to commitment - Focus on the mutual project objectives - Loose schedules - Opportunistic attempts. 	<ul style="list-style-type: none"> - Contractual terms drove to commitment - Unexpected situations occurred - Occasionally opportunism occurred in a larger way.
Communication and information sharing	<ul style="list-style-type: none"> - Communication on a good level - Information sharing limited between contractors - Documentation well executed. 	<ul style="list-style-type: none"> - More communication needed. - Information sharing limited between contractors - Difficulties with IT databases and documentation.
Innovativeness and continuous improvement	<ul style="list-style-type: none"> - Contractors possessed more knowledge of the target company - Innovativeness already in the planning stage. 	<ul style="list-style-type: none"> - No drivers - Contractors' inability of being innovative in unexpected situations.
Contextual factors	<ul style="list-style-type: none"> - Different scopes - Familiar contractors and site personnel - Mutual cultural backgrounds. 	<ul style="list-style-type: none"> - Complex and underestimated scopes - Challenging contractors.

Trust

In general, all successful projects were noticed to have a high level of trust between contractors while the challenging projects had more variation on the levels that were achieved. The key challenges in establishing an all-round high level of trust in a project network were claimed to be single contractors, which seemed to have either a lack of motivation or insufficient resources to carry out the defined activities desirably. Multiple interviewees from the challenging projects claimed that the difficult situations in the project execution stage put the trust between contractors and the target company on a test. If one challenging situation is faced successfully, this specific contractor can receive more trust from the target company. On the other hand, trust was said to be decreased if a contractor shows insufficient motivation on working in a satisfactory manner or does not respect the mutually agreed decisions. A comment from a challenging project pointed out

that in challenging situations the target company should provide guidance in a consistent way. In practice, this would mean a practice where the target company clearly describes the required actions and the deadlines for them.

The most essential finding on how trust could be increased was selecting contractors that are familiar to the target company. The personnel who carry out the activities at construction site should know each other's procedures thoroughly to enable a more fluent project execution. Thus, knowing people on a personal level was stated in most answers to provide success. However, the new main contractor in the project E proved to be an exception. The motivation of this specific contractor to carry out the set activities well enabled greater trust, which was also said to help in selecting the same contractor to another project. Some interviewees claimed that contractor's will and motivation towards project execution was extremely strong when possibilities of future projects with the target company attracted interest. Another way that created a greater level of trust in the successful projects was to establish an open atmosphere with contractors. Thus, more mutual understanding and reactivity towards finding mutual interests were stated to be more achievable.

Commitment

The amount of commitment was noticed to be greatly linked to the amount of opportunistic behavior, which explains the similarity of answers between the topics of trust and commitment. Additionally, the importance of contractual focus was linked to establishing commitment. The level of opportunistic behavior often grew in the challenging projects while in the successful projects contractors seemed to understand the importance of meeting the set mutual project objectives. Opportunism typically grew when sudden unexpected factors interfered with work at construction site. Furthermore, commitment to joint decisions became harder when motivation and resources to carry out the proposed activities lacked in a significant way. Still, even with the successful projects contractors had opportunistic attempts either in the beginning of project or in the final settlement. These attempts were mostly linked to scope changes and additional works, which were claimed of not being included in contract terms. However, no major opportunism existed in the middle of project execution in these successful projects as most focus was put on completing the activities on time to avoid penalties.

Another factor to have a positive impact on the level of contractors' commitment was the stated to be the determined schedule. With a looser schedule the probability of challenging situations was said to be lower while a tight schedule was noted to set additional pressures to contractors. Therefore, designing accurate milestones for a project was stated to provide better circumstances for a higher level of commitment. This way a contractor was said to have a better ability to analyze all needed resources in a cost-effective way. In practice, this approach was stated to need an early implementation and enough time for both internal planning and eventually mutual planning with contractors.

A second way to increase commitment was claimed to be a great amount of joint decision-making and guidance from the target company, which was noticed earlier to be a way of increasing trust too. In practice, this increased joint decision-making would still be executed in regular coordination meetings, but the target company should encourage contractors more towards giving opinions on how future challenges should be managed. Thus, the likeliness of facing larger changes could be lower in the project execution.

