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Effects of partnering on construction projects

The cultural, collaborative and contractual aspects

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Abstract

To meet the challenges created by the increasingly complex and fragmented state of today's construction industry, project actors need to adapt their way of working. The techniques of adapting to the changing industry are numerous and it can often be difficult to identify the appropriate method. More complex projects with many actors involve a lot of risk and partnering can be one way of managing such risks.

According to literature, partnering reduces adversarial relations between project stakeholders, it increases collaboration, it spreads the risk between stakeholders and it encourages them to align their goals. With that said, the implementation of partnering has faced some difficulties. The reasons for these difficulties can be various, some of the explanations might be unclear definitions of the concept partnering, non-matching expectations and a reluctance of adapting to new ways of working. Recent studies have revealed that clients are not as satisfied with the outcome of partnering projects as might be expected. Because of this, the authors felt that a deeper knowledge about the effects of partnering was needed. In order for the partnering concept to mature and the industry to understand its implications, more research on specific partnering cases is needed.

The research discovered three categories of practical implications for partnering. These categories contain cultural, collaborative and contractual aspects that cover both positive and negative effects in the projects. The cultural aspects that are affected by partnering are e.g. the division of responsibility and the atmosphere. The collaborative aspects that are affected are e.g. communication, involvement of stakeholders, transparency and problem solving. The contractual aspects that are affected are e.g. flexibility and risk management.

The improved joint problem solving and innovation was perceived as beneficial for time, cost and quality while other factors such as work environment and environmental impact was believed to be less affected. In order to improve the project result with the help of partnering the researchers' recommend to embrace the openness, encourage new work habits, remove predefined views, make use of the improved joint problem solving, develop a contractual framework for partnering and create incentives and bonuses that are S.M.A.R.T (Specific, Measurable, Achievable, Realistic and Timely).

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1. Introduction

1.1 Background

The construction industry is changing to be more complex, with an increased uncertainty and higher time pressure (Eriksson & Nilson, 2008). To face challenges like this the client's traditional competitive mindset is no longer appropriate. The projects require cooperation-focused coopetition which has led the industry to be more interested in the concept of partnering and its future development.

Partnering is about building up basis for collaboration between opponents in good time before problems may arise (Larson, 1997). This is done by team building sessions, early involvement of key actors from different sectors of the project, workshops etc. In partnering, stakeholders should be driven by the same set of goals and understandings for their project. All the organizations involved should be willing to use feedback in order to improve the collaboration (Bennet & Jayes, 1998).

Partnering can be seen from several perspectives, some argue that it is an ethical framework; others say that it is a procurement approach while some view it as a toolbox for managing relationships (Khalfan & Swan, 2007). Partnering can be said to support all of these views depending on how partnering is implemented, used and defined by the organization. When reading about partnering it is clear that different authors perceive partnering differently. Some define partnering more strictly while others see it as a flexible concept. How this thesis defines partnering can be found in the chapter theoretical framework.

Many authors have focused on different aspects of partnering. Some investigate how partnering can reduce the adversarial relationships (Khalfan & Swan, 2007; Cox & Thompson, 1997; Eriksson, 2008), others focus on finding the success factors of partnering (Black, et al., 1999; Chan, et al., 2004), the applicability of partnering (Lu & Yan, 2007) or investigate quantitatively and qualitatively if partnering is beneficial (Josephson, 2013; Larson, 1995; Bresnen & Marshall, 2000).

1.2 Problem

The reason why partnering is newsworthy is because Josephson (2013) published an investigation of the level of productivity in the Swedish construction industry. The investigation consisted of 444 projects where 70 of these were partnering projects. The conclusion regarding partnering in the study was that clients are less satisfied with both the quality of the product and the collaboration in partnering projects.

Authors like Josephson and Gadde & Dubois (2013; 2010) have found many problems in achieving the desired outcomes of partnering. Josephson (2013) suggests that it may be due to false expectations that the clients are less satisfied in partnering projects. The parties might also be lured into a false feeling of security, due to partnering, even though the project is not going very well. Furthermore Josephson suggests that it is important to study why the clients are less satisfied by investigating specific projects and explore how partnering was implemented and how that is connected to the project result.

Other literature has found many opportunities related to partnering. For example benefits from increased productivity and reduced costs, reduced project time due to early supplier participation and team integration, more opportunities for innovation, better cost control, continuous quality improvements and improved client satisfaction due to faster responses to changes (Gadde & Dubois, 2010; Chan, et al., 2004; Australia, 1996). Partnering facilitates improved communication and conflict resolution. This can affect both the duration of the project and the efficiency within the work environment (Chan, et al., 2003). Larson (1995) performed a study of 280 construction projects and reached the conclusion that partnering projects achieved better results considering controlling costs, technical performance and satisfying customers compared to projects managed with a different strategy.

By investigating earlier research it can be concluded that some researchers has found various positive effects because of partnering while others have concluded that partnering seems to create no effects at all. This is an interesting problem, why have researchers studying the same topic reached different results?

1.3 Purpose

The purpose of this thesis is to understand and identify the effects of partnering in a construction project. Furthermore the purpose is to use the strengthened understanding of these effects to develop and improve the concept of partnering. By understanding how different implements of partnering affect a project it is possible to practice partnering in such a way that the desired effects can be collected.

1.4 Research question

The main research question is;

- What are the effects of partnering in a construction project?

1.5 Delimitations

This chapter will describe how the authors decided their focus and how they chose to delimit their study.

The researchers have delimited the area of research by choosing to study complex infrastructure projects within Stockholm, Sweden. The number of projects that will be studied are two projects, Norrströmstunneln and Söderströmstunneln. The reason for using two case studies and over 15 interviews was because the result would be considered more trustworthy. The studied cases are similar in complexity, size and customization but have different backgrounds in partnering which makes them interesting to investigate. More detailed description of the projects can be found in chapter 5.

The reason for choosing these two cases are that both of them have implemented partnering. One of the projects have an extensive partnering contract that was implemented from the start and will continue until the project is finished. The second case implemented partnering in the middle of the process due to difficulties in the project. Because of the differences between the cases it

was considered as a good opportunity to get two different perspectives and furthermore a deeper knowledge about the effects of partnering. The second reason for choosing these cases are that the client and the contractors in both cases are familiar with partnering and eager to collaborate with the researchers to facilitate the investigations.

It is important to differentiate on the concepts of project- and strategic partnering; project partnering focuses on short-term benefits and strategic partnering focuses on long-term benefits (Gadde & Dubois, 2010; Li, et al., 2000). This thesis will focus on project partnering partly because of the cases available and partly because of the limited time for this research to investigate long-term benefits created with strategic partnering. Another reason for emphasizing on project partnering is because the collaboration is often most intense in projects when stakeholder have to collaborate intensely during a shorter period of time.

For this research the measure of partnering success will be separated from the measure of project success (Cheng & Li, 2004). This is a difficult, if even possible, task. What the researchers can consider during the analysis is that project success is usually measured by means of cost, quality and time, partnering success refers to the perceptive effectiveness of partnering by involved parties. In order to be able to separate projects success from partnering success in this research, the interview questions will be formulated in accordance to certain frameworks. The frameworks are collected from researchers that has studied project success factors. In this research we will focus on capturing the effects that partnering has on the case studies, this will be done with the help of these collected frameworks.

1.6 Disposition

This thesis will start with an introduction containing the background of partnering and furthermore the subject of partnering will be problematized. The introduction is followed by a literature review covering important articles and other relevant research.

The chosen method will be described and reflected upon and furthermore the theoretical framework used in the analysis will be presented.

The report continues with a description of the studied cases, an analysis of the results and discussions about the analysis. Some possible improvements and further research are suggested. The thesis ends with a conclusion and further recommendations.

2. Literature review

Many papers have concluded that the construction industry is highly fragmented and conflict-ridden due to this large amount of smaller companies (Li, et al., 2001). Projects are organized by many parties with different knowledge and skills such as architects, engineers, suppliers etc. Because they are so diverse they might have different goals and objectives in a project which can create conflicts and induce adversarial relations.

Partnering is seen by many in the public sector as a way of moving away from the adversarial relationships in construction projects and approach a more collaborative method of managing projects (Khalfan & Swan, 2007). Khalfan & Swan (2007) conclude that the drivers for public bodies, at least in the UK, to adopt partnering has been because they have been told to do so by articles, reports, panels and national strategies.

Satisfied customers is one of the critical success factors of partnering and one of the reasons why partnering is a concept that might be of an importance to the industry. Larson (1995) empirically tested the relationship between the partnering dimensions and customer satisfaction on low-bid awarded contracts. The result showed that adversarial relationships lead to low customer satisfaction, and co-operative parties, as in partnering, has a higher chance of satisfying the customers' requirements. Eriksson & Westerberg (2011b) have in later years created a framework for cooperative procurement processes that they propose will have a positive influence on many aspects of the project performance.

The partnering method was designed to manage large, complex, customized projects with long duration (Naoum, 2001; Eriksson, 2010). These kind of projects are becoming more common in today's developed construction industry. According to transaction cost economics, the cost of using partnering in small, one-off and less complex projects is too high compared to the benefits. The projects size and complexity have led the traditional procurement methods to fail in satisfying clients criteria. Because of this, partnering has started to evolve. In order to achieve good project Naoum (2001) emphasizes on the importance of all stakeholders, top down, to be involved in the process of the changing the mindset.

Construction projects are all different in their own way. When it comes to choosing the appropriate procurement form, clients need to evaluate the most suitable strategy that fits to their project's needs. What is thought to be an important factor when it comes to selecting an appropriate procurement method is suggested to be the risk (Love, et al., 1998). This is one of the reasons why partnering is important to discuss. Partnering has a different way of allocating risks than most other governance forms. The client and the contractor share the risk to a larger extent than in a normal project. If a new procurement form is to be accepted by the industry the clients have to know how to use it and what effect the procurement form will have on the project outcome (Eriksson & Westerberg, 2011b).

2.1 Industry

For the last couple of years there has been seen an increased interest in the cooperative concepts such as partnering (Eriksson, 2008). Bresnen and Marshall (2000) express an important issue about partnering; they found that it was evident that people and relationship was the core of

collaboration but that the lack of continuity of relationships undermined attempts to fully secure the benefits of collaboration.

The discussion about the construction industry being adversarial and competitive has been leading the focus towards promoting non-adversarial relationships which creates the impression that collaborative methods are a solution for the sector (Eriksson, 2008; Cox & Thompson, 1997). It is still debated if a collaborative way of working can create success, new collaborative organization needs to be maintained and nurtured in order to be successful. It also needs to be decided to what degree the collaboration should be established in order to reach a collaborative success within a construction project.

Trust is often said to be essential in partnering and trust between stakeholders can take a long time to establish. Ingirige and Sexton (2006) point out that the degree of cooperation within the project teams' increase with time. That being said, they believe that long term partnerships is a better option when it comes to achieving the goals, objectives and sustainable advantages.

Sharing culture and sharing knowledge is thought to be the main drivers of partnering (Ingirige & Sexton, 2006). Sharing knowledge within the collaborative culture is a way of achieving cost reduction targets of the project. If the contractor is able to hand over a project with great cost savings, the client is more likely to offer the contractor continuous workload which forms the basis for a win-win relationship. The collaborative method also stimulates quick resolutions of conditions which can be found at lowest authority level.

2.2 Success factors in partnering

Some partnering success factors found in earlier research are trust, communication, commitment, clear goals, understanding of roles, consistency, flexible attitude etc. (Black, et al., 1999). One of the factors that escalate better partnering projects is the early involvement of the contractor and the supplier (Eriksson & Nilson, 2008). Work and knowledge sharing increases and with the early involvement, the risk of these partners splitting up due to difficulties during projects are minimized.

Some of the benefits accomplished when using partnering both for the contractor and the client are (Slater & P.E., 1998):

For the contractor:

- Increased opportunity for profit
- Heightened productivity
- Improved decision/reaction time
- Less risk for cost overruns or delays
- Reduced exposure to litigation

For the client:

- Reduced exposure to claims and litigation
- Enhanced quality of construction

- Lower exposure to cost escalations
- Efficient resolution of situations
- Reduced overall project cost

2.3 Implementation

Implementation of partnering can involve several steps and different factors. Factors that may improve cooperation in partnering is early involvement of contractors in joint specification, direct negotiation with only one bidder, bid evaluation based on soft parameters, joint subcontractor selection, incentive based compensation, collaborative tools and joint activities (Eriksson & Nilson, 2008). Depending on if the client wants a more competitive or cooperative environment, he may choose to use more or less of the previously named factors.

The majority of the attendees at the partnering workshops in public construction projects are the contractor's project manager, contractor's senior manager, the client's project manager and the client's senior manager (Khalfan & Swan, 2007). It is necessary to use systematic assessment of partnering before the procurement. Assessment that can evaluate if partnering is useful for a given situation (Lu & Yan, 2007). Lu and Yan have developed an applicability assessment model for partnering that focuses on factors related to management tools, organizations and project parameters. First thing is to identify the project parameters and secondly to compare the gains from partnering with the expectation of the project. Thirdly the recommendation is to select partners carefully in order to understand the partner's potentials, capabilities and expectations of the project.

The implementation of partnering goes through different steps as can be seen here below suggested by (Li, et al., 2000).

- The introduction of partnering to organization
- The identification of the needs for partnering
- The selection of the partnering companions
- The organization of the partnering workshop
- The development of the partnering value/culture during the workshop
- The mobilization of the internal work process
- The execution of the project
- The repetition of the cycle

2.4 Problems and criticism to partnering

Problems that often occur in partnering projects are; not understanding partnering, relationship issues, trust problems, trouble of sharing risk, over dependency on each other, cultural barriers, inefficient problem solving, communicational problems, insufficient efforts to keep partnering going, inadequate training and not involving key parties (Chan, et al., 2003).

Josephson's (2013) reveals some of the specific problems of partnering. He also identifies factors in partnering projects that clients are more or less satisfied with.

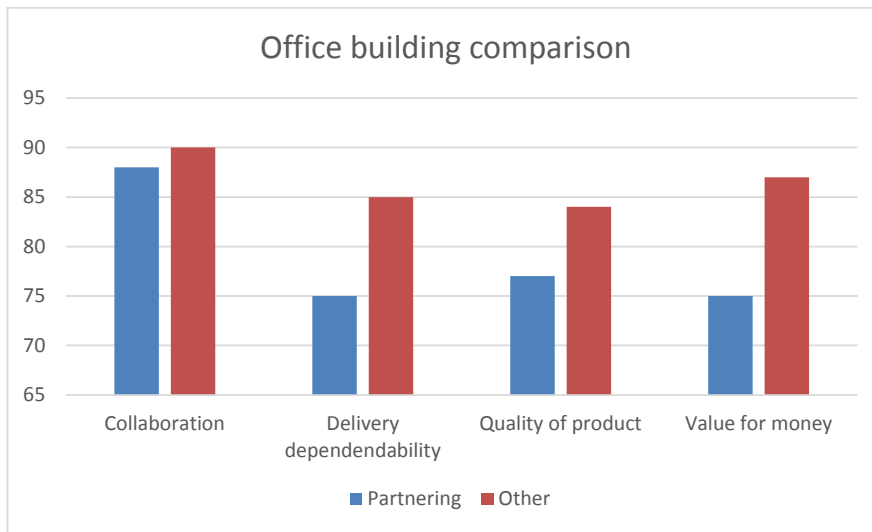


Figure 1. The contractors (office buildings) achievements in partnering projects compared to other projects (Josephson, 2013, p.70).

Josephson found that clients in commercial partnering projects are less satisfied with the quality of the product, the value for money and the delivery dependability. At the same time he found that the collaboration in commercial partnering projects was perceived to work almost as well as in an ordinary non-partnering project.

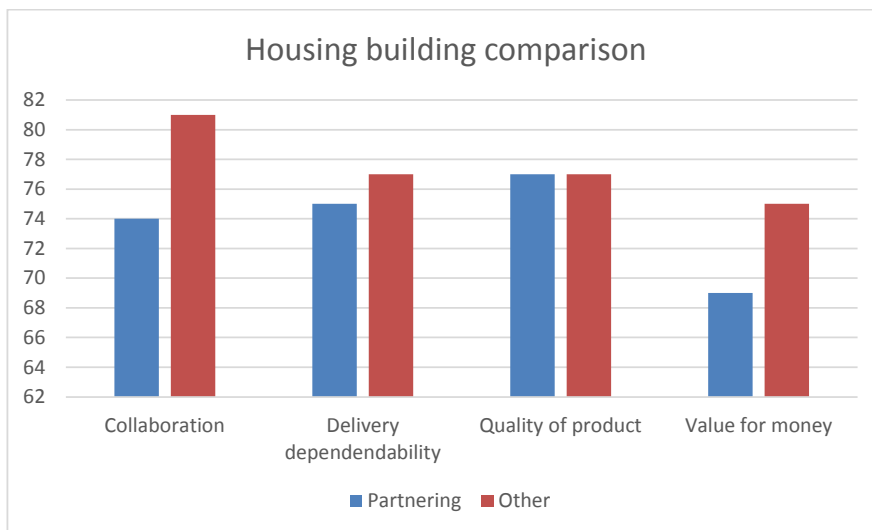


Figure 2. The contractors (housing) achievements in partnering projects compared to other projects (Josephson, 2013, p.69).