Communication and information sharing

The risk of opportunism was noticed to set limitations on information sharing and communication among contractors. Knowledge integration was limited to not seeing each other's progresses, cost data or other sensitive information. The most vital of all information limitations was stated to be contractors' progresses, which does not enable project's real-time status for project network participants. This limited progress data was said to decrease contractors' needs to lower manpower resources, which often are seen to reduce the likeliness of meeting schedule milestones. Surprisingly, the challenging projects emphasized the importance of increasing transparency while the successful projects put more focus on limiting this kind of progress data. One example of this was a situation where a lack of communication in the beginning of this project led to the contractor demanding more schedule and payments for additional works. However, communication and information sharing was more transparent in all projects if the topic was associated with nearer future activities at construction site. This decision-making related to completing nearer future activities was mostly done in regular coordination meetings.

The standards with documentation were noticed to variate in line with the success of a project. With the successful projects interviewees stated that no major improvements should have been needed with project documentation. However, interviewees from the challenging projects saw that more consistent procedures and guidelines were needed. Consistent procedures on how coordination meetings should be held and how documentation should be carried out were the major needs regarding the flow of information. One way to solve this was claimed to be a consistent use of internal documentation tools with each project instead of using methods that are more familiar to contractors. In the successful project E, the target company tailored a documentation system that suited the project characteristics and needs in a more satisfactory way. Thus, the challenges of previous documentation systems were recognized early before the start of construction work and there was enough time to develop a better and a more user-friendly system.

Innovativeness and continuous improvement

Intriguingly contractors' innovativeness was noticed to be slightly limited in the project execution stage, because the target company wants to know about all planned activities

that might have effects on other parties' works. For example, a single agreement on a sudden issue that two contractors make is not beneficial if the knowledge of these parties on the work of other contractors is lacking. Thus, coordination and guidance is needed, which leads to a situation where innovativeness needs an approval. Furthermore, no interviewee pointed out how continuous improvement was fulfilled at construction site. A single comment from the successful project D stated that if some actions of continuous improvement were made at construction site, they happened with no one paying special attention to them.

However, the successful projects had the characteristic of contractors being innovative with the target company already in the project planning stage. In general, innovativeness was seen more probable if a contractor had cooperated previously with the target company. Still as noticed earlier to be an exception, a single new contractor with motivation and knowledge displayed innovativeness in the project execution planning in the successful project E. Furthermore, as noted earlier with discussing negotiation strategies, in the successful projects innovative cost-effective ways of executing construction works were presented, evaluated and finally approved already in the beginning of a project. The challenging projects had the characteristic of having challenges in the middle of project execution, which meant that innovative solutions were needed in a hurry. In these cases, the contractors did not have enough resources or knowledge on responding sufficiently. Thus, contractor's objectives in these projects was directed towards protecting their own financial situation.

A single comment stated that more complexity is always involved in the project execution phase than in the project planning phase. Therefore, more preparation should be done early on in every project. One driver for increasing innovativeness was occasionally stated to be financial, which had been present in some previous projects on behalf the end customer. In practice, this approach would mean creating an open atmosphere, where all project network participants are equally qualified to receive bonuses from providing innovative solutions.

Contextual factors

Contextual factors were noticed to have impacts on the success of contractor cooperation. As one observation, cultural similarities of contractors were noticed to play a key role for cooperativeness in terms of communication and information sharing. In practice, this factor was seen to result in being proactive towards finding the mutual objectives to carrying out activities at construction site. An approval for carrying out the defined activities was still needed from the target company, but no major changes for the actions proposed by contractors was seen necessary.

The amount of complexity was seen to be related to the determined scope, end customer's requirements and to the unwillingness of single contractors to cooperate. Complexity was

stated to grow significantly if underestimations to the required activities were made. Either a challenging contractor or a demanding customer were said to reduce the fluency of daily operations and progress at construction site. As noticed earlier, having a longer contractor relationship seemed to reduce the level of complexity in project execution and lead to better results.

Project F was noticed to be a totally different project in terms of contextual factors having effects on the outcome. This project included the use of incentive structures at a very complex construction site, where the contractors cooperated very well, which was stated to be surprising. It was seen hard to evaluate if either the complex situation or the set bonuses drove contractors to be more cooperative. The interviewee from this project assumed that communication probably grew since all project network participants knew that everyone's contribution is needed to achieve the possible bonuses. Additionally, in this project the contractors were mostly familiar to each other from previous projects and shared the same culture, which all may have contributed to the achieved good result.

4.4 Final questions

Three final interviews questions were determined to summarize the covered topics and receive more specific answers to the defined research questions. Overall, the noticed elements seem to emphasize the early stages of a project lifecycle. Figure 10 illustrates the most significant themes that were noticed with the final questions.

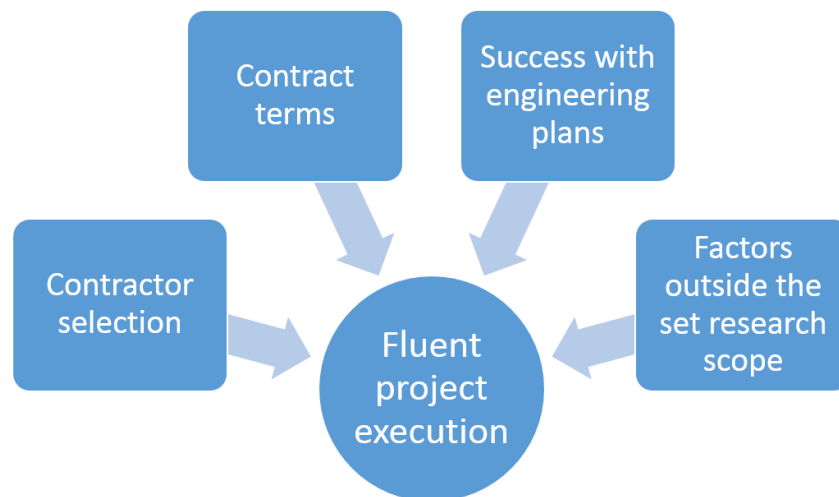


Figure 10. *Emphasized themes with the final questions.*

In general, nearly all answers with the final interview questions were linked to the planning phase of project execution. Contractor selections, success with providing sufficient engineering plans to project network participants and defining contractual terms were stated as the most essential areas in providing a more fluent project execution. The importance of creating trust and communication with contractors in the project execution

were seen to be significant too, but the claimed prerequisites for this were having a sufficient focus on defining contractual terms and contractor selections. A special notice with this was to select those project network participants that form the best team for executing construction activities. Furthermore, these contractors should be familiar to the target company on a more personal level too. Simultaneously, a project network should possess all needed engineering plans to enable meeting the defined schedule. Additional factors to these were noticed to be outside the limited research scope. Client's requirements and on-time material deliveries were said to be those factors outside the limited research scope that the target company can not significantly forecast or have effects on. Still, troubles with schedule were said to be occurred if either of these is against expectations.

It was consistently stated that the used contract model in particular did not have effects on the achieved results. This approach was mostly explained by the lack of knowledge on other alternative contract models that the target company has not used or is familiar with. However, a single comment from the challenging project B stated that using an open book contract or an incentive structure based contract could have contributed to a better project outcome.

Overall, the process of determining contract terms comprehensively was found more important than using another alternative contract model. The findings indicated that more attention should be put on setting milestones, penalties and responsibilities of contractors. The importance of practicing a proper project evaluation with documentation was expressed, which should include the evaluation of used contract terms. Thus, the possible good practices could be transferred into a new similar project, while the harmful ones could be acknowledged and withdrawn from future projects. Especially those practices that consider the works of multiple project network participants should be well documented and evaluated. Lastly, a single comment expressed the need of forming consistent internal guidelines for change management procedures. In practice, this means clarifying the actions and persons that should be involved with disputes of different levels.