When studying housing projects Josephson found that collaboration, delivery dependability and value for money was worse in partnering than in non-partnering project. He also found that the products quality was more or less the same in both partnering and non-partnering projects.

Summarizing some of the difficulties with partnering it is possible to identify nine groups of problems (Chan, et al., 2003);

1. Misunderstanding of the partnering concept
2. Relationship problems
3. Cultural barriers
4. Uneven commitments
5. Communication problems
6. Lack of continuous improvements
7. Inefficient problem solving
8. Insufficient efforts to keep partnering going
9. Discreditable relationship

Li et al. (2000) state that subcontractors are rarely aware of partnering agreements in the contract when they accept the terms of the project. That is mainly because of them being afraid of losing the chance to work for the contractor if they refused the contract. A large group of professionals suggest benefits of partnering for construction projects in a client-contractor relationship. It must be acknowledged that partnering relationship might not last throughout the whole project (Li, et al., 2000). It is also important to acknowledge that partnering is only a management technique and its success depends on the individuals that use it (Chan, et al., 2003).

One of the barriers to implement partnering is the adversarial culture which stimulates win-lose situations in the industry (Eriksson & Nilson, 2008). In these cases, stakeholders aim at obtaining their own objectives rather than collaborating. This situation is caused by low commitment of partners. A way to solve this is to involve as many stakeholders as possible in order to accomplish a successful collaboration.

Though partnering has shown many benefits for construction projects, it has been found that actors lack the understanding of both the concept and its benefits (Eriksson & Nilson, 2008). This is thought to be causing a difficulty within the industry to accept partnering.

There is a big need of cultural change in order to achieve this collaborative climate within a organization. The labor actors have a large influence on the culture (Brown, et al., 2001). The labor unions are thought to be old fashioned and conservative creating a challenge to achieve a cultural change (Eriksson & Nilson, 2008).

There are many occasions when companies enter a partnering collaboration without changing their traditional procedures which increases the risk of failing the partnering implementation (Brown, et al., 2001). In order to achieve successful partnering project, companies need to make fundamental changes on their actual processes.

Collaborative strategies and processes are thought to become very costly, leading the collaboration relationship into a low trust and high cost conflict relationship (Brown, et al., 2001). Trust is created based on cooperative behaviors and not through costly strategies. It is

trust that underpins the client-contractor relationship. Trust is more important than the system of incentives since the system is not necessarily creating trust (Bresnen & Marshall, 2000). In fact, incentive systems tend to represent lack of trust instead of promotion of trust.

The design-construction process is recommended to involve the key stakeholders such as clients, contractors and suppliers. The problem is when the contractor is omitted; it can leave dramatic consequence for the process leading to problems in the project performance (Bresnen & Marshall, 2000).

3. Method

This report is based on two case studies; Norrströmstunneln, called project A in this research and Söderströmstunneln, called project B. The studied cases are two partnering projects where the client is a large governmental organization. The contractors in project A are a private Scandinavian company and in project B the contractors are a large European construction company.

3.1 Research Method

For this research the preferable qualitative method to use is interpretative research, which involves in-depth and semi-structured interviews (Bhattacharjee, 2012). Interpretative research aims at building theory, the selected cases are based on whether they are applicable to the studied phenomena and whether it is possible to get access to documents and interviewees. This kind of method does not employ random sampling.

3.1.1 Reflections

One advantage with interpretative research method that was used is that if the researcher finds other interesting phenomena while doing the study he/she can change the research question. Some challenges with interpretative research are that it is time consuming and resource intensive (Bhattacharjee, 2012). Another challenge with the chosen research method is to be aware of the researcher's role as the data collector. If the researcher was not careful he/she might influence the result so it is important to try to achieve objectivity. The participants in the study might also have different knowledge about the subject which may cause biased answers. It is also important to realize that other dimensions might affect the answers from the interviewees; examples of these dimensions are different experiences, competences, professional background and relations between individuals.

One advantage with face-to-face interview is that it is more personalized than a questionnaire which makes it possible to ask follow-up questions, record personal observations and get more nuanced answers. A downside is that fewer people might have the possibility to participate since interviews can take longer time.

3.1.2 Limitations

The limitation of only studying two projects was the lack of data which made it difficult to generalize for a broader area. Because the location was limited to Stockholm, it might have limited the applicability of the result. Another limitation of the study was that it was performed in cooperation with the same client in both projects. This might have decreased the generalizability of the study. The positive aspect was that company culture from the client side could be held constant which made it easier to analyze the results. The duration of the master thesis research period was around four months and therefore it wasn't possible to perform a longitudinal study which might have been preferable.

The fact that only two projects were investigated was a limitation in the sense that the more projects studied the more valid results could have been attained. The problem was that within the

timeframe of this master thesis it would not have been possible to investigate such a wide scope regarding the project result in more than two projects.

Another limitation in this study was that only the client-contractor relationship was studied. The reason for this was that these projects only established formal partnering between the client and the contractor, even though other stakeholders were involved in some of the partnering activities. The research aimed at investigating the projects process from the design phase to the production phase. The problem was that it was several years ago the projects were in the design phase and the interviewee's answers might have been more influenced by the present state than the past.

3.2 Strategy

3.2.1 Approach

In order to answer the research question, empirical data was collected through interviews with participants in two case studies. The questions were designed based on relevant research within the area and refined according to inputs from other researchers. The interviews were transcribed and recorded. The collected data was analyzed with the help of chosen theories.

To be able to identify the partnering effects, the authors of this thesis have found six factors that are considered to mirror the level of success in a project. These indicators are used by other researchers in the area to measure project success (Khalfan & Swan, 2007; Chan & Chan, 2004; Eriksson & Westerberg, 2011b). The chosen performance indicators are time, cost, quality, environmental impact, work environment and innovation.

To define the extent of partnering used in the projects a model created by Eriksson (2011a) was used as a frame to create questions. These questions were used in interviews with the partnering representatives in each of the organizations. These questions took into consideration the depth of the partnering, the width of the partnering, the duration of the partnering and how intense the partnering was implemented in the projects. A more detailed description can be found in the theoretical framework in chapter 4.2.3.

The partnering intensity in both projects was measured according to how many tools and activities were implemented in the projects. The activities were collected from a report created by Eriksson (2011a) and inserted in the tool presented in figure 3. This tool is similar to Nyström's (2007) partnering flower and contains similar factors, but it is important to note that they are not exactly the same. While Nyström used the flower to define the partnering concept this figure is used to define the intensity of the partnering. The interviewees were asked to mark the activities and tools that were implemented in the studied projects. This way, the researchers drew a conclusion of how intensive the partnering was implemented for each project.

Professionals regarding management of time, cost, quality, innovation, work environment and environmental impact were also interviewed in each organization. They were asked about their perception of how partnering affected the project outcome in their specialized area. The interviews were believed to capture valuable information that helped to measure the effects of partnering. The questions measuring the projects result were created and analyzed based on frameworks and models from Eriksson & Westerberg and Chan & Chan (2011b; 2004). The questions used for defining the implementation and the use of partnering were based on a model created by Eriksson (2011a).

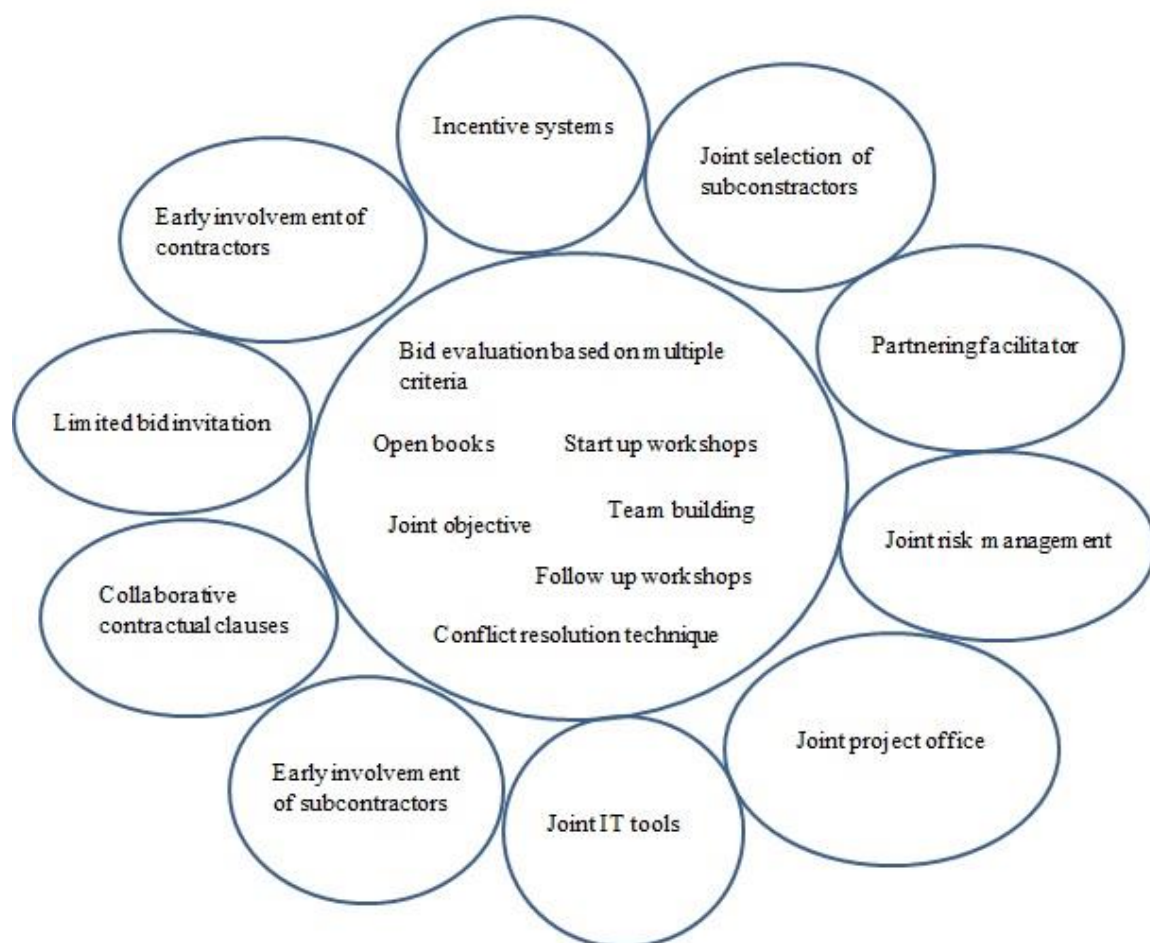


Figure 3. Measurement tool for partnering intensity.

The six pre-defined project outcome indicators, mentioned above, were used to measure the effects of partnering in the two projects. Interview questions were designed in order to attain information from the interviewees. The answers were not only analyzed with the help of practical theories regarding the six indicators but also through more theoretical theories such as the principal agent theory and economic psychology theory which are explained more thoroughly in chapter 4.

Figure 4 explains how the interviews were organized. For each project, project A and B, interviews were performed with the client's organization, client A and B, as well as the contractor's organization, contractor A and B. One professional from each organization was chosen to answer questions about the project outcome and about the partnering implementation.

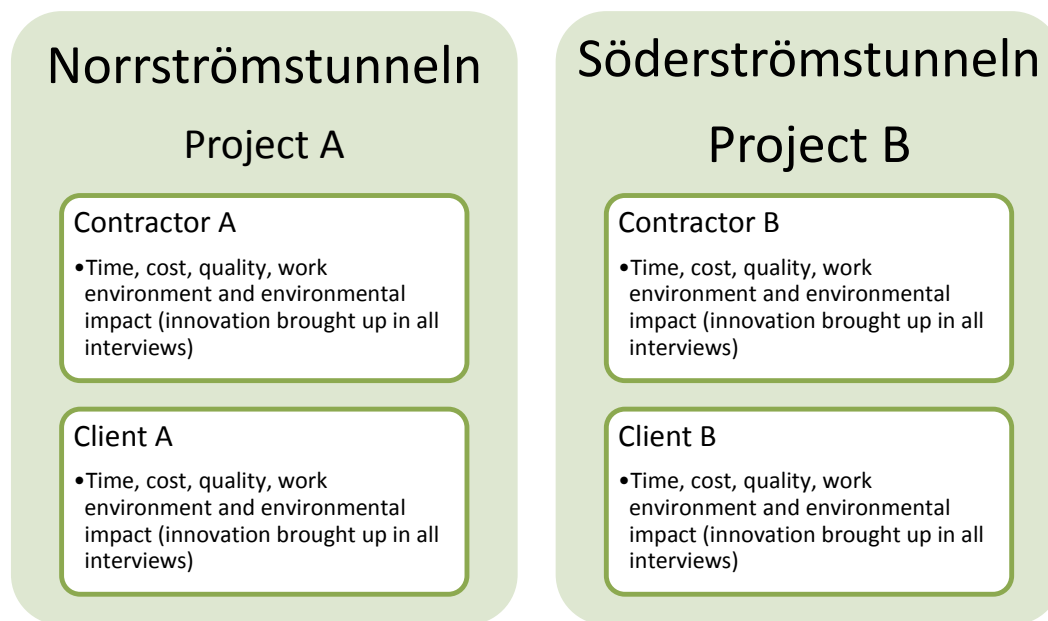


Figure 4. The studied cases and interviewed departments.

The subject of this thesis was inspired by research conducted by Josephson (2013). While Josephson only looked at the client level in 70 different partnering projects, this research has investigated the effects of partnering in several levels of the client and contractor organization in two case studies. This gives a useful hint of the underlying effects of partnering and when the effects are clearer, it might make the implementation more effective. Furthermore, the more effective implementation might also give better benefits to the project, increasing the chance of higher client satisfaction.

3.2.1 Data collection improvements

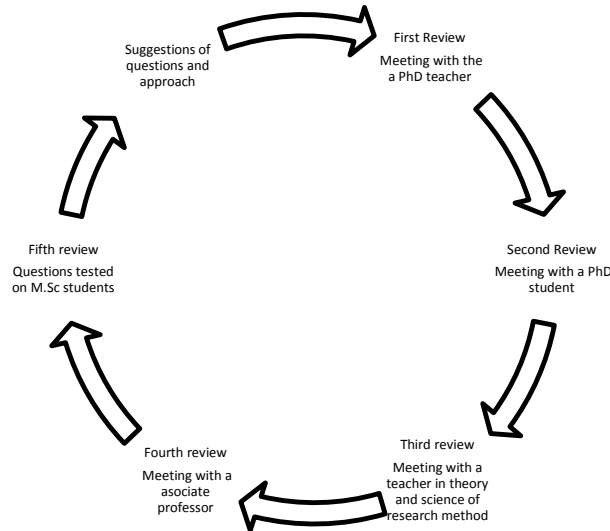


Figure 5. The refinement process of the interview questions.

The data for this research was collected through interviews with chosen professionals from the projects. In order to enter the data collection phase with strong and confident research questions, it was decided to ask several professionals for their inputs and suggestions for improvements. This refinement process can be seen in figure 5.

Firstly the authors tried to find a definition of project result and how the result could be measured. These definitions were then connected to quality and client satisfaction which led to a first draft of questions. After further development, feedback from a teacher in Theory of Science and Research Methods was given regarding the structure of the method and the questions. After additional discussions with the supervisor from the university the number of interviews was increased and a small survey, which was originally planned, was removed.

The small survey was decided to be obsolete. The questions in the survey could be added to the interviews to reduce pressure on the interviewees. The reason for doing more interviews was because a second project was included in the research. This was thought to make the conclusions more generalizable and to create a possibility for comparison between the projects.

3.2.2 Data

Interviews

Data was collected from face-to-face interviews with the managers from the two case projects. Interviews were conducted as semi-structured interviews with open ended questions. Open ended question were used in order to get more elaborative and nuanced answers. In total 16 interviews were conducted. The length of the interviews was around 1 hour. The approach to contact the interviewees was to first send an email with detailed information and suggestions of times to meet. If this attempt to establish contact was not successful, a telephone call was made to the

potential interviewee to ask for a response. Copies of the interview questions were sent to the interviewees upon request.

Because there were two researchers, the interviews were conducted in such a way that one researcher wrote down the interviewee's answers and the other one asked the questions. Notes were also written about how the respondents behaved and answered and when interesting sections were brought up. The interviews were recorded to help the researchers to remember, to help to find phrasings and citations and to clarify unclear sections. Even though the interviews were recorded, they were still transcribed during the interview in order to save time. This allowed the researcher to use the notes instead of listening to every interview again.

Interviewees

The interviewees were chosen based on recommendations from project managers in projects A and B. The recommendations were based on the potential interviewee's ability to answer questions regarding partnering, cost, time, quality, work environment and environmental impact.

Figure 6 will be a support when writing the analysis. It will be used as a guide to describe interviewee's level of responsibility and at the same time it hides the respondent's identity. The reason for concealing the respondents' identities was to make the respondents feel more safe and comfortable during the interview and thereby encourage them to express their true opinion regarding the topic.

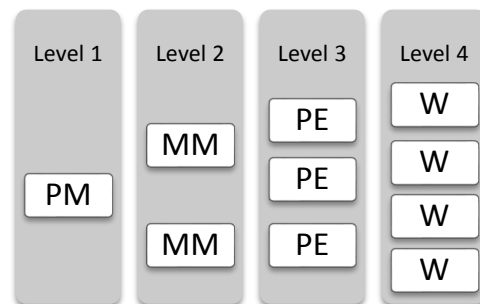


Figure 6. Levels within the organization

Project Management, PM, have the highest level of responsibility in the organization.

Middle Managers, MM, are production managers, design and production coordinators, and managers for supportive functions in design and production phase (cost control, planning, quality, environmental impact and work environment)

Project Engineers, PE, are responsible for inspections, detailed planning, quality control etc. Their roles can be site engineers, project engineers at contractor site and resident engineers at client's side.

Craftsmen, W. The level 4 contains subcontractors and the main contractor's craftsman.

The question sheet used can be found in appendix A.

Internal documents

In order to get an overall picture about the projects, documents regarding the structure of the cases were given to the researchers by the project organizations. These documents included information about the project plan, the contract, the collaboration strategy, the organization and the work environment. The documents helped to create the interview questions, to understand the payment methods and the overall requirements for the projects.

Observations

The research contained observations which were collected during two visits to both the Söderströmstunneln and Norrströmstunneln. The researchers were located at the clients and contractors' joint project office at Norrströmstunneln. This created possibilities for informal communication with project participants regarding the subject of partnering. This enabled the researchers to get a feeling of the general attitude towards partnering in Norrströmstunneln and also enabled the researchers to gain some amount of trust from the interviewees.

3.2.3 Research ethics

The researchers approached the interviewee's by sending an email asking for permission for recording the interviews. It was explained to them that the purpose of the recordings was to remember details when analyzing their answers.

The documents attained from the companies included sensitive data and figures about the projects. For example the exact numbers of the profit distribution was not included in the master thesis but a description about the profit system was included instead. These figures were not thought to be important for the results. The important part was to get an idea about how the project, project plan, the collaboration and the contracts were organized.

The interviewee's identities are concealed in the report because several of the interviewees expressed their concerns about anonymity during the interviews. Instead of using names, coded titles replaced their names when presenting statements. This allowed the interviewee's to be anonymous which might have increased their honesty in answering the questions.

3.2.4 Validity & Reliability

A measure is reliable when something is measured consistently while a valid measure is when you measure the intended construct (Bhattacharjee, 2012). The validity depends on how well the questions are constructed. If the questions succeed to measure the intended construct, the measurement will be valid. The problem is that it is really hard to define concepts like project result. If the questions in the interviews are not understood correctly by the respondent, the research could end up measuring another construct than was intended and there for lose its validity.

Different questions were used throughout the interviews depending on what specialist is being questioned. The interviews were recorded in a systematic way. By doing that, reliability of the

research was increased. What has to be considered is the researcher's interpretation of the interviewee's response. The researchers had to be aware of their subjectivity. The goal was to be as objective as possible but because it was difficult to be entirely neutral towards the environment, it was impossible to reach total objectivity. Data collection techniques such as observation depended a lot on the researcher's subjectivity while techniques such as questionnaires' were less dependent on subjectivity. An interview is a mix of questionnaires' and observations which will make the results more reliable than observations but less reliable than questionnaires.

3.2.5 Criticism towards method and sources

The layout and questions of the semi-structured interviews can be seen in appendix A. To increase reliability the researchers considered it important to ask similar questions to all interviewees. This was sometimes problematic when the interviewee turned the discussion towards another subject. This was considered as an opportunity for fruitful discussions and because of that the researchers sometimes went along with the changed direction of the conversation to capture valuable information that otherwise would have been overlooked. Due to this reason the reliability of this research was decreased, but on the other hand valuable input to the research topic was gained.

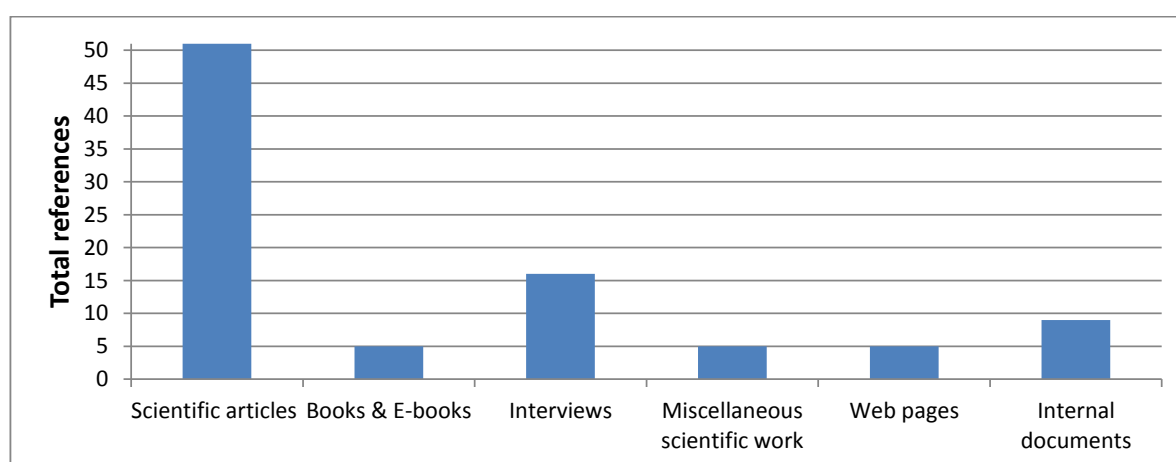


Figure 7. Overview of all the sources used for the research

The sources for the research were of various types and in total they summed up to be 91. The different types of references, the amount of each category and their year of publish can be seen in figure 7 and figure 8. From figure 7, it can be seen that more books could have been used in order to widen up the theoretical scope for the subject and increase the dependability of established theories.

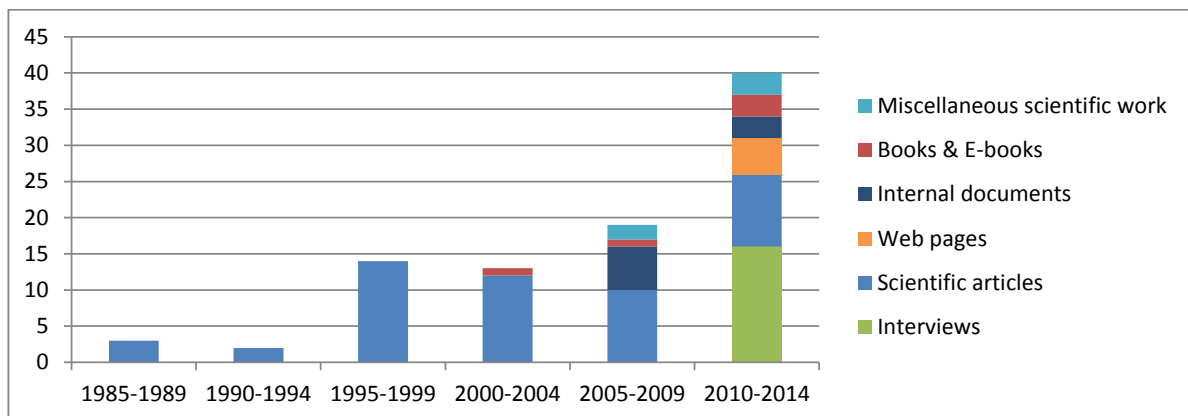


Figure 8. Overview of the published year for all the references in the research

The age of the references used for the report are mainly published between the years of '05-'14. The older references from the years of '85-'05 are a lot fewer since the researchers focus was mainly on using more recently updated work. The reason for still using references older than 10 years was because there is limited research regarding certain topics. It is important to consider what information to use from old sources since some information might be outdated.

4 Theoretical Framework

This chapter will introduce the theories used for designed questions and analyzing of the results of the study.

4.1 Definitions and theories

This chapter will introduce the theories used to analyze the empirical data that was collected. The reason for choosing the Principal Agent Theory is that the Principal Agent Problem is a common problem in the construction industry and partnering is believed help resolve these difficulties. The Framing Theory connects to the difficulties that organizations deals with when adapting to new processes, for example when implementing partnering.

4.1.1 Partnering

The literature review reveals several definitions of partnering. One of broadest definitions found on partnering is written by Lu & Yan (2007, p. 165) where they say that “In general, partnering is mainly defined as working relationships between stakeholders through respect, trust, teamwork, commitment and shared goals. Such a relationship is often determined by good faith rather than a formal contract.”

Black (1999, p. 423) elaborates on the partnering concept by stating that “ the partnering procurement method aims to eliminate adversarial relationships between client and contractor by encouraging the parties to work together towards shared objective and achieve a win-win outcome...Successful partnering requires many factors, in particular high level of commitment to shared goals, preferably including those of the client.”

The most detailed definition is written by Eriksson (2010, p. 915). He states that “The main theoretical contribution is a developed definition of what partnering is: partnering is a cooperative governance form that is based on core and optional cooperative procurement procedures to such an extent that cooperation-based coopeition is facilitated. The mandatory core procedures are: bid evaluation based on soft parameters (e.g. technical and managerial competence, collaborative ability, earlier experience of the supplier and shared values), compensation form based on open books and usage of the core collaborative tools, start-up workshop, joint objectives, follow-up workshops, and teambuilding and conflict resolution techniques. Optional procedures that can be implemented to a varying extent are: early involvement of contractors in concurrent engineering, limited bid invitation, joint selection and involvement of subcontractors in broad partnering teams, collaborative contractual clauses manifesting relational norms, incentives and bonus opportunities based on group performance, usage of complementary collaborative tools (e.g. partnering questionnaire, facilitator, joint risk management, joint project office, and joint IT tools), and increased focus on contractors’ self-control”. This is the definition of partnering which will be used in the thesis (see figure 3), even though only one definition will be used, three other definitions are presented to show that the concept of partnering are currently interpreted differently by different researchers.

Partnering projects can differ from each other and because of that it has been difficult to define the exact factors that the partnering strategy consists of (Nyström, 2007). An approach that the philosopher Ludwig Wittgenstein generated follows a procedure of looking into overlapping

similarities for each project. Since it has been quite hard to pin point the exact factors for each project this approach has been seen as appropriate when describing the concept of partnering. By stating the common starting point, the discussion about how to structure the partnering can begin.

This family–resemblance theory which is used in order to define partnering is also called the *partnering flower* and consists of necessary components in the center of the illustrated flower and of non-necessary components outside of the center, see figure 10 (Nyström, 2007). Some of the components in the Wittgenstein partnering flower were believed to be too vague and therefore an organization called FIA came up with a new, more concrete and structured partnering flower that in fact defines partnering with more flexibility. Stakeholders can then mark around the areas in the flower which then develops an explanation of how partnering is defined in their own project.

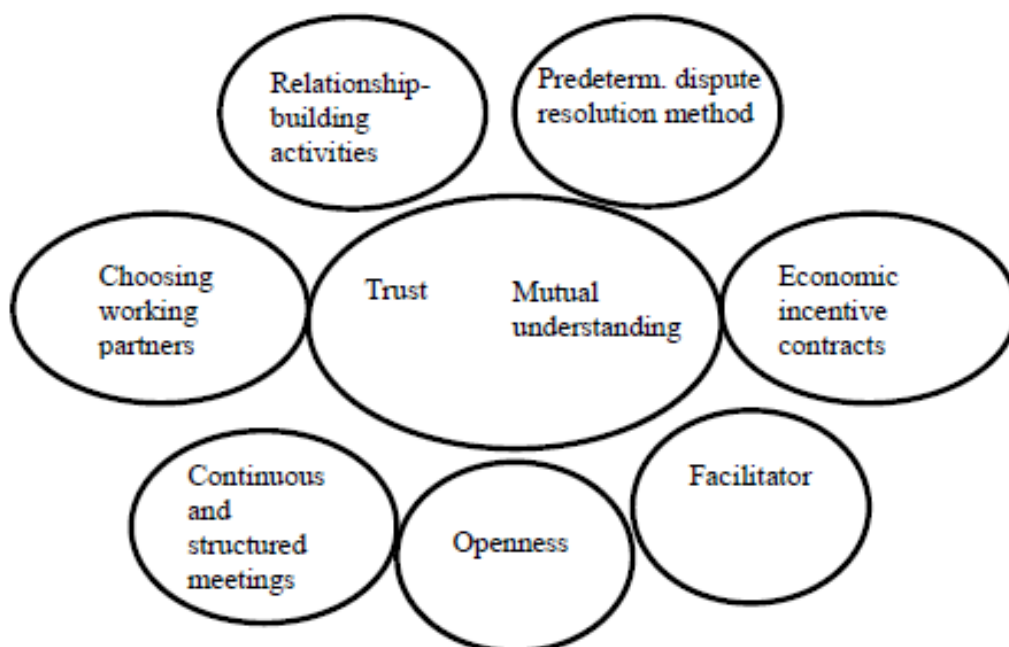


Figure 9. The Partnering flower (Nyström, 2007).

4.1.2 Principal Agent Theory

This is one of the core theories used as a support when analyzing the empirical data later in the report.

The theory describes a common problem in the construction industry and explains when the contractor (agent) knows more about certain bid and situations behind a project and the client (principal) knows less than the contractor (Eisenhardt, 1989). The unbalance of knowledge between the parties is also known as the lemon problem. The lemon problem is clarified by Winch (2010 p.100) where he explains that a seller, the agent, knows much more of its product

than the buyer, the principal. Even though the buyer might try out the product some defects can be hidden. Winch mentions that the solution to the problem is trust between the parties, but how should the buyer choose a trustworthy seller? What partnering strives to do is to minimize the adversarial relationships and unbalanced information between stakeholders. This is relevant to this research because many of the problems and conflicts that occur in a construction project are related to adversarial relations, opportunistic behavior and unbalanced information.

The theory can be related to risk sharing problems and different attitudes between stakeholders towards a project that has high uncertainty (Eisenhardt, 1989). The principal agent theory usually includes two things; a) the goals between the agent and the principal conflict and b) the principal not having the full knowledge of what the agent is really doing.

The principal agent problem also leads to moral hazard and adverse selection (Winch, 2010);

- Moral hazard; can the client be sure that the contractor that is hired will really give the client their best effort? Or will they allocate their best resources to another project or to their own firm?
- Adverse selection; how can the client be sure that the lowest bid is not the most desperate bid because the contractor cannot get any other jobs and therefore act in an opportunistic manner?

The attempts to try to stop these kinds of issues create adversarial behavior (Winch, 2010). The client wants the most profitable deal through competitive tendering but not at the expense of adverse selection or moral hazard. To avoid this, clients will try to control the situation so that no contractor with unrealistic bids will participate in the competition. The client controls the situation by applying their own cost control and quantity surveying functions. The contractors respond to this by developing their own quantity surveying function. This will cost the contractor money which will be added to their overhead cost. This pushes development towards more fixed designs in the tendering stage leading to more fixed contractor prices which will decrease possibilities of reducing costs.

The designers need to create a more detailed design which are believed to prevent opportunistic behavior from the contractor (Winch, 2010). The problem is that this also creates a less flexible design that is not adapted to the construction. This gives the contractor less possibility to be innovative and less possibilities to find ways of increasing their margins. Instead of decreasing opportunistic behavior this might increase that kind of behavior because the contractor will disclose information to try to increase their profit.

Winch (2010) describes how project partnering can align the goal of the client and the contractor and create a win-win situation instead of the win-lose situation that defines an adversarial relationship. To remove the adversarial relationships, information needs to be balanced and both parties must have a possibility to make a profit. This can be done through a clear agreement on gain, open books, by providing incentives for information sharing and facilitate communication and collaboration (Chinyio & Olomolaiye, 2010).

The principal-agent problem and further moral hazard can also be described and managed as an incentive problem. The client (principal) wants to provide optimal incentives for the contractor

(agent). This is complicated when the contractors output is not fully visible (Bergin, 2005). The client cannot monitor the full effort of the contractor so instead he observes a variable, for example output, which gives partial information about the contractors effort. This output does not only vary with the contractors effort but also because of other factors such as weather, deliveries, document problems, governmental issues etc. This creates a problem if the incentive system measures a kind of output that includes things that the contractor cannot control. If the contractor is very risk averse, incentives that have a too weak correlation to the effort might not be strong enough.

It can be said that destructive competitive behavior leads to adversarial relationships (Chinyio & Olomolaiye, 2010). This might have been the start of a wish from the industry to work in a more collaborative manner. Many companies try to collaborate to attain competitive advantages and to secure long-term returns. Firms often have to act collaboratively and competitively at the same time. This makes it hard to implement a culture of collaboration because it can sometimes be hard to know in which situation to use which approach.

4.1.3 Framing theory

The behavior of a projects organization has a lot to do with how the participants perceive each other (Chong & Druckman, 2007). Most of the stakeholders have worked within the industry for certain amount of time and during that time; they have most likely built up certain opinions about each other based on their previous experiences.

These real life situations lead to a theory that combines both economics and psychology, called the economic psychology theory and more precisely the framing theory. Chong & Druckman (2007, p.104) describe the theory; “The major premise of framing theory is that an issue can be viewed from a variety of perspectives and be constructed as having implications for multiple values or considerations”.