5. DISCUSSION AND CONCLUSIONS

5.1 Discussion

In this chapter, the findings of literature review and empirical material are compared and discussed further. This chapter desires to answer the set research questions in a thorough way. Thus, meeting the determined research objective is made possible.

The motivation of the target company to investigate viable alternative contract models for contractors originated from executing challenging projects in the recent past. A major challenge in these projects was stated to be the contractors' lack of cooperation and motivation. Since the academic field has acknowledged the benefits of cooperation in project networks (Sena Ferreira et al. 2012), the target company determined to conduct further research on how contractor cooperation could be increased and what contract models could be the most suitable ones for contractors.

However, the level of contractor cooperation was evaluated in the circumstances where only one type of contract model was used in the examined projects, which set some limitations on how analysis could be done. This currently used contract model was determined to be closest to the characteristics of a unit price contract. Thus, the linkages between cooperativeness and the currently used contract model are possible to evaluate. Simultaneously, the analysis of other alternative contract models is more dependent on the selected scientific theory than on the gathered empirical material.

RQ1: How could cooperation be developed with contractors in complex project networks to influence positively on achieving project objectives?

Empirical material illustrated that the level of cooperation varied significantly in the examined projects. However, the current contract model was not seen to be a factor in providing more cooperativeness. The importance of having early planning was noticed to result in a more successful project outcome, which is discussed in a wider fashion with the third research question. Another reason for variances in contractor cooperation were claimed to be selections of single challenging contractors.

In general, those projects networks that included contractors familiar to the target company and to each other were noticed to be more successful in terms of cooperativeness and financial results. In line with empirical data, Martinsuo & Ahola (2010) emphasize the more probable cooperativeness with familiar contractors that often results from experiencing multiple projects together in the past. Accordingly, commitment to the mutual objectives was seen to be enabled in a better way. In a similar way, the amount of opportunism was stated to be reduced when parties are aware of the consequences of not

acting expectedly, which is in line with the earlier presented definition of trust (Sako & Helper 1998).

Communication and information sharing were stated to be significant in developing cooperativeness in project networks. However, knowledge integration in target company's project network was found to be opposite to what the theoretical background proposes. It is claimed in the academic field that knowledge integration should be as transparent, continuous and open as possible in project networks (Ruuska et al. 2011; Tiwari & Gupta 2012). However, this theory does not consider the importance of used contract model, which makes a great difference. As the currently used contract model is price-oriented and made individually to all contractors, opportunism was noticed to rise if information regarding contractors' progresses is too transparent and open. Thus, in the current situation knowledge integration must be limited to the information that is relevant to completing the nearest future activities at construction site. All this information explains the typical characteristic of construction industry confronting lack of communication in carrying out required operations (El-Saboni et al. 2009). Altogether, other viable contract models and practices should be chosen if larger transparency and openness are greatly desired in the project network of the target company.

Empirical material pointed out that a financial driver could motivate contractors to more cooperativeness with other project network participants. The main reason for this was noticed to be the high tendency of contractors to pursue opportunistic behavior. Implementing an incentive system into a contract was present with two projects. Similarly, the timing of implementation varied in these projects, which showed an implication where the earlier implementation led to success. MacLeod (2007) states that the applicability of a bonus system requires finding innovative ways to execute the set scope of activities. Since carrying out multiple large construction activities at the same time needs adaptation to sudden changes, it can be stated to respond to the optimal context defined by MacLeod. In addition, a scientific theory states that if no extra financial drivers that require cooperativeness are determined, challenges may occur in a construction environment (Laan et al. 2011). Thus, an incentive system could be a viable option for the target company, which has been experienced with one successful project already.

RQ2: What are the alternative contract models that could be used with contractors?

Alternative ways of negotiating a contract can be categorized into two categories, where the first category is having a cost-oriented focus while the other category focuses on enhancing cooperativeness (Ertel 2004). This research shows that the selected contract model responds well to the used negotiation approach. At the moment, the currently used contract model leans more towards the cost-oriented focus since estimated quantities are in the center of attention, which does not have direct effects on cooperativeness. The only factor that was seen to have effects on cooperativeness was the success of having right estimates with the required scope. When estimates were wrong, disputes with contractors

were noticed to arise due to increased financial risks, which is in line with the theory about unit price contracts (Hyari et al. 2017).

The covered price-oriented contracts in this thesis were fixed price, unit price and cost-reimbursable contracts. It was noticed that a pure fixed price contract increases transparency and predictability but could lead to disputes with contractors in the case of major scope changes. This finding is in line with the claim of Xia et al. (2016) about contractors carrying the largest amount of financial risks with fixed price contracts. Additionally, Tahir (2004) states that pure fixed price contracts should be used in a stable environment and with activities that are not important to business, which does not fit well to the context of the target company. Unit price contracts were stated to be fairer for contractors and consequently provide a more positive outcome for contractor cooperation even if the defined scope changes. Still, long negotiations with contractors over scope disputes are possible (Hyari et al. 2017), but according to empirical data cooperativeness is enabled in a better way in long-term. Scientific theory can not be seen to support using cost-reimbursable contracts in the context of the target company as the buyer carries all the risks with this contract model (Gransberg & Riemer 2009). Empirical findings agree on this opinion as even one single cost-reimbursable contract was noticed to have major effects on meeting schedule objectives in target company's project network. The main reason for this was seen to be the lack of setting time pressure for the contractors.

From these price-based alternatives, a unit price contract is reasoned to be the most suitable contract model in terms of enabling cooperativeness. This contract model was also noticed to be closest to the currently used contract model. Therefore, a need of contract improving contractor cooperation is still valid as not all projects had a sufficient level of cooperativeness in the project network.

Alternatively, two alternative contract models can be claimed to enhance cooperativeness as the level of transparent information and openness increase. The use of open book contracts was noticed to divide opinions on the success of implementing it to contractors. Having a great level of trust with contractor was stated to be a prerequisite for using open book (Agndal & Nilsson 2008), which is in line with the findings of empirical material. The main challenge with using open book contracts is to find a mutual understanding with contractual parties about searching for inefficiencies in the benefit of all instead of considering it as buyer's opportunistic behavior (Agndal & Nilsson 2008; Romano & Formentini 2012). This finding was also present with empirical findings.

No discussion about the alliance model was done in the interviews, which is stated to be the second contract model that focuses on cooperativeness (Pihlajamaa et al. 2016). Scientific theory supports this claim by stating that alliance contract is seen to emphasize working together towards mutually set objectives as all project network participants are included in one single contract, where all risks and benefits are shared in a mutually agreed way (Koolwijk 2006). Compared to having singular contracts by using an open

book contract, empirical material leans more towards using an alliance model as balance in the project network of the target company is more likely to be achieved by managing project network participants equally. Furthermore, the context of the target company is greatly applicable to implementing an alliance contract as each project was claimed to be large and involve complexity (Scheublin 2001). This is supported with fact that all activities carried out in project networks are claimed to be highly complex (Ruuska et al. 2009). However, since the use of an alliance contract needs all parties to be involved (Pihlajamaa et al. 2016), the applicability of this contract model into practice can be questioned due to no empirical material about the perspectives of contractors, clients, external engineering services and material suppliers.

RQ3: What should be considered in implementing alternative contract models into practice to have positive effects on carrying out projects?

An implementation is determined to cover the entire project lifecycle, which includes activities of planning, execution and evaluation. Firstly, the optimal implementation of the currently used contract model is explained by focusing on the factors that presented in Figure 11. After this, a brief analysis is done to discuss the effects that implementing cooperation-enhancing contract models could have on the success of a project.