Framing is a process where people develop a certain conceptualization of a subject or their own mind of a subject (Chong & Druckman, 2007). Frames have also been described as a concept or action of mind that wakes up a defensive reaction by the opponent (Hänggli & Kriesi, 2012, p. 261). Beliefs and opinions are thought to be an evaluation of an weighted sum that is driven by great collection of positive and negative beliefs towards certain subject (Chong & Druckman, 2007). This phenomenon can be considered as forms of different individual understandings that are used to categorize information rationally and process it competently (Lecheler & de Vreese, 2011).

4.2 Measurement factors

To be able to identify how partnering affect a project, the authors of this thesis have found six factors that are considered to mirror the level of success in a project (Khalfan & Swan, 2007; Chan & Chan, 2004; Eriksson & Westerberg, 2011b). These factors were used to construct questions for the interviews in order to capture the effects of partnering on a construction project. This chapter introduces the factors in a more detailed manner.

4.2.1 Evaluation of project outcome

Quality

The definition of quality is stated by Swan and Kahlfan (2007); quality is correlated to the defects on the finished product. The defects must be put into relation to the impact of the defect, the number of issues and the response from the contractor particularly from a time perspective. Quality is often stated to be one of the most important indicators of project success; the problem is that quality is often a rather subjective concept. The measure of quality is suggested to be defined as “the meeting of specification” (Chan & Chan, 2004; p.214).

Bresnen and Marshall (2000) analyzed nine medium to large scale projects and found that the satisfaction with the quality of the work was higher in more collaborative projects (Bresnen & Marshall, 2000). Partnering with the goal of increasing cooperation and integration among the project participants can create benefits regarding quality, sustainability, dispute resolution, innovation and also cost and time reductions (Eriksson, 2008). Warsame (2011) states that from a quality perspective, partnering (as in working with common goals and structures) should decrease the risk for moral hazard and should always be an advantage.

Quality is a combination of two factors; product quality and process quality (Kärnä, 2004). Product quality measures technical performance aiming to minimize defects of the product and creating goals to achieve material and equipment success. Process quality looks into the design, construction, operation and maintenance achievements and how these phases were managed during the whole project.

Warsame (2011) explains quality in a different manner, he writes that there are three different kinds of quality; absolute, relative and comparative quality. Relative quality can be separated into two categories (Warsame, 2011; Kärnä, 2004); explicit relative quality which is the evaluation of quality made from the client’s design requirements and implicit relative quality which is an evaluation of the quality relative to what the client expected to get for the money.

Costs and time

Kahlfan & Swan found that time, cost and quality are the most important objectives in public construction projects. Partnering has been acknowledged to lower the risk for cost overruns and delays because of the possibility to apply better cost and time control, have less cost claims and use value engineering (Chan, et al., 2003; Li, et al., 2000). Bresnen and Marshall (2000) found support for the fact that partnering has potential benefits on “hard” performance outcomes like cost and time as well as benefits for the project process.

The contractor is usually responsible for factors connected to cost savings and improvements but by using a mutual orientation partners can help each other in what costs to consider (Larson, 1997). In this way partnering can create the possibility of a total-cost approach which may improve the economic outcome for both parties (Gadde & Dubois, 2010). By this mutual orientation the clients will become more integrated in the process with increased possibilities of influencing the project to get the most desired outcome.

One of the most common tools in partnering are incentives and bonus systems. Naoum (2001) points out that the use of incentive based systems could be a way to stimulate time efficiency in partnering projects and remove the focus of lowest cost. On the other hand Alfie Kohn (1993) refers to studies that have shown that incentive based systems really do not change the human behavior nor affect commitments to a project and almost do not have any effect on decision making. People are focused on the amount that they will get rather than the work that needs to be done. Kohn (1993) states that “The surest way to destroy cooperation and therefor organizational excellence is to force people to compete for rewards, recognition or to rank them against each other”.

Time as a key performance indicator can be defined as the duration for completing a project (Chan & Chan, 2004). Time can be measured in three different ways, the construction time, time variation or speed of construction. In this thesis the construction time is used when referring to time. Time is an important project performance measurement tool and is stated to be improved by the use of partnering (Eriksson, 2008; Bresnen & Marshall, 2000; Chan, et al., 2003). Factors that are related to time delays are design changes, inadequate planning of construction activities and labor, risks and uncertainties, complexity of works, non-performance of subcontractors and inaccurate evaluation of project duration (Kaming, et al., 1997; Olawale & Sun, 2010).

Environmental impact

The environmental impact has become more important as it has been shown that the construction industry is one of the major contributors to environmental problems (Eriksson & Westerberg, 2011b; Varnäs, 2008). The importance is also verified by the increased support in environmental matters from the authorities in many countries (Varnäs, 2008).

The researcher's point out that according to anecdotal evidence it is suggested that these issues are of increased importance in the coming years (Khalfan & Swan, 2007). Local authorities are often forced to take the leads on environmental issues and when it becomes a part of their objectives it will also become more important for the objectives in the individual projects.

Chan & Chan (2004) suggest that the application of ISO standards, the EIA score (Environmental Impact Assessment) and the number of complaints received during production can be used as indicators for environmental performance. Eriksson & Westerberg (2011) suggest including environmental impact factors such as emissions, energy usage and toxic substances to measure the environmental impact from a project.

Work Environment/Health and Safety

Hapanava & Al-Jibouri (2010) state that measuring safety levels should always be done when measuring project success. The construction industry has a bad history when it comes to health and safety (Eriksson & Westerberg, 2011b). Even today with advanced new technology and strong safety standards the construction industry is still a dangerous place to work in. This must be changed if the industry wants to attract the most intelligent and high performing employees to gain long-term competitive advantage. Health and safety are defined in Chan & Chan (2004, p.212) as “the degrees to which the general conditions promote the completion of a project without major accidents and injuries”.

Work environment can be measured through indicators such as sick-leave days, perceived safety on site and number of accidents (Eriksson & Westerberg, 2011b). When comparing the accident rate in two projects it is important to take into consideration the complexity and the size of the projects. Examples of factors that influence safety are; experience of managers, reduction of team turnover, increase of formal safety meetings, money spent on safety, clients objective, communication of risks, two way communication in design-construction, early involvement of contractor, educated client, designers site visits and the organizations approach towards safety (Hapanava & Al-Jibouri, 2010; Hare, et al., 2006).

Atkinson & Westall (2010) studied how the integration of design and construction can affect health and safety issues. The statistical method in the article did not verify that integration of design and construction increased safety. On the other hand, the qualitative method showed results that integrated design and the construction lead to better feedback (Atkinson & Westall, 2010). Through this feedback the designer would know how the design affected the building method and furthermore the safety. Partnering may give better opportunities for improved safety because the designer has a better chance of working proactively for safety. Some of the critical success factors for safety found by Hare et al. (2006) revealed similar conclusions as Atkinson & Westall found. Critical factors for health and safety were considered to be client interaction, designer interaction, flow of information and links between construction and maintenance.

Innovation

The collaboration method develops problem solving guidelines where problems are resolved in a timely and productive manner (Larson, 1997). Methods are constantly being improved so that the owner and stakeholders response rate for new proposals becomes more efficient. This also affects savings and the understanding of shared risk. Partnering is considered to increase the possibility for innovation, especially in constructability improvements and value engineering (Chan, et al., 2003).

In the article *Enabling and measuring innovation in the construction industry* by Gambatese & Hallowell (2011, p.553) innovation was defined as “the actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change”. This is the definition that will be used in this thesis. The reason why innovation can be seen as an important factor to measure is because it influences many of the project performance indicators (Gambatese & Hallowell, 2011; Eriksson & Westerberg, 2011b). Innovation can lead to lower costs, shorter schedule, sustainable improvements and improvements in quality and safety. Innovation can also have a positive impact by increasing the market share and create competitive advantages. One possibility to explore whether partnering increases innovation is to investigate how many new processes and methods have been implemented in the project and how many new materials and technologies have been used in the final product.

4.2.2 Client Satisfaction

It can be challenging to define the concept “client satisfaction” in the construction industry. The concept has been clarified in an article written by Kärnä (2004) where he explains that customer satisfaction is a function of perceived quality and the level to which the quality fails to match expectations.

Ahmed and Kangari (1995) suggest several factors that play an important role for the overall satisfaction of the client. These functions are customer orientation, communication skills and response to complaints. Other factors suggested to be important to client satisfaction is the organizations knowledge about the clients' interests, goals and structures etc. (Kärnä, 2004). It can be concluded that when the contractor does not pay attention to the client's needs it can often result in poor performance and low client satisfaction. Many positive statements about the relation between partnering and client satisfaction are described in literature, for example it has been said that partnering and co-operative methods increase client satisfaction and shared benefits arise for clients, contractors and consultants (Chan, et al., 2003; Larson, 1995).

The factors that are considered to be most important to client's satisfaction are finishing the project in time and within budget, fulfilling specification, good quality, full commitment, good teamwork, understanding of the goals and effective informal/formal communication etc. (Love, et al., 1998).

4.2.3 4D Collaboration

A concept called 4D collaboration is being developed by Eriksson (2011a). He examined several cooperative procurement procedures that were used as the basis for partnering implementation. From Eriksson's analysis four dimensions of collaboration could be found; width, depth, duration and intensity. The summary of these dimensions and what each dimensions contains can be found in figure 10. By using this concept it becomes easier to discuss details concerning the implementation of partnering in the studied cases.

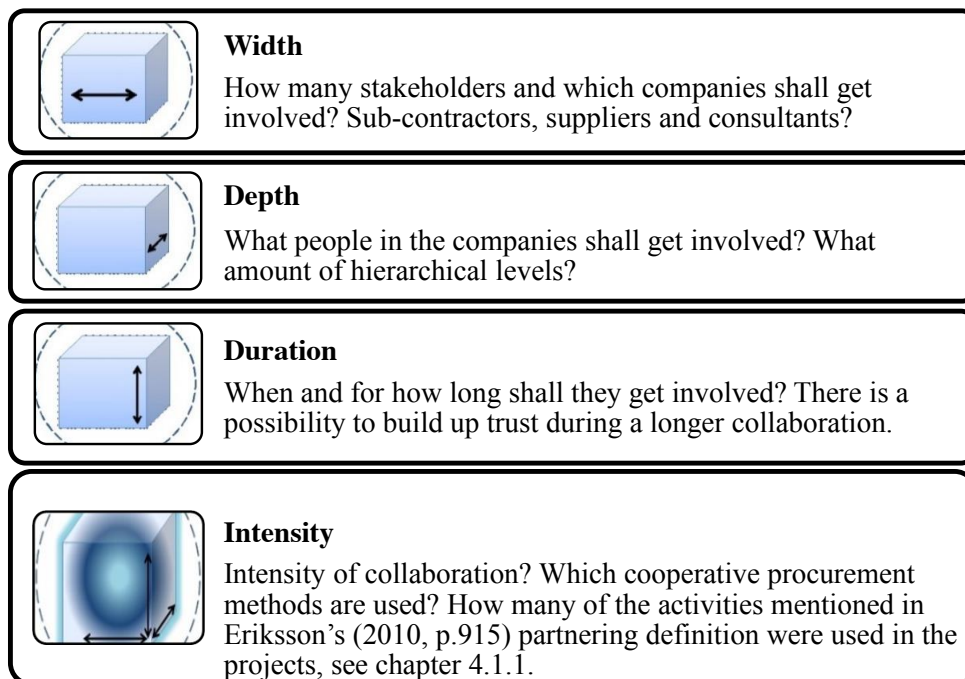


Figure 10. Description of how the four dimensions of collaboration are defined (Eriksson, 2011a)

The four dimensions

The conclusion of Eriksson's (2011a) conference proceedings is that this way of defining collaboration gives a more detailed and holistic picture of how partnering can be implemented. He also concludes that a greater width of collaboration is appropriate in complex engineering projects with many interdependent actors that need to coordinate (Eriksson, 2011a). A greater depth of collaboration is necessary when the end-users are vital for customized design. A longer duration of collaboration is desirable when time pressure requires parallel construction and design. A higher intensity of collaboration is important when projects have high complexity, uncertainty and time pressure (Li, et al., 2000; Gadde & Dubois, 2010).

4.2.4 Project success

Project success is defined by Chan & Chan (2004, p. 204) as "the set of principles or standards by which favorable outcomes can be completed within a set specification". Another way of looking at project success is to focus on whether the client's requirements have been fulfilled and his inclusion to the organization (Brown, et al., 2001). This is a more subjective approach than the one described by Chan & Chan (2004) which is the reason why this master thesis will investigate six pre-defined project outcome indicators to measure the success and identify effects of two projects because of partnering.

The "iron triangle" is a traditional way of measuring project success in terms of cost, quality and time. It focuses on short term benefits, but because sustainable development is becoming more and more important this "iron triangle" needs to be expanded (Eriksson & Westerberg, 2011b;

Chan & Chan, 2004). Therefore three additional criteria's have been found. These are environmental impact, work environment and innovation which will measure more long-term competitive advantages (Chan & Chan, 2004; Eriksson & Westerberg, 2011b)

It is difficult to study project outcome because of the complexity of what underlies an evaluation of a project outcome. The experience of success or failure is not absolute but it depends on the individual's personal standard for what constitutes a successful or failed project. Project stakeholders probably have different objectives and therefor different ways of measuring success (Liu & Walker, 2010; Chan & Chan, 2004). It is also important to consider that project success depends on the project type, size, complexity, the definition of goals, measurement criteria, identity of the evaluator and the timeframe for measurements.

Quite a lot of research have focused on measuring the success of partnering. Fewer reports have focused on measuring how well partnering supports a successful project outcome, which is different from a successful partnering outcome. The degree of the relationship success in client-contractor collaboration could be measured by six major criteria's; meeting schedule, controlling cost, technical performance, customer needs, avoiding litigation and satisfaction of participants (Li, et al., 2000). The reason why there are few reports focused on if partnering supports a successful project outcome can be that it is difficult to connect the project outcome to the partnering. It is not possible to know for sure if the outcome was affected by the way partnering was implemented or if there were other dimensions influencing the project outcome.

Pinto & Slevin and Crane et al. (1988, 1997) suggested that the project participant's perception of the project is an effective way of evaluating project success.

5. Case Studies

Citybanan is an ongoing project of building a 6km railway tunnel for the commuter trains in Stockholm. The project is divided into eight smaller contracts and this case study will focus on the two projects in the central and south part of Citybanan called Norrströmstunneln and Söderströmstunneln.

5.1 The stakeholders

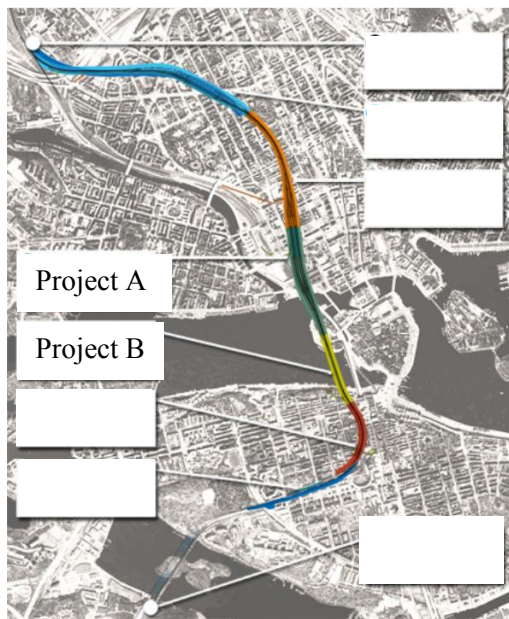


Figure 11. The studied cases in the different part of the Citybanan (Trafikverket, 2014).

5.1.1 Client A and B

Client A and B represent the same client but in different projects. The client is a governmental organization which is responsible for long-term planning of the transport system for road traffic, railroad traffic, shipping and aviation. The organization is responsible for building, operating and maintaining public roads and railroads (Trafikverket, u.d.).

5.1.2 Contractor A

Contractor A is one of the leading construction and property development companies in northern Europe. The company has a turnover of 57 billion SEK and has 18 000 employees (NCC AB, 2013). In project A, the client A and the contractor A have been co-located from design to production. Project A is one of the largest infrastructure projects in Stockholm and the average order value in the project is 1800 million SEK. The location of project A can be seen in figure 11.

5.1.3 Contractor B

In the beginning, the contractor in project B was a consortium between two contractors, but when one of the contractors went bankrupt in August 2013, one of the contractors took over the project by himself (Trafikverket, 2014).

5.2 Norrströms tunneln

One of the studied cases is Norrströms tunneln which is located in the central part of Stockholm, this case includes Station City which is a new station located below the existing station T-Centralen. 490 000m³ of rocks will be extracted, 15 000 m³ of concrete will be casted, 7000m of pipes will be buried and 9000m of cable slots will be constructed. The main part of Norrströms tunneln should be finished by the 23rd of February 2015 and installations and interiors, should be finished the 16th of March 2016.

5.2.1 Description of the contract

The contract is a design-bid-build with a partnering agreement. The payment method is a cost plus payment method with incentives and bonuses. A cost plus payment method is when the contractor is paid in several stages, depending on the agreement with the client. The payment sum is based on the invoices the contractor has received from suppliers and other involved stakeholders and the profit is based on a predefined percentage. The incentives and bonuses are customized for each project.

The partnering agreement in the contract is defined as collaboration in design, cost control, production guidance, procurement, risks and information activities (Norrströms tunneln AB, 2008). The contractor collaborates in the design process as an advisor regarding production, production methods, cost savings and the finished product.

The prerequisites in this project are combinations of complex layouts and connections to and in the subway, disturbances for the traffic/commuters through vibration and noise, nearby hotels and cultural heritage interests; proximity to Riddarholmen and cable/pipeline tunnels (Norrströms tunneln AB, 2008). The purpose of the contract and the payment methods is to minimize the contractor's and the client's economic and up-to-date risks (Norrströms tunneln AB, 2008). It is supposed to minimize disturbances and impacts on the surrounding and at the same time increase the quality. To attain the bonuses the parties have to fulfill established goals regarding time, quality, collaboration, cost and environmental impact.

Incentive system

The client organization has created an incentive plan to encourage the contractor to achieve and go beyond the goals specified (Norrströms tunneln AB, 2008). The system is created so that the contractor is rated on a scale from one to five on how well they have achieved the goals in the plan within the areas of quality, collaboration and health & safety. Depending on how well they perform, they receive different payments.

The incentive plan for time and cost is complex, depending on how long in before-hand the contractor can finish a sub time target, a decided sum of money is collected (Norrströms tunneln

AB, 2008). The client has defined a target cost for the contractors' variable costs excluding commission, bonus and volume indexed works. If the contractor falls below the adjusted target cost for the variable part, the contractor will attain 40% of the part below the adjusted target costs, but up to a maximum amount. If the project is late and exceeds the set sub time targets they will be fined. An extra fine will be added to the original amount if they still haven't finished. (Norrströmstunneln AB, 2008).

The contractor's plan for reaching these goals and how they are measured are shown in the matrix below in table 1. (Norrströmstunneln AB, 2009).

Table 1. The contractors plan of how to achieve the incentives and bonuses in the contract.

Factor	Goal	How?	Metric/Measurement
Time	To finish the contract in or before the set timeframe	Work actively with production management	Bonus if times are kept and if client did not cancel significant works.
Technical quality	To hand over the contract without defects.	Work actively with production management and execute internal inspections.	Create an average amount of defects per inspections which will give points 1-5 depending on the number of average defects.
Collaboration	To execute the contract in a collaborative and good spirited manner.	Collective experiences can be used by working with proactive collaboration during design and production.	<ul style="list-style-type: none"> *Management of economic questions *Joint procurements *Low turnover of employees *Preparation before meetings *Ability to be creative *Well-being and daily dialogue
Environmental impact (Health & Safety)	Limit the work accidents and minimize disturbances for external stakeholders	<ul style="list-style-type: none"> *Actively identify risks and from these decide appropriate methods, equipment and locations. *By keeping external stakeholders through clear and regular information based on good planning. 	<ul style="list-style-type: none"> *Organization of the *Few workplace accidents *Complaints from external stakeholders *Actively informing surroundings *Actively work with precautions
Financial control	To carry out the contract within agreed budget		Defined a target cost, if fall below the adjusted target cost, the contractor will attain 40% of the part below the adjusted target costs

Summary of the collaboration success

A result of how well partnering was proceeding can be found in table 2. This table gives an overview of how the collaboration has influenced the atmosphere and effectiveness of the organization in Project A.

Table 2. A summary from a questionnaire regarding how well the partnering is proceeding.

Question: I think we have....	Managers	Craftsmen
<i>..production adapted design</i>	Absolutely we have ambition for it	Not so much regarding pipe design
<i>...optimized methods, execution and material</i>	High demands, too easy decisions=expensive.	Should have more forward planning
<i>...a creative and prestige less environment where it's fun and jovial.</i>	(No answer)	- It's crowded and messy. - Some individuals have bad attitudes.
<i>.. an environment where I don't feel stress/anxiety about my workload.</i>	(No answer)	-Sometimes it's stressful. - Everything is stressed all the time.
<i>..open and clear communication paths.</i>	(No answer)	True within the different departments but not between them.
<i>..effective meetings.</i>	Depends on who has the meeting.	Can be more effective.
<i>What has worked best in the project so far?</i>	-Solutions to difficult technical problems. -Fast and creative solutions. -Good common goals and engagement in collaboration and production. -Good team. -Keep within time and cost. - Acceptance from public stakeholders.	-Open dialogue. - Good atmosphere among workers. -Night shifts. -Planning and work management.
<i>What can you, in your role, do to improve the project?</i>	-Good communication with colleagues and managers. -Keep the public's acceptance. - Use proactive communication. -Actively contribute with ways of working so that the goals are fulfilled	-Communicate well. -Be positive and see opportunities. -Create conditions that allow better order and accessibility. -Always work hard. -Quality and effectiveness. -Be happy.
<i>What can we improve and work more with in the project?</i>	- More respect for each other's roles. -Joint view of quality. -Listen and understand. -Be more down in the tunnel. -Better planning regarding time, coordination, logistics and work environment. -Think about perspective of external parties. -Keeping the time plan. -Quality work. -Keep the communication paths even	-Documentation of jointly agreed precautions. - Collaboration and communication. -Communication with other trades. -Planning. -Preparations before work. -Buy cake. -Communication between ground, concrete, carpentry etc.

	though organization change.	
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Change requests

Due to the payment- and implementation method, the change requests are not regulated according to the normal rules in the standardized contractual framework for Design-Bid-Build contracts. Instead the contractor is obliged to continuously report in writing all changes that affect the production budget (Investeringsdivisionen Projekt Citybanan, 2008).

5.2.2 Time planning and financial control

Processes for planning are jointly developed by the contractor and client. The one responsible for planning will be a support regarding what technical choices and methods to use. The production plan is jointly developed by client and contractor.

Control of costs are handled daily and reconciliations regarding hours, costs and incomes will be done continuously in the project. The financial accounting is open to the client through sharing of entitlement with cost software. The client is given full insight in the process of procuring and given possibility to influence the process according to agreed routines.

5.2.3 Quality management

The contractor is responsible for self-monitoring the process according to a set control plan. This is monitored by the client in monthly quality meetings. Inspections are done continuously according to set routines. The inspections contain the following reviews; internal controls, pre-inspection, final inspection, guarantee inspection and inspection before use. Audits can be done within the project and also according to a separate program for consultants, suppliers and sub-contractors.

5.2.4 Management of health, safety and environment

Work Environment

The goal for Norrströmstunneln is that the number of accidents should be 80% lower than the average rate of accidents in the industry, measured in accidents per million worked hours, which for Citybanan means 8 accidents/million hours (Norrströmstunneln AB, 2008).

The client will be responsible for coordination of the work environment in construction during the design phase while the contractor will be handed the responsibility of this for the production phase (Norrströmstunneln AB, 2008). Safety will be increased by education, risk analyses, design choices, work preparations documents, safety rounds, reporting of accidents and meetings/workshops (Norrströmstunneln AB, 2008). The client has a controlling and supporting role regarding health and safety (Pehrsson, 2008).

Environmental impact

Surveillance of water quality is done continuously (Norrströmstunneln AB, 2008). Work should be planned with respect to the level of noise pollution. Chemical products must be recorded in a database about materials and have available information in order to be approved by the client.

The client and the contractor jointly communicate to external stakeholders regarding environmental impact. Both the client and the contractor shall reward teams with good awareness and contribution to environmental work (Pehrsson, 2008). Environmental rounds are performed every fourth night together with the contractor and the client.

5.3 Söderströmstunneln

5.3.1 Description of the contract

The contractual form is a Design and Build contract (Banverket Östra banregionen, 2006). From the start of the project in January 2008 until December 2010 the payment form was fixed price (Trafikverket, 2011). Due to problems and conflicts regarding compensation in time and cost, the payment form was changed 1 January 2011 to cost plus payment method with cost incentives.

New rules regarding extended collaboration were implemented. The original contract is still valid with the additional agreements and adjustments. The reason for the added agreement is to create a good collaborative climate, better prerequisites for finishing the contract and to solve other complex dealings. The contract comprises the design and construction of a concrete tunnel from Södra Mälarstrand to Riddarholmen, see figure 16. (Banverket Östra banregionen, 2006). The project should be completed and available for final inspection at 2014-10-31 (Trafikverket, 2011).

Project Goals

The project goals and strategies of how to reach the goals can be found in table 3 (Banverket; JV Söderströmstunneln, 2008):

Table 3. The contractor's strategy to achieve the project goals in Project B.

Project Goals	Strategies
Complete project before or within timeframe	Actively work with time management through detailed planning and control. Identifying possible risks.
Complete project within budget	Actively work with cost management and check development against the budget
Hand over the project without defects on quality or execution	Actively work with planning, managing and controlling quality

Establish a positive and interference free collaboration with the client and other stakeholders	Actively work with the intention to solve disagreements with the client at the lowest possible level.
To acquire a good relationship with mutual trust from project stakeholders and the public	
To carry out the projects without any accident causing death or serious injuries	Actively work to identify vital risks for accidents and from those risks develop work methods.
To carry out the project without causing damages on nearby environment, buildings, wires/pipes, road- and train traffic	Actively work to identify vital risks for damages on nearby environment and construction. From the identified risks work methods.

External stakeholders

Companies, businesses and housing are located in a nearby residential neighborhood (Banverket Östra banregionen, 2006) . Some governmental institutions are located on Riddarholmen and there are several rock chambers nearby. All of these functions are located in close proximity to the work area and should be operable during the construction time. The project needs to take great consideration to the existing traffic, shipping and pedestrians (Banverket Östra banregionen, 2006).



Figure 12. Marine works, preparation for casting under water (JV Söderströmstunneln, 2012, p.9).

Procurement of sub-contractors

The contractor chose consultants, suppliers and sub-contractors based on their qualification (Banverket; JV Söderströmstunneln, 2008). The project management will ensure that the contracts with the consultants, suppliers and sub-contractors fulfill all demands from the client towards the contractor's. The contractor encourages understanding and engagement from the sub-contractors and suppliers regarding demands on execution and joint management of risks

(Banverket; JV Söderströmstunneln, 2008). The contractor's board approves all larger procurements of sub-contractors and suppliers before executing the procurement.

Added collaboration agreement

The ways of working in collaboration and the goals of such collaboration are stated in table 4. (Trafikverket, 2011):

Table 4. The goals of collaboration in Söderströmstunneln.

Collaboration methods	Goals of collaboration
Production management, to finish the contract in or before the set timeframe	Structured planning, forward planning and time keeping
Design, to achieve optimal constructions and construction methods	Find production adapted solutions and saving possibilities
Joint procurement of sub-contractors and suppliers	Good collaborative climate, joint goals and operational collaboration
Risk management, to jointly work to avoid conflicts and prevent unexpected occurrences	Maximal cost control and cost management
Planning and execution of information activities to external parties	High quality with few defects
Work environment and safety to minimize accident and incidents	Secure workplace with no or few injuries
Minimize impacts on the neighborhood to secure acceptance and trust from the public and other stakeholders.	Minimize environmental impact

The purpose of the new contract and its payment method is to create a positive collaborative climate and eliminate conflicts (Banverket Östra banregionen, 2006). The contractor has an open collaboration with the client to decide upon the final design of the product, the planning and the cost management. The contractor is obliged to write a diary that is accessible to the client and that contains agreed information about work, changes, accidents, resources etc.

Collaboration group for collaborative work

A collaboration group shall exist in both the client's and contractor's organization containing the project management and design management (Trafikverket, 2011). The collaboration groups should guide the work in the project and the steering group shall support the collaboration group in problems they cannot agree on. The collaborative parties' representatives shall be adequately co-located to facilitate collaboration.

5.3.2 Time planning and financial control

Time

A production time plan has been developed during the procurement phase and this plan is updated according to new information in agreement with the contractor and the client (Banverket; JV Söderströmstunneln, 2008). Responsibility for control, development, refinement and changes of the time plan are delegated to managers for each module and the staff managers in the organization. Module refers to a department within the construction organization that is responsible for specific work area. When the production plan is handed in for approval to the client it can only be revised again after an agreement with the client.

Cost

The payment form up until December 2010 was fixed price (Trafikverket, 2011). From 1 January 2011 the payment was changed to cost plus with a fixed target commission and a larger variable target price with both bonuses and incentives for time goals.

By using prognoses and ongoing controls of the project costs it will be assured that the budget is kept (Banverket; JV Söderströmstunneln, 2008). Responsibility for control, development, refinement and changes of budget are delegated to managers for each module and the staff managers in the organization. Coordination and compilation are done by the project manager for cost control and after that the project management will finalize the budget.

Before the start of the project, a review of the budget calculations and the production budget was executed (Banverket; JV Söderströmstunneln, 2008). Control of hours, costs and earnings are done continuously. Deviations from the budget are analyzed and stated in the monthly report. Change requests were regulated by the contract up until the adjusted agreement was implemented in 2010, by then those kind of changes were handled by the cost plus payment form (Trafikverket, 2011).

Incentive system

Bonus can be attained for finishing sub-parts of the works in or before time. There are three such sub-times which in total can award the contractor a predefined sum of money. If the main tunnel is completed, inspected and handed over to the client so that operation is possible at the latest 2014-08-31 then a specific amount of bonus can be attained each calendar day it is finished before this date. There is a maximum amount to this bonus.

The parties have also agreed upon a target cost for the contractor's variable costs (Trafikverket, 2011). If the cost falls below this, the contractor can get a bonus of 40% of the difference between the target cost and the true cost to a certain maximum. If the variable costs are exceeded, the contractor will be reimbursed up to the roof price that is 20 % over the adjusted target cost, after that the contractor has to pay the rest. If the completion is delayed, then there are penalties for each started week up until a certain amount.

5.3.3 Management of resources, risk and quality

Resource management

Responsibility for planning time and resources are delegated to managers for each module and the staff managers in the organization (Banverket; JV Söderströmstunneln, 2008). When the resource plans are reviewed and approved at the start of a clearance meeting, the resource procurement can take place. Sub-contractors are procured in joint consultation between the contractor and client regarding the sub-contractors technical competences. Any change of sub-contractors has to be authorized by the client (Banverket Östra banregionen, 2006).

Staff management

Higher positions in the project are established by the boards of contractor and recruited from their own organizations (Banverket; JV Söderströmstunneln, 2008). Other project participants are recruited by the project management. Every project participant should attend an introduction and be given work place information to ensure appropriate understanding of the collaboration between the contractor and the client.

Quality management

To acquire continuous improvements an adequate education in quality shall be given to the project participants (Banverket; JV Söderströmstunneln, 2008). Self-controls and quality inspections will be done continuously to ensure that quality demands are fulfilled.

The quality policy contains three goals (Banverket; JV Söderströmstunneln, 2008):

1. With a planned and systematic control schedule, defects should be prevented and furthermore costly errors and defects are minimized. If defects occur they should be corrected so that the end product fulfills the set quality demands.
2. To achieve results that fulfills the set demands regarding quality in the contract and fulfills the demands on documentation of preformed work.
3. During the execution of the above mentioned activities, a quality control system should be created. The quality control system should ensure that all quality demands are fulfilled in both sub-suppliers and the consultants own systems.

Innovation

In the adjusted agreement from 2011 a fund was created with the purpose of reducing risks during production to sponsor the research of optimal production methods (Trafikverket, 2011). A set amount of money is available for investigations and enquiries of new creative methods to solve and optimize problems.

Risk management

Management of the risks and opportunities in the project takes place through a risk analysis in accordance to decided guidelines (Banverket; JV Söderströmstunneln, 2008). The risk analysis

should contain the risk, the date the risk was identified, the probability of the risk happening, responsibilities, prevention methods, the reason for the risk and the consequences etc.

Responsibility for the development of the risk analysis is delegated to managers for each module and the staff managers in the organization (Banverket; JV Söderströmstunneln, 2008). The project management in collaboration with the client should establish the risk analysis for the risk management.

5.3.4 Management of health, safety and the environment

Environmental Impact

The contractor's environmental policy includes (Banverket; JV Söderströmstunneln, 2008):

- Base the project operation on a comprehensive view where environmental impact during the projects entire life-cycle is considered.
- Minimize the effects of disruptions in nature and protect the fauna.
- Engage all project participants in environmental issues.
- Fulfill and exceed laws, regulations and other demands within the environmental area.
- Operating the project with a well-functioning environmental management system to fulfill the set goals.
- Work with continuous improvements.
- Actively collaborate in environmental issues with the client, suppliers and other stakeholders.
- Openly account for the contractor's environmental work.

To ensure that arrangements are carried out the environmental analysis is continuously updated and arrangements are worked into the plan of execution, in work preparation documents and in control programs (Banverket; JV Söderströmstunneln, 2008). Self-control of environmental inspections is continuously carried out.

The environmental department in the project is responsible for coordination of environmentally related processes.

Work Environment

The contractor shall be handed over the responsibility for the work environment safety that according to the law belongs to the client. The contractor should work to prevent accidents and illnesses at the joint work place (Banverket Östra banregionen, 2006).