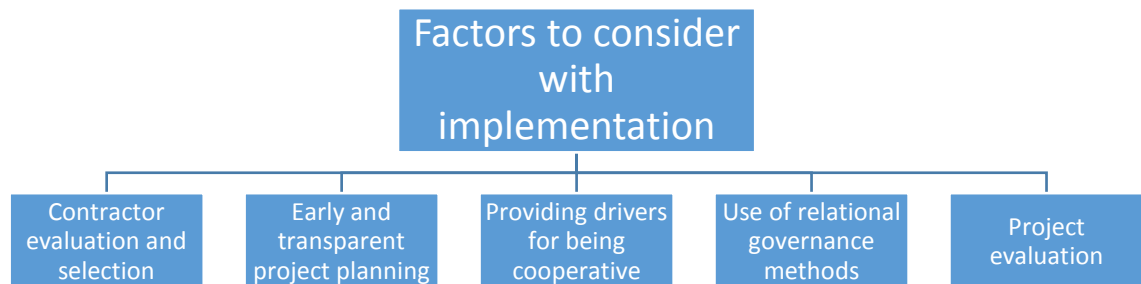


Figure 11. *Factors to consider with implementing contract models into practice.*

The objective of the contract negotiation was noticed to be one key factor in determining the success of a project. The projects that emphasized having fluent cooperation over the price of work proved to be more successful. Hence, the approach of Ertel (2004) about determining a contract that could work in practice is realized significant for the context of the target company. As answered in the first research question, a contractor being familiar to the target company should be a top priority. However, the empirical material recognized the need of evaluating contractor's likeliness of succeeding thoroughly before every project. This criterion was also acknowledged to be a top criterion with a theory related to selecting contractors (Singh & Tiong 2006). Lastly, contractor selection should consider the factors of both organizational and personal levels equally importantly, which could result in greater cooperativeness with both the target company and with other contractors involved in the project network.

Empirical material stated that a fluent project execution should be considered already in the project-planning phase, which includes especially negotiations and construction planning with contractors. Designing a project network was said to be a long-lasting and demanding process while the execution phase was said to be less challenging as it mostly involves monitoring the designed process (Hellgren & Stjernberg 1995). By providing honesty and transparency in this price negotiation stage about capabilities and requirements for working, both parties were stated to have less struggles with meeting the defined objectives and achieve a successful financial outcome due to a lower amount of opportunism. Additionally, early transparency was noted to have the greatest impact on the amount of innovativeness in the project execution stage.

This research is stating that clear drivers should be set for contractors to increase their cooperativeness for the benefit of project's overall performance. Otherwise, most interests of contractors are set on achieving their own profit margins without thinking of others. As told with the answer in the first research question, one option is to determine a bonus that requires cooperativeness and team spirit from project network participants to attain it. Empirical data added that considerations for future projects could be another appealing driver for contractors to work in a cooperative way. However, the willingness of working with the target company in future projects can be challenging if drivers are not properly explained or implemented.

The use of relational governance methods was noticed to have a positive effect on the achieved results in the examined projects. Heikkilä et al. (2013, p. 135-136) expresses the need of high coordination and information sharing in a complex environment. Additionally, another theory linked to managing project networks emphasizes the importance of finding mutual objectives with less hierarchy and by concentrating on relational governance methods (Ruuska et al. 2011). Overall the steps for completing required activities were set quite clearly for all contractors, which is relatable to the theory of Heikkilä et al. (2013, p. 40-41) about having a process-based focus on determining a service contract. Empirical material agrees on these scientific theory based perceptions. Guidance and getting approval from the target company were noticed to be evident with contractor cooperation in all selected projects. Still, a successful project execution should include relational governance methods, which was noticed to be more likely with familiar contractors. Pursuing the relational governance approach was stated to provide a more reactive approach towards sudden changes and increase the overall atmosphere among project network participants. However, the level of documentation should be sufficient to provide proof in the case of sudden changes as not all opportunism can not be deleted.

The last factor to consider with implementation is conducting a proper project evaluation, which should cover a few elements. Firstly, the gained knowledge from past projects should be utilized to new ones, which is acknowledged to be a good practice in designing project networks (Ruuska et al. 2011). By focusing on a proper project evaluation, improved capabilities in planning and execution are assumed to be more likely in future

projects. Cooperativeness was noticed to increase with familiar contractors as higher levels of trust and commitment were already gained from previous projects. Thus, pursuing long-term contractor relationships could be a viable option since the supply market may not always have suitable contractors that are capable of completing the required scope.