The work environment policy for the contractor says (Banverket; JV Söderströmstunneln, 2008):

- The contractor shall ensure that all work can be performed in a safe and healthy way and that at least all laws, local regulations and project specific demands are fulfilled during the design, planning and execution of the project.
- Ensure that work environment is an integrated part of all the contractor's activities with a clear responsibility through the organization.

- To carry out continuous improvements to achieve set goals and ensure that all personnel are well informed and live up to their personal responsibilities regarding the work environment policy.
- To make sure that project participants are not hurt mentally or physically at work.
- To ensure that all colleagues at all levels shows compassion, are attentive and use common sense when working.

To encourage safety and health, the contractor will support health-promoting activities were bonus is offered for fulfilling certain goals (Banverket; JV Söderströmstunneln, 2008). To create engagement and motivation among the colleague's rewards will be given to the department that has the best preventive safety work.

Training and awareness

All contracted employees at the contractor shall participate in the safety training as a pre-requisite before they start work. In the manual it is explained that the contractor uses a training matrix with various types of training sessions and tests to ensure that all personnel including subcontractors obtain acceptable level of training and awareness.

Toolbox talks is a method that the contractor uses in their safety plan which establishes good communication, supporting the safety message throughout the workforce. The toolbox talk is believed to improve the development of a safe working culture, guiding the supervisor or safety representative when they have a weekly update discussion about recent accidents. The meeting is documented and a copy of the toolbox talks is sent to the safety engineer where they are filed and stored (JVS, 2010). A special competence test has been developed for foreign operators to ensure theoretical and practical knowledge on how to operate.

Health and safety agreement

The health and safety plan provides guidance to all levels of involved parties and the goal is to eliminate and minimize risk and possible hazards to employees and others personnel on site, visiting or working in the project. The construction is handled in accordance with legal, contractual and internal safety requirements.

Improvements

The contractor decided to start with having occupational safety management system, which the contractors' safety engineer is responsible for reviewing and updating. The procedures of hazard identification, risk assessment and the implementation of control and maintenance measurements are vital for the project organization.

The contractors' objectives are (JVS, 2010):

- Zero lost time accidents to all personnel and members of the public
- Lost time accident rate shall be the lowest of all construction sites in the Citybanan project
- The contractor shall encourage that safety becomes part of the culture through constant training, communication and "your behavior counts" campaigns

6. Findings and Analysis

This chapter will contain the findings from the interviews combined with an analysis of the findings. The reason for combining findings and analysis is to make it clear to the reader how the analysis is connected to the gathered data and how the findings are related to theory. This method allows the reader to remember the statements as the analysis proceeds.

6.1 Partnering in general

This chapter will present the interviewees' view of the concept partnering and their expectation of partnering. The interviewees' definition of partnering can be compared to the theoretical definition of partnering presented in the theoretical framework.

For the analysis it is important to explain a few concepts that will be frequently mentioned in the following chapter. These concepts are;

- **Adversarial relationships** are relationships characterized by conflict or opposition (Oxford University Press, 2014).
- **Opportunistic behavior** are characterized by the exploitation of immediate opportunities, especially regardless of planning or principle (Oxford University Press, 2014b).
- **Traditional contracts** are generally referred to as design-bid-build contracts regardless of payment method (The Joint Contracts Tribunal, u.d.). In this analysis we will use the term traditional contract to describe all contracts that do not employ partnering and its related payment method.

6.1.1 Definitions of partnering

A number of statements from the interviewees regarding their view of partnering can be found below.

Collaboration

- The contractor's project engineer 1 in project A saw partnering as a close collaboration with the client.
- Contractor's middle manager 2 in project B felt that partnering both managed and drove economical, time and cooperative focus within the organization.
- The client's middle manager 4 in project A and B thought that the collaboration originated from the win-win situation created.
- The client's middle manager 3 in project A said that close collaboration was the core of partnering.
- The contractor's middle manager 2 in project A defined partnering as "the will to cooperate in a constructive manner that is driven by the task, the complexity and the risk you have.....but also you have the hardcore facts like economy, schedule and all that, a way to manage that."

Joint objectives

- The contractor's middle manager 2 in project B described partnering as creating goals together, which the client's project manager 1 in project B also stated.
- The contractor's middle manager 2 in project B said that partnering made you communicate and create the same goals, in traditional projects the stakeholders have conflicting interests; the contractor wants to build as cheap as possible and the client as good as possible. As he/she puts it "The client wants a Porsche and the contractor wants to build a Lada".
- The contractors and clients middle managers that were involved in project A and B mentioned that partnering was joint goals, open communication and joint decision making with the client. Emphasizing on close collaboration between the client and the contractor, aiming for the same goals.
- The contractor's middle manager 1 in project B described partnering as being a more positive contract where goals were defined to create a win-win factor.

Joint problem solving

- Both the client's and the contractor's middle managers felt that partnering was about helping to manage disagreements, leading stakeholders into more focus towards finding solution.
- The clients project engineer 1 in project A defined partnering as working together and finding solutions together. The contractor's middle manager 1 in project A described partnering as making decisions together and producing the best product for the customer.
- The client's project manager 1 in project A defined partnering as "to jointly take responsibility for the execution of the project. To use each other's knowledge."

Transparency

- The clients middle manager 1 in project B said that the biggest difference between partnering and non-partnering projects were the open books which made it possible to openly discuss the agendas.
- The contractor's project manager 1 in project B also said that partnering was to work together and have open communication.
- The contractor middle manager 1 in project B described partnering as being open books, an involved client, open meetings and no secret agendas.

6.1.2 Analysis about the partnering definition

The stakeholders understanding of the partnering concept correlates to what the theory states but are much more limited. While some theory defines partnering as several factors (see definition by Eriksson (2010, p.915)) practice in these projects defines partnering mostly as joint problem solving, risk sharing, transparency, shared responsibility and common goals. These are just few things out of many that Eriksson (2010) uses to explain partnering but fits more or less the theoretical definition by Black (1999) and Lu & Yan (2007).

It seems like most of the participants in these two projects have similar views of partnering, although their definitions varied slightly which might be due to their different experiences. Only little more than half of our 16 interviewees had any earlier experience of partnering which can explain the varying expectations. This can also cause the interviewees to be more or less comfortable with the concept of partnering which also might affect their answers during the interviews.

In theory partnering is defined in different ways, which might increase confusion about the concept in the industry. Since partnering is quite new in the Swedish construction industry, it can be assumed that certain confusion among project actors will occur if the method is not implemented in the organization professionally. It happened frequently that the interviewees were not able to answer how they used partnering. Later in the interview they described many of the strategies that belonged to partnering not being aware that these strategies were part of the partnering concept. A graph of the interviewees' explanations of their definition of partnering can be seen in figure 13.

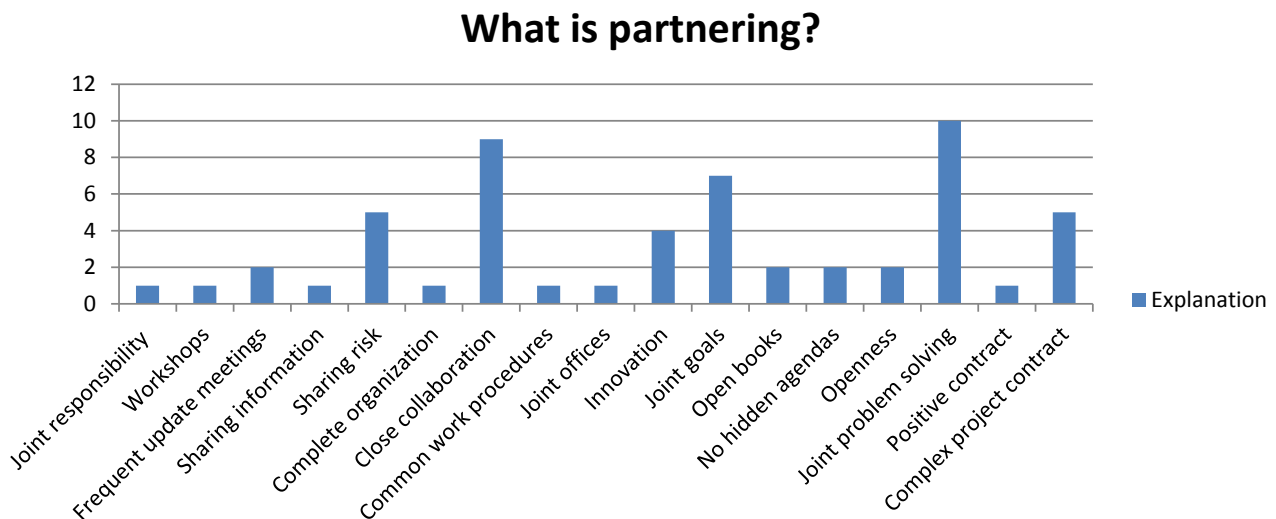


Figure 13. Interviewee's definitions of what partnering consists of.

6.1.3 Expectations

A number of statements from the interviewees regarding their expectations of partnering can be found below.

Transparency

- The client's middle manager 1 in project B expected to openly discuss the agendas and to achieve greater quality due to the fact that the client and contractor could collaborate to find new solutions together.

- The client's project manager 1 in project B also expected better cooperation and that partnering would facilitate discussions because of the joint budget. The parties would not have to think strategically but speak more open and freely about problems and solutions.

Collaboration

- The contractor's project manager 1 in project B expected to collaborate with the client. The client's middle manager 1 in project A described a similar expectation, he/she expected less conflicts when it came to changes and additional work and better collaboration with the contractor.
- The contractor's middle manager 1 in project A expected the client and contractor to work together, make joint decisions and frequently talk to each other.
- The contractor's project engineer 1 in project A expected less conflicts and more collaboration.
- The contractor's middle manager 1 in project B expected better collaboration with the client.
- The client's project manager 1 in project B expected better cooperation with the contractor.

Problem solving

- The client's middle manager 3 in project B expected to find solutions together with the contractors.
- The client's middle manager 1 in project A expected minimum conflicts which would facilitate joint and fast problem solving.
- The contractor's middle manager 2 in project A expected that partnering would make it easier to find solutions together and motivate innovations.

No expectations

- Neither the client's middle manager 1 in project B, the client's middle manager 3 in project B, the contractor's middle manager 3 in project A nor the client's project engineer 1 in project A said that they had any expectations because of the partnering. The client's project engineer 1 in project A expressed that he/she was not told anything about the concept of partnering just that he/she was obliged to work in collaboration with the contractor.

6.1.4 Analysis about expectations in partnering

The expectations expressed by the project participants were increased openness, transparency, communication and collaboration but more detailed result of their most common explanation can be seen in figure 14. The participants expected the client to be more engaged and that the parties could be more honest with each other.

This indicates that the participants in a partnering project are not educated in beforehand about partnering. For the participants with no earlier experience of partnering, it will become difficult

to step into a different mindset if they neither are educated nor have experience in how they should approach their new role.

According to earlier presented statements from Josephson and Kärnä (2013, 2004) high expectations might increase the risk of customer dissatisfaction if the outcome fails to match the expectations. In the statements above it can be seen that a lot of focus is put on the potentials of collaboration, joint objectives and problem solving. If the statement above is applicable it can be suggested that the participants will become less satisfied regarding factors such as collaboration,

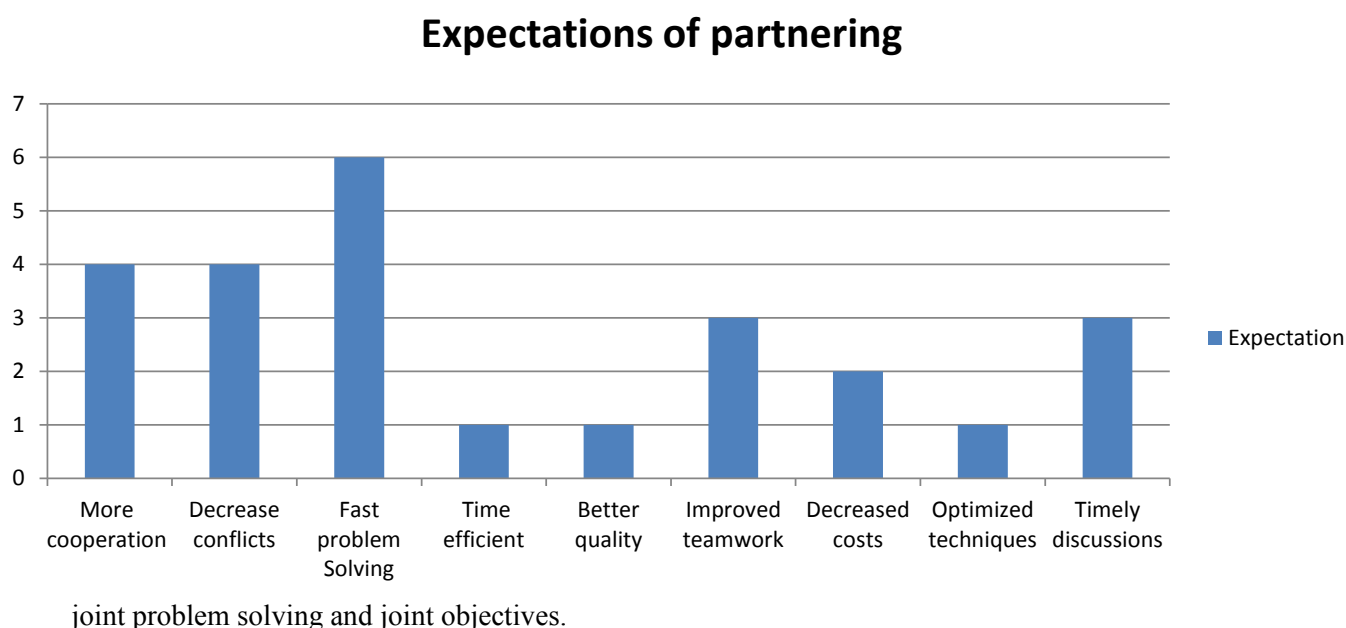


Figure 14. Interviewee's expectations towards partnering

6.2 Partnering in the projects

6.2.1 Project A

The information in the table below is based on interviews with project managers from the different projects. These project managers had a good insight in how partnering was implemented and used in the different cases.

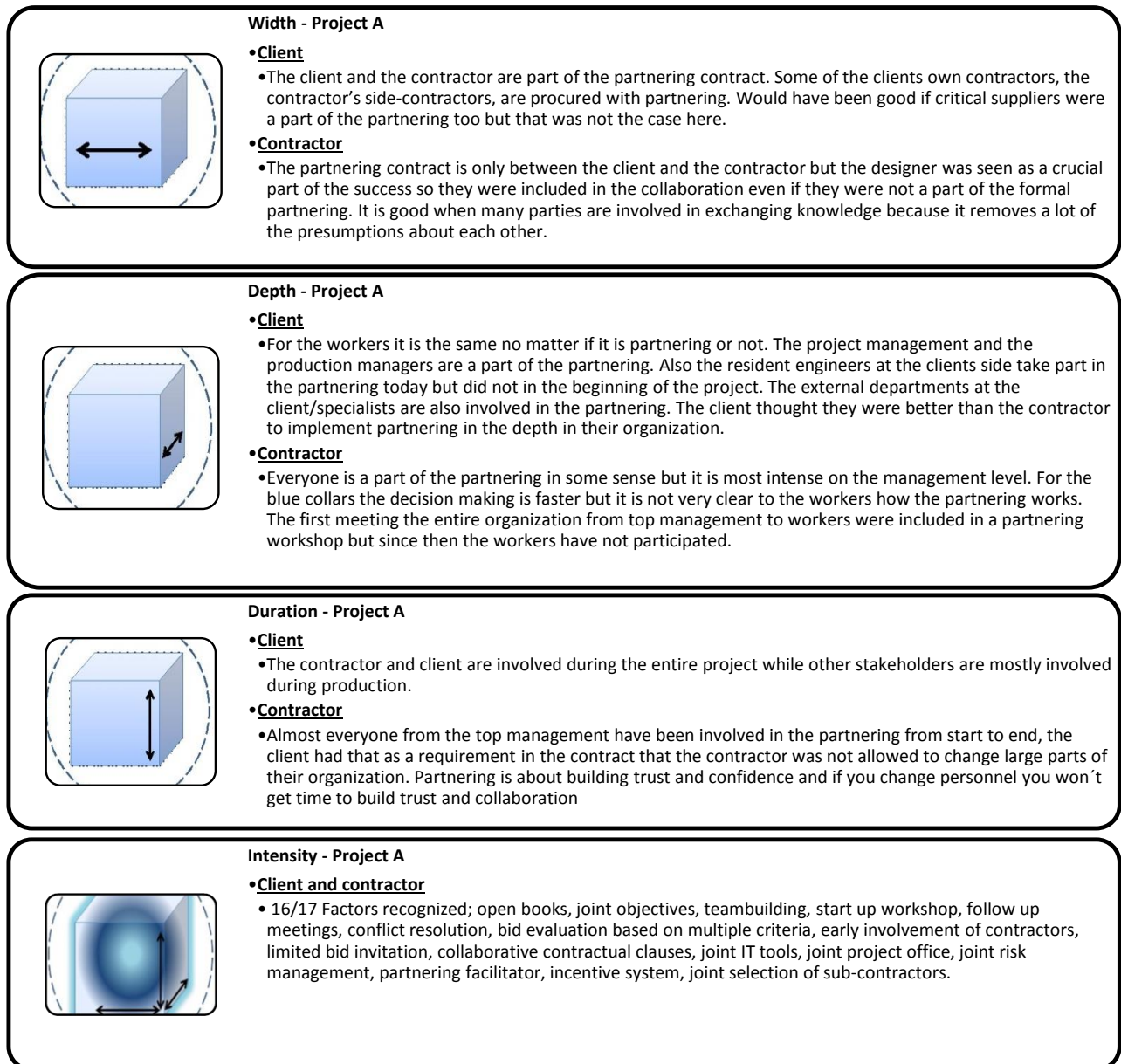


Figure 15. The result of the 4D collaboration evaluation in project A.

6.2.2 Project B

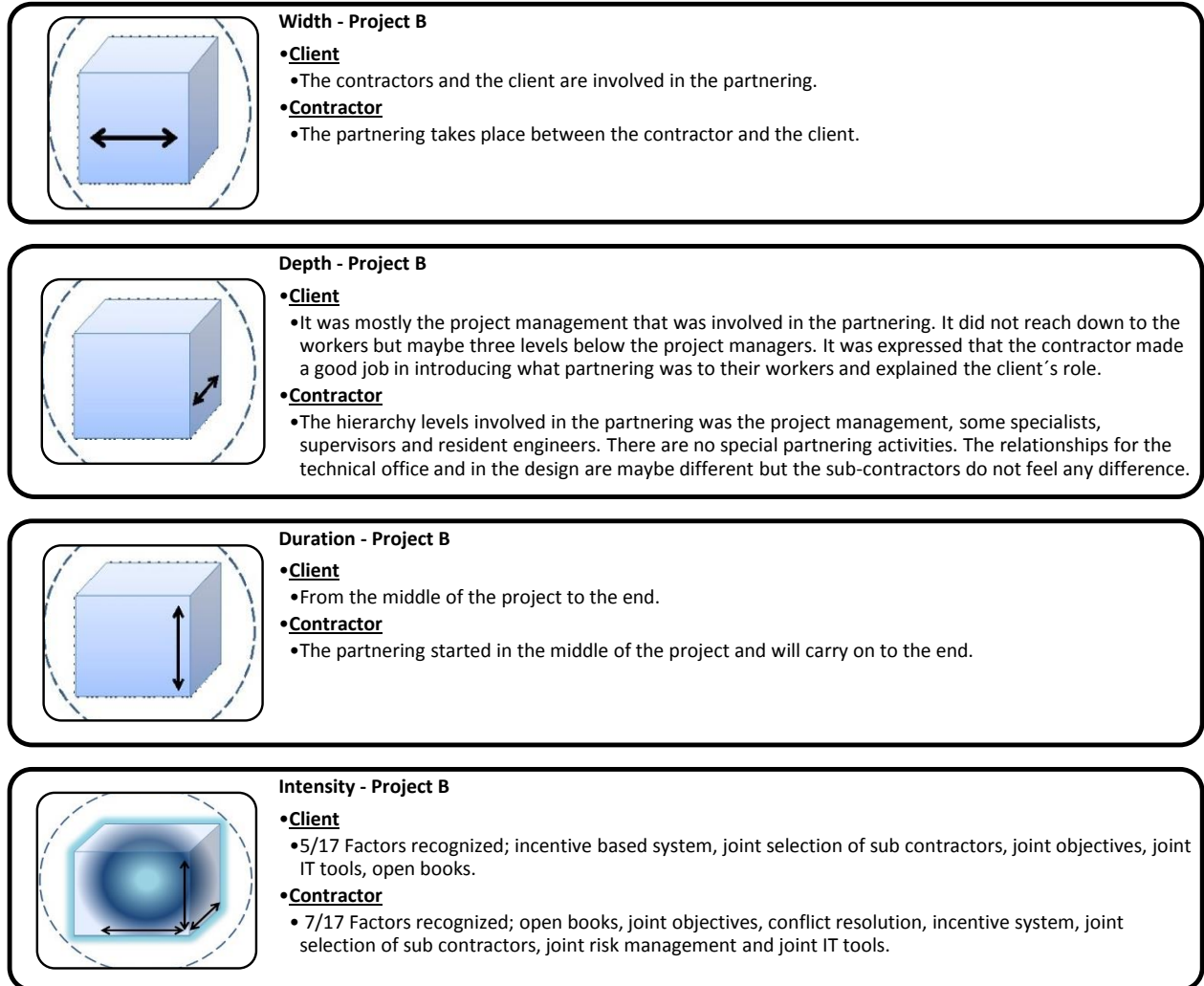


Figure 16. The result of the 4D collaboration evaluation in project B.

According to the answers connected to intensity, see figure 16, the client and the contractor's perception of what tools they use in partnering do not match. The reason for this might be due to the fact that partnering was implemented in the middle of the project phase without a partnering facilitator. This might have caused confusion within the project organization because the parties have not been educated or prepared for the changed strategy. The reason why the factors don't match can also be due to different jargon used between the actors and between the partnering professionals. Some factors might not have been brought up or recognized by the interviewees because they had another naming convention.

6.3 Contractual effects

6.3.1 Flexibility

- The client's middle manager 3 in project B considers it advantageous that the client can affect the project as he wants. The client's middle manager 4 stated that partnering contracts were way more flexible to changes.
- The client is also a lot more involved and can affect the project a lot. This increases the chance of a greater client satisfaction in the end. The client's middle manager 3 in project B said "especially if the client is not really sure what he really wants from the project, and then partnering is very beneficial".
- The client's project manager 1 in project B stated that "we have more influence on the project. I would say if we want them to go to the opposite direction than we can make that happen". The client has a greater influence in the project because of partnering. The client's project manager 1 in project B said that this is because they are the ones paying.

In traditional contracts the flexibility of the client can be an issue, when the client hands over the responsibility for design and production to the contractor they have little possibility to influence design and production. If the needs of the client are unclear or there are a high uncertainty, limited flexibility is a problem. In a design-build contract the client is removed from the designers, which are procured by the contractor, and usually cannot communicate directly to them. In a design-bid-build contract the clients have a lot of influence and flexibility during the design phase but as soon as it is handed over to the contractors the possibility to change the design is limited. In design-bid-build it is also less common that the contractors have the possibility to give inputs on the design and make it more production adapted.

Partnering solves these problems in the way that if the needs of the client are unclear they can be explored during the design process. Additionally because the design takes place parallel to the production they have a lot of flexibility to influence as they go along. Partnering also employs a cost plus payment method which causes the contractors to be less opposed to changes. The client has a greater possibility to influence the project; this also seems to decrease the risk of the client's dissatisfaction since the client will be better informed about the progress. Another advantage is that the contractor can give inputs during design.

6.3.2 Financial

Contractual framework

- The client's middle manager 3 in project A said that partnering was more of a concept for the collaboration and the organization. He/she also stated "If you apply this payment method in a non-partnering project. I don't know. Because in a traditional contract you have more specific rules. The contractor's liability is stricter so the payment method would have to be adjusted a little, but it would maybe work. "
- The client's middle manager 1 in project B stated that it was possible to manage the cost of the risk by only applying cost plus with incentives in a traditional project. The problem in a traditional project was that it could become more expensive when you did not use the partnering tools to find new solutions together and lower cost and risk through that.

This brings up a problem that should be investigated; the possibility to create a contractual framework that is more suited to the use of partnering. To be able to fully use partnering without having to rearrange it to fit into the contract framework of AB04 (Design and Build contract framework) or ABT06 (Design Bid Build contract framework) it would be beneficial to create a contract framework that takes the problems, responsibilities, commitments and division of risk related to partnering into consideration.

Profit

- The client's project manager 1 in project B said that the profit for the contractor could easily become too high with partnering, if the project was wrongly estimated. This is not acceptable when spending the tax payer's money. "I know several estimations that have gone wrong in partnering projects. We need to have models where the profit is limited."

According to this statement it is wise for the client to be more careful when deciding how the profit should be distributed and how the target price should be set. These occurrences can be typical examples of adversarial relations, for example when the client might have incorrectly estimated the target price. Even if the contractor would be aware of this it is not in his interest to share this information because it would lower his profit.

Incentives

- The client's middle manager 3 in project A explained that the target price could be adjusted if there was a change in the design. He/she explained that because the contractor's main interest was to undercut the target price. This kind of situations has created discussions due to the fact that the parties have opposite interests.
- The client project manager 1 in project B agreed that design changes were one of the main issues. He/she also explained that the target price was one of the main conflicts in their project. The contractor knew that they couldn't go below the target price and according to the client's project manager 1 in project B the client knew this too. In order for the stakeholders to agree, the contractors compromised and settled for a lower target price.
- The contractor's project manager 1 in project B believed that the discussion about target price was more complicated due to the use of incentives. Incentives created a hidden agenda for both parties leading to more discussions and disagreements. The contractor will always try to push the target price up while the client tries to push it down. This is the same problem that is expressed by client's middle manager 3 in project A in the paragraph above. The contractor's middle manager 3 in project A stated that the discussion that usually occurred about claims and additional work was moved to the discussion about target price when using partnering. He/she finished by adding that the target price discussions were usually less infected than the discussions about claims.

Even though discussions are moved from being about claims into being about target price, somehow the discussion seems to become less infected according to the interviewees. Maybe this is because the discussion about target price becomes more general and the parties are not required to fight about details but can negotiate from a holistic perspective.

These statements about hidden agendas shows that information between the client and the contractor is not balanced and a principal agent problem might still exist. The fact that incentives are used can encourage opportunistic behavior from the contractor in the sense that they can choose to disclose information from the client with the purpose of increasing the target cost and thereby have a greater profit. This is consistent with Bresnen & Marshall (2000) they describe incentives as not being capable of creating trust, instead they tend to represent lack of trust.

Both project A and B employed target price with a shared profit. Chapter 6.2 shows how partnering was implemented in the projects. Both projects employed penalties or fines to some extent. It is reasonable to believe that the discussion and conflicts about target price might become even more intense when the threat of penalty exists.

Bonuses

- The contractor's middle manager 1 in project A thought that the bonus system, especially for the soft bonuses such as work environment and environmental impact, were not very clear. It was difficult for the contractor to know how to reach them. He/she also stated that bonuses were not important in the context of health and safety; the fact that they had workers on site that could be injured were incentive enough to work as efficient as possible with preventing accidents and promoting safety.
- The client's middle manager 1 in project B thought it was good having many incentive factors but that it was complicated when you tried to measure softer factors such as environmental impact. In those cases you had to have good and clear metrics. The contractor's middle manager 3 in project A pointed out a different problem with time bonuses. It was hard for the client to set relevant time bonuses in the beginning of a long project because it was still unclear how the client wanted to prioritize later in the project due to unexpected conditions.

Even though project B did not employ other bonus factors than time and cost which can be seen in the 4D collaboration evaluation in chapter 6.2, both participants from project A and B had thoughts regarding the impact of many bonus factors.

These opinions can be connected to the part of the principal agent problem that is connected to incentives (Bergin, 2005). If the client tries to implement incentives that are based on output that the contractor don't know how to fulfill or do not have control over, the incentives might be overlooked in favor of other goals that are considered easier to achieve.

- The client's middle manager 4 in project A and B explained an interesting view towards incentives and bonuses. "Incentives are a disturbance factor, making the contractor to focus only on the bonus, resulting with him being reluctant to changes since the bonus and the time is an essence for them". His/her statement described a situation where the contractor became too focused on driving the project forward. The contractor might put less attention to e.g. quality standards because the bonus for quality is smaller than the bonus for keeping within time and cost.
- The contractor's middle manger 2 in project B believed that the incentive systems encouraged the contractor to find more creative solutions because the contractors always wants to attain the extra bonuses.

The incentive systems can be seen as one of the driving factors in partnering projects. Still, some managers expressed concerns about the use of incentives. One negative aspect of the system is what the client's middle manager 4 said above. This means that the incentives for achieving good quality regarding environmental impact might not seem worth it compared to the money they could earn by focusing on keeping within time and budget. The client's middle manager 4 in project A and B expressed this negative aspect of incentives but also stated the positive aspect: "The systems are still very important in order to decrease time and money and it motivates the contractor".

How bonuses and incentives affect planning

- The contractors in both projects stated that the time based bonuses made it easier for them to prioritize the time planning and to know what dates and finalizations were most important to the client. The client's middle manager 1 in project A expressed that the time controls that they achieved through the time bonuses were not sufficient. The planning of the work between the bonus dates were rescheduled by the contractor which caused the client to feel that they did not have enough control. At the same time the contractor's project engineer 1 in project A said that a beneficial aspect of the bonus date system was that the contractor had the possibility to optimize between the set dates. What the contractor perceived as an advantage was seen by the client as a lack of control.

This part of the bonus system seems to create a problem; the contractor's freedom to optimize causes the client to feel as if they lose control over the time. The contractor believed that they had taken the clients wishes into consideration by following the set dates, but in fact the client expected to have control over activities between the set bonus dates too.

One reason why the client wants to keep control between the set bonus dates can be found in the procurement of the clients other contractors (the main contractor's side-contractor). They are procured on fixed price with a design-bid-build contract. They are directly procured by the client and have certain start dates. While the main contractor is free to optimize between bonus dates because of the partnering approach, the side-contractors do not have the same flexibility. The problem arises when the client needs to steer their side-contractors while the main contractor is given the freedom to optimize.

- This is supported by the contractor's project engineer 1 in project A who stated that side-contractors complicated the work in their project. This was because the side-contractors had been promised certain access dates that might not always fit to the main contractor's schedule.

It can then be concluded that using different contractual forms in the same project for different participants can limit the possibilities of optimization.

The contractor's subcontractors are procured with another payment method which differs from the contract that the client has with their main contractor. This setup creates different goals and interests among the parties which imply that it would be beneficial to involve everyone in the partnering concept in order decrease the risk of different objectives which also could create adversarial relations.

- The contractor's middle manager 3 in project A did not agree that bonuses had any effect on how they work, he believed that they are "just like bonuses for big CEOs, you have to do your work anyway. Does not affect how you work from day-to-day". At the same time he agreed on that the bonuses affected the allocation of resources and the planning to achieve the dates in the bonus plan.

Kohn (1993) stated that incentives do not change the way people behave or how committed they are to the project, this goes hand in hand with what the contractor's middle manager 3 in project A described. On the other hand other interviewees expressed that incentives affect the way they work. Maybe the bonuses don't change how an individual commits to a project. Incentives might make the goals of the client clearer to the contractor. When the goals are clear it will be easier for each individual to focus on what actually matters to the client even though they might not work "harder", they will probably work more focused.

Penalties vs. incentives

- The contractor's middle manager 2 in project B said that "The penalty puts more negative pressure towards the contractor, and then you always try to find something in the conditions, why you are delayed, so that you can get compensated".

Penalties might create more discussions regarding money then incentive systems do. The contractor basically confessed that in general, contractors will try to search for conditions which grant him removal of penalty, if a penalty occurs. Incentives on the other hand are more positive in the sense that the contractor will probably never be charged for money if they do not reach the goal of the incentive, they will just not get the bonus.

One interesting thought is that if the client uses penalties for time overruns; can the penalties than be considered as a risk from the contractor's point of view? Would this risk of having to pay penalty then be added to the contingency which is added to the bid? This is maybe unlikely because the contractor probably allocated the resources in such a way that they are able to keep within time. In certain cases it could happen, if the contractor feels that the time span is too tight. Then a higher contingency amount might be put in the bid to make up for this risk.

6.3.3 Risks handling

Applicability of partnering

- Partnering is preferably chosen when dealing with projects of great complexity according to information from both the contractors and the client. Contractor's middle manager 2 in project A felt that if project A had been procured with a normal fixed price contract, the high risk would have hindered the focus on implementing new developments. The client's middle manager 3 in project A said that partnering was good especially for this kind of project where there are many difficulties from the start.
- The client's middle manager 4 in project A and B believed that partnering was a strong concept and a good way to push projects forward. The reason for choosing partnering was very similar to what the other interviewees said, the main reason being that projects

A and B were very difficult to design and difficult to define, having a high level of uncertainty and a challenging environment.

- The client's middle manager 1 in project A described partnering as sharing the risks. In a normal fixed price contract most risk would be pushed to the contractor but in this case it would be too expensive to bid on the contract.
- The contractor's middle manager 1 in project A said that if partnering would not have been used in this project the risks would have been too high for any contractor to afford it, partnering was the only way to work in project A. The contractor's middle manager 1 in project A thought that partnering was good for complex projects but if the client had a very clear idea and an easier project he recommended a normal fixed price contract.

Love et al (1998) wrote that the most important factor for selecting an appropriate procurement method is risk. When facing great challenges and difficult projects, partnering is brought up as an alternative due to its method of allocating risks. Love et al. (1998) suggested that with partnering, the stakeholders share risk to a much greater extent than in a normal traditionally contracted project.