The characteristics of cooperation-enhancing contracts can be claimed to include all the elements what the successful implementation of the currently used contract model is analyzed to consist of. The currently used contract model was noticed to guarantee success in implementing the determined factors into practice only occasionally, but the use of cooperation-enhancing contracts can be assumed to enable a better likeliness of achieving each determined factor.

With contractor evaluation and selection, open book contracts were stated to consider having familiar contractors as a prerequisite for use while the alliance model includes a team testing that should enable choosing the most suitable project network participants. Thus, both approaches in their own ways enable a higher likeliness of having suitable contractors. Secondly, the only driver for contractor being cooperative currently is based on meeting the defined contract terms, which was noticed to provide the best outcome inconsistently. Determining drivers for being cooperative can be a time-demanding task with an alliance model as multiple parties are involved (Pihlajamaa et al. 2016), while with open book contracts the same could be easier with only one familiar contractor. Still with successful planning, cooperativeness is assumed to be enforced in a better way than with the current contract model. Thirdly, an early integration is required with both cooperation-enhancing contract models, which responds to the need of designing network sufficiently (Hellgren & Stjernberg 1995). Fourthly, both contract models enable reacting to sudden changes together with relational governance methods, which is not clearly present with the currently used contract model. To explain this, an alliance model provides an all-involving approach towards managing changes and enabling innovativeness (Koolwijk 2006), while an open book contract reacts to the inefficiencies of a single buyer-supplier relationship (Agndal & Nilsson 2008). Lastly, evaluating a project thoroughly is assumed to be more fluent with contractors due to an increased focus on cooperativeness in the previous stages of the project.

5.2 Conclusions

The research objective set for this thesis was to find practices that could improve overall performance in project execution by developing contractor cooperation and selecting the most appropriate contract models for contractors. This research provides a limited amount of result generalization due to examining only six projects, but simultaneously a more specific and reliable analysis was achieved with this narrow focus of target company's projects. However, contextual factors may have had effects on the researcher's interpretation of empirical results, which should be considered with evaluating the

reliability of achieved results. Altogether, the set research objective can be claimed to be met in this case study.

This research shows that the target company has room for improvement in practicing contractor cooperation. Contractor being familiar to the target company was noticed to be significant in a successful contractor cooperation as trust, commitment and abilities in managing sudden changes increase with the help of experienced previous projects. It was also recognized that information sharing is limited due to the tendency of contractors to pursue opportunism with the currently used contract model. Therefore, this research states that drivers for overriding contractors' opportunism should be set and implemented. Additionally, more efforts should be put on enabling circumstances for contractors to meet the contract terms as planned.

This thesis succeeded to evaluate various alternative contract models. The currently used price-oriented contract model does not guarantee cooperative behavior with contractors, which clarifies the need of finding alternative practices and contract models to implement. The determined factors to consider with implementation are analyzed to affect the success of a project, which could be achieved more likely by using cooperation-enhancing contracts. As one key finding for the target company is to place an incentive structure into the contract. The possible alternatives for this are to implement incentives into the currently used contract model, into a more transparent open book contract or using the alliance contract that already includes an incentive structure. On the other hand, the focus can be solely on the early and transparent project planning with contractors, which could enable finding practices for completing the required activities in a way that makes meeting the profit margin objectives of both parties more likely.

These determined factors should be considered with decision-making, which applies also to the situation of not deciding to use cooperation-enhancing contract models. Still, as no empirical data about using cooperation-enhancing contracts was present in this research, a thought for testing them in future projects is recommended for the target company.

5.3 Theoretical contribution

This research provides a limited theoretical contribution to the academic fields of managing contractors, cooperation in project networks and contracting strategies. In line with the existing literature, this research strengthens the scientific viewpoint of contractors pursuing opportunism in project networks. The number of attempts was noticed to increase especially with unexpected changes in the project execution stage, if project planning with contractors had been insufficient and not transparent enough. Therefore, the research results agree on the perception of Ertel (2004) on designing a contract that could actually work in practice. Furthermore, this research supports the importance of selecting familiar contractors to projects, but the need of knowing a contractor on a more personal level is not strongly expressed in the academic field. As

another observation, this research supports the need of clear financial drivers to create a situation that forces contractors to be more cooperative with others in a project network.