From the interviews it can be concluded that the high risk behind a complex project is one factor that decides whether to use partnering or not since it would be unlikely that any contractor would bid for the project without adding a high contingency to the target price. From the client side, it would be unlikely that any client could afford such a high bid from a contractor. The combination of a complex project and challenging environment are thought to be the drivers for using partnering.

The interviews conducted support this conclusion. Many of the interviewees mentioned that project A had to be procured with partnering in order for it to be affordable considering the risks it contained. Project B was changed into partnering after it was realized that it was much more complex and contained more risks than first was thought.

6.3.4 Summarized Analysis

Flexibility

The flexibility is improved with partnering due to the fact that money is not a barrier to an open discussion. The contractor is more inclined to listen to suggestions from the client and the client is more involved because he needs to keep control over the projects economy. Partnering enables an exploration of the client's needs during the design process. The increase in interaction between designers and contractors can cause conflicts due to their different interests.

Payment methods

It is advisable to create a contractual framework that is more suitable for partnering. This kind of partnering framework could also be a way of dealing with profit distribution that is one of the problems which the client's manager mentions.

The interviewees explained that change requests do not exist in the partnering concept. This might be true but what has been discovered is that these discussions regarding payment of change requests are moved to a discussion about increasing or decreasing the target price.

The fact that the client pays with a cost plus method seems to facilitate joint problem solving and transparency. There is a risk that the contractor will be financially ineffective when the client pays with cost plus. This risk is managed through incentives and bonuses. These are constructed to guide the contractor in the right direction. The difficult part seems to be to create the “right” bonuses in a project with long duration because usually it is not known where the contractor should be steered several years ahead.

Bonuses and incentives

Many of the interviewees believed that incentive based bonus systems had some negative (-) and positive (+) implications. These were:

Negative statements

- Opportunistic behavior due to different interests regarding target price
- Bonuses are evaluated on an output that the contractor is not sure how to reach or control. Especially difficult to evaluate “soft” bonuses with unclear metrics such as work environment and environmental impact.
- The individual participant’s behavior is probably not changed due to the bonuses.
- It seems to be difficult for the client to create relevant bonus goals that are relevant in the future.
- The differences in the achievability of the bonus goals and amount of profit in the bonus goals can affect the contractor’s effort towards these goals.

Positive statements

- + Bonuses can help to clarify for the contractor what is important for the client.
- + The bonus system can give the client the possibility to steer the project but still allows the contractor to optimize their production in between the bonus dates.
- + Incentives have the possibility to create positive atmosphere and a win-win relationship while penalties results in more negative discussions.
- + Incentives can align the stakeholder’s goals.

Risk

From the interviews it can be concluded that risk is one of the main factors when it comes to selecting the appropriate procurement method and for high risk and complex projects, partnering is thought to be a suitable choice.

6.4 Collaborative effects

6.4.1 Communication

Information and control

- The client's project manager 1 in project B thought that the contractor tried to perform a better cost control when using partnering because they knew that it was more important for the client in a partnering project. The client's middle manager 1 in project B also said that partnering created more frequent follow ups while the contractor's middle manager 3 in project A did not feel that it had any difference in the cost control compared to other projects he/she had been involved in.

The fact that the answers are not aligned is probably because these individuals come from two different projects and furthermore from different parties. Depending on the role of the interviewee in the organization and the implementation of the partnering, the satisfaction with communication varies.

Examples of communication difficulties and improvements

- The contractor's middle manager 2 in project B stated that the benefits of partnering were e.g. better communications about problems due to that the teams have the same goals. The client's middle manager 3 in project B also explained the great difference in communication in the project from the time before they implemented partnering, he said "Before it was very difficult to communicate with the contractor, putting the client in a very uncomfortable situation".

In project B both the client and the contractor felt that partnering had improved communication. This can largely be attributed to the fact that the communication was very poor before the management decided to change it to partnering and open books (see chapters 6.2.2). The chapter 6.2.2 describes the 4D partnering in the project B. The change into partnering altered the mindset in the project.

- The client's other contractors can be described as the project's main contractor's side contractors and they had a fixed price contracts with the client. The client's middle manager 4 in project A and B thought that it was good communication between the main contractors in project A and the side-contractors. On the other hand the contractor's project engineer 1 in project A said that it was difficult to communicate with the side-contractors. One example of a communication problem is the long communication path between the main contractor and the parallel contractors. Sometimes that caused the information to not reach all the way.

The reason why the client's middle manager 4 and the contractor's project engineer 1 state different things might be because they have different roles in the hierarchy. The middle manager seemed to only be aware of the theoretical benefits in communication of the partnering while the project engineer that works on site experiences more practical difficulties in the communication.

Interaction and flow of information

Hare et al. (2006) and Atkinson and Westall (2010) identified some critical factors for health and safety; they were client interaction, designer interaction, flow of information and links between construction and maintenance. What can be concluded from the interviews is that partnering should be able to improve health and safety because if partnering was implemented as intended it is designed to improve the above mentioned critical factors.

- The contractor's middle manager 1 in project B, the clients project engineer 1 in project A and the contractor middle manager 1 in project A all stated that partnering is about working closer with the client, so this factor seems to actually be improved in practice.
- The factor of designer interaction is not as clearly improved by partnering; the designers are not formally a part of the partnering contract even if they have been collaborating with the contractor in the partnering group to make a more production adapted designs. The contractor's middle manager 2 in project A said that they were able to "cooperate well and collaborate in methods and design to link it better to the production. In retro perspective it would have been an advantage to have same contract". In project B the design was done before the contractor was brought into the project. This factor has the potential of being increased by partnering but without complete integration of the designers in the partnering contract it seems unlikely that increased designer interaction would take place.
- The flow of information seemed to be increased, the contractors middle manager 2 in project B stated "We have an open communication", the clients project manager 1 in project B said that it is "easy to discuss when having the same budget" and the clients middle manager 1 in project B said "open books in partnering, so you can openly discuss agendas".

The links between construction and maintenance seems to be very limited in these projects. The researchers had not heard anything about this in any of the interviews. Nobody had spoken about the facility management or the safety of those working in the construction when it is finished.

6.4.2 Involvement

Designers involvement

- The client's middle manager 2 that was in charge for the environmental department both in projects A and B stated that the client had workshops with designers from all disciplines in project A. This was done in order to discuss solutions of how to achieve minimum environmental impact e.g. by choosing the right material.
- According to client's middle manger 4 in project A and B it was often difficult to find a collaborative link between designers and contractors in a traditional contract. In partnering, the contractor was generally supposed to comment on the design in order to make the production run more efficient. According to client's middle manger 4 in project A and B this often created conflicts because it contradicted the architect's expectations of being able to design freely. The interaction during design could cause conflicts because the designer and contractor have different interests and backgrounds.

This problem can be explained with the fact that these different actors have different backgrounds and different interests in the project. Partnering can facilitate the resolution of such conflicts but cannot prevent such conflicts from occurring. Even if the actor's interests are more aligned, the fact that they have different roles and objectives can still create conflicts. The fact that partnering groups these actors closer together might increase the number of conflicts. This might also be good because it encourages the actors to learn how to work together and learn from each other.

- The contractor middle manager 1 in project B believed that early involvement of contractors would have enabled them to decide upon a better plan for health and safety already in the design phase. The contractor middle manager 1 in project A thought that safety could be improved a lot by focusing on small safety developments in the design.
- The clients project engineer 1 in project A thought that the discussions between the designers, the contractors and the operator of the subway surely had pushed the safety and health issues in the right direction although neither the operating organization nor the designers were formally part of the partnering.

These statements are consistent with some of the theories we found in literature; Atkinson & Westall (2010) wrote that integration of construction and design could increase health and safety. Bresnen & Marshall (2000) recommend involving clients, contractors and suppliers during the design phase in order to decrease problems in a later stage with the project performance. These facts are identified by research and apparently by practice too, but still they are seldom fully implemented.

Sub-contractors involvement

- The contractor middle manager 1 in project A said that it would be preferable if the sub-contractors were involved in the entire chain and that it would also be easier to plan work if side contractors had same goals and partnering.
- The client's middle manager 2 in project B also said that it would be beneficial to include sub-contractors in the partnering contracts but the reason it's not happening yet was because partnering was quite new and the industry might not be ready for more extensive partnering steps yet.
- The client's middle manager 3 in project B stated that they did not include sub-contractors early in the process. Project B was different from the other projects since the contract changed in the middle of the process. He still thought that a lot of extra cost and time could have been saved with the early involvement of subcontractors into the project.

One of the important factors in the partnering flower was early involvement of stakeholders. The reason for this is that early involvement might give stakeholders the possibility of open discussions and possibility for preparation which could increase the quality of both the process and the project.

The openness and the motivation to collaborate can be related to the fact that the client employs a cost plus payment method which in turns might decrease hidden agendas. The early involvement could be a benefit to the contractor because it increases their possibilities to achieve the bonuses. Due to the early involvement the contractors could achieve a greater insight in the

different aspects of the project. The early involvement might also decrease the adversarial relation between the client and the contractor due to the trust building process that occurs during the early involvement, simply put; it gives the teams more time to bond.

The early involvement can also be assumed to decrease the adversarial relation because more information is shared between parties when they work together for a longer time. Although this is recognized as a benefit it can be seen that the depth and the width of the partnering in the projects is not fully developed, see chapter 6.2. The reason why the sub-contractors are seldom a part of the early phase might be because the partnering concept is still undeveloped in the industry. Stakeholders are often struggling with the implementation of partnering between the client, the contractor and designer.

Awareness within the organization

- The client's project engineer 1 in project A said that "partnering is not working in the production, top managers do their partnering and then it's not implemented correctly in the lower levels of the hierarchy". The contractor's middle manager 1 in project A agreed with the fact the workers did not experience any difference in health and safety works because of partnering.
- The contractor's middle manager 2 in project A, the client's project manager 1 in project A, the client's project manager 1 in project B and the contractor's project manager 1 in project B all expressed that the lower levels of the organization were not involved in the partnering and did not experience much difference due to the partnering.

The feeling during the interviews was that most people agreed that partnering was not implemented at the lower levels but that it was not considered a problem. In project A and B it seemed that problems were lifted to a higher level, where they used partnering, so that the production would not suffer from conflicts. Because of this reason partnering at the lower levels might be considered redundant. Some problems of involving the lower levels were thought to exist because the sub-contractors did not have partnering contracts.

The possible benefits that could be obtained by moving the partnering down to the lower levels would be that if all actors had partnering contracts they would have incentives to help each other. They would get paid for the extra activities they performed and get a part of the profit created. They would also have a better understanding of the production plan which could increase efficiency.

- The client's project manager 1 in project A said "at the management level in the contractor and client organization, participants hug each other and use partnering. Partnering meetings at this level works well. The lower levels do the same work not caring if it is a partnering project or not."

According to the interviews and the 4D collaboration evaluation in chapter 6.2, partnering is implemented more frequently at the higher levels. The problem with this is that lower levels will maintain the traditional work habits which could increase the occurrences of adversarial relations. This can be related to what Eriksson & Nilsson (2008) expressed; the traditional mindsets of the labor actors make it difficult to implement a collaborative culture. Partnering

could remove the traditional frame that creates opportunistic behavior, but because that partnering is unevenly implemented this opportunistic behavior will remain in the lower levels while being discouraged at higher levels.

6.4.3 Problem solving

Joint problem solving

- Complicated projects usually involve complicated conflicts between the contractor and the client. The contractor's middle manager 2 in project B, the contractor's middle manager 2 in project A and the client's middle manager 3 in project B felt that one of the benefits using partnering was that it increased efficiency in finding solutions together for unexpected problems. Both the contractor's middle manager 2 in project A and the client's middle manager 4 in projects A and B agreed that partnering encouraged both stakeholders to help each other finding solutions. This kind of joint problem solving was a big part of increasing the quality of the work.

The interviewees expressed that the collaborative atmosphere and the will of solving problems together results in a better quality for the project. This is consistent with Bresnen and Marshall's (2000) conclusion that satisfaction regarding quality is higher in more collaborative project. As the complexity of project increases, the risk awareness among stakeholders seemed to become stronger which also might encourage them to decrease adversarial relations as much as possible.

- The contractor's middle manager 1 in project B described that today when they have changed into partnering "we sit down and talk about the problem and try to find solutions together".

The reason why it is easier to collaborate in these projects is probably that partnering creates a positive atmosphere through the open books and transparency. It also creates incentives for solving the problems together in order to attain increased profit. The increased and developed joint problem solving was expressed in both project A and B.

- The contractor's project engineer 1 in project A and the contractor's middle manager 1 in project B looked as being an partnering for the client and the contractor as it encourages them to work together as a team. The contractor's middle manager 1 in project B stated that "today we sit down and we talk about the problems and try to find solutions together". Being collocated is what the project engineer 1 in project A believed being decreasing the number of conflicts and increasing the will of working jointly towards solutions.
- The contractor's middle manager 1 in project B explained that due to partnering, the department was more eager to find joint solutions. They feel that the client understood the risk better since they were more involved in the project. This decreased the time spent in discussing cost. The contractor's middle manager 1 in project B thought that it was because the client shared so much of the burden of the project which made them wanting to be more involved in finding solutions.

According to the contractor's middle manager 1, the joint problem solving is facilitated due to a mutual understanding of the consequences of environmental problems. This goes hand in hand with Khalfan and Swans (2007) statement that there is an increased attention toward environmental impact among authorities. The authorities are more willing to take the lead in solving the environmental issues. Varnäs and Eriksson & Westerberg (2008, 2011) write that the construction industry contributes to 50% of all major environmental problems which furthermore strengthens the reason why the client wants to be more involved in these discussions.

Examples of solved problems

- The contractor's project engineer 1 in project A and the client's middle manager 2 in project A counted the most common environmental issues being groundwater issues, vibrations, noise, chemicals, machinery pollution, external parties and water usage in production. These issues were very similar to the ones that the contractor from project B experienced. What the contractor's project engineer 1 in project A experienced was that solutions were easier to find when working together with the client. Like the clients middle manager 2 said "the client has better chance of informing the surrounding households because the dialog is better".
- The contractor middle manager 1 in project A described one problem they had in the project regarding impact on external parties. The project plan had set a limit of acceptable vibrations in the subway when blasting. To keep this limit would cost a lot of time, money and effort from the contractor. To show that the limit for acceptable vibrations could be increased the contractor performed tests with the client and the external parties to jointly agree on a new acceptable vibration level. This gave a lot of benefits in the end.
- The most common problems when it came to time management according to the clients project manager 1 in project B was the geotechnical conditions, changes in documents, changes in drawings and rock problems. All these were handled better with the use of partnering because stakeholders could solve them together and spend less time on discussing the problems. These issues were closely related to the most common time overruns found in the theoretical framework. According to the client's project manager 1 in project B partnering helped the handling of such time issues.

Why does partnering help the handling of such problems? The adversarial relationships that usually exist in a construction project can act as a barrier for collaboration. When the interviewees described solving problems together they meant that instead of backing away from the responsibility of the problem, both stakeholders worked jointly to find a good solutions fast. If only one party is responsible for solving the problem it often takes longer time and requires more resources which also can become expensive. In partnering the gain share/pain share creates incentives for collaboration and should partly remove the adversarial relationship.

6.4.4 Transparency

The enablers of transparency

- Contractor's middle manager 2 in project A felt that the client was more engaged to the quality work due to the increased economic transparency and the fact that the client is paying with cost plus.

- The contractor's middle manager 2 in project B said that the benefits of partnering was decreased risk of low quality, because of the collaboration and it was less risk that the contractors would hide defects from the client.

This is an interesting comment that shows that one of the disadvantages of having normal contract is that the contractor will probably try to hide defects. This is a credible testimonial because it is stated by the contractor himself. This strengthens Blacks (1999) statement that partnering creates a transparent economy which aims at eliminating adversarial relations between client and contractor. This also encourages them to work towards shared goals in order to achieve a win-win outcome.

- The contractor's middle manager 1 in project B said that the client was more involved in the projects economy and showed great understanding for new ideas and purchase needs. The client's middle manager 2 in project A and B stated that the open climate encouraged the contractor not to hide any information about environmental problems from the client. Instead it resulted in quick information sharing so problems got solved faster.

It is interesting to see that information was shared to a greater extent in both the quality department as well as in the environmental impact department. The client's middle manager 2 described that principal agent problem, unbalanced information, had been occurring in other projects he/she had been a part of. The transparency and openness in this project seemed to have encouraged information sharing about environmental problems.

One explanation for the closer collaboration is the fact that the client pays with cost plus. When the contractor is involved in a project where he has increased economic safety due to the cost plus, he might feel more engaged to the partnering attitude. He doesn't have to worry about money and can concentrate on constructing a good product in collaboration with the client.

- The client's project manager 1 in project B said that the time plan was "more openly presented to us" because of partnering and that more planning was done in collaboration.

This is probably related to the fact that the client is more interested in seeing the time plan as they share a larger part of the risk. The contractor is also more willing to share the information because there is less need for hiding information. As Black (2009) puts it; the main goal of partnering is to get the stakeholders to work towards the same goals to achieve a win-win result.

6.4.5 Summarized Analysis

Communication