On the other hand, this research acknowledges one key difference with scientific theory. Using a price-oriented contract model forces buyer to limit knowledge integration among project network participants due to the risks of opportunism. Therefore, this research emphasizes the importance of selecting a suitable contract model to enable information sharing and openness, which is considered to be relevant in managing a project network (Tiwari & Gupta 2012).

5.4 Limitations and future research

The set limitations are linked to the proposed future research considerations. The suitability of the selected interviewee group to this research can be questioned, which concerns the validity of results too. The results do not cover the actual viewpoint of contractors on the research topic and therefore the achieved results can be claimed to be unilateral. Thus, it is challenging to estimate the effectiveness of implementing recommended cooperation-enhancing actions and suitable contract models into practice. Hence, a comprehensive analysis by focusing solely on buyer's perspective can be questioned and further research on contractors' opinions is needed. Furthermore, the implementation of either an alliance contract or an open book contract require an investigative research on the viewpoints of clients, external engineering services and material suppliers to analyze its suitability.

Case selection is another element to consider. A few of selected projects had been completed a while ago, which made interviewees hard to reminisce project-specific facts that resulted in answers occasionally straying towards recent projects. A limitation to examine only recent projects is therefore a recommendation for future research to add the reliability of results. Another limitation to consider is the imbalance of chosen successful and challenging projects, which may emphasize the perception of successful projects in a wider way. Thus, examining more cases equally could increase the generalizability of results, which was limited due to lack of resources within a six-month time period.

This research focused on evaluating the suitability of other alternative contract models with scientific theory due to insufficient empirical material related to them. Hence, this study provides a more complete approach to price-based contracts. Therefore, a case study investigating multiple alternative contract models in practice should be conducted to enable a better dialogue between theory and practice. Thus, the differences between alternative contract models could be evaluated in a more complete way. A special focus should be put on examining the recommended cooperation-enhancing contract models that include using drivers for increasing cooperativeness.

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APPENDIX A: INTERVIEW QUESTIONS

Background

1. A brief description of interviewee's background.
2. Confirmations to the project-specific information gathered by the interviewer (financial result, country, product, customer and contractors).
3. A brief description of the project.

Contracting suppliers

4. Which contract were the most critical in terms of project execution and who were the contractors in these?
5. What contract model was used in these critical contracts? Also a brief description.
 - a. Fixed price / Lump sum
 - b. Unit price
 - c. Cost-plus
 - d. Open book
6. Based on what criteria was this contract model selected to this project?
7. Based on what criteria were the contractors selected to the project? The alternative criteria are: *quality, price, knowledge, fluency of cooperation, alignment of strategies and likeliness of succeeding*. Choose three of these, place your choice in order and explain your selection.
8. What are the strengths of this contract model?
9. What are the challenges associated with this contract model?
10. What was the main objective when negotiations with contractors were conducted?
11. How did this contract model improve or lessen cooperation during the project execution?
12. How were decisions made?
13. How were changes made?
14. How were problems solved?
15. Does possible previous cooperation with contractors have effects on decision-making, change management and problem-solving during a project?
16. Were other alternative contract models taken into consideration in this project?

Managing buyer-supplier relationships in a project network

17. How would you describe the cooperation of contractors with each other?
18. How would you describe trust in the contractor relationships?
19. How was commitment to mutual decisions fulfilled in the project?
20. How would you describe the level of information sharing and communication with contractors?

21. How would you describe the abilities of contractors' to come up with innovative solutions and continuous improvement during the project execution?
22. How did contextual factors have effects on the functioning of contractor relationships?

Final questions

23. What would be the first thing to focus on so that cooperation with contractors would improve or stay in the previous good level and make a better project outcome possible?
24. Would a different kind of contract have had a more positive effect on the outcome? What kind and why?
25. Did factors not dependent on the used contract model have a larger effect on the outcome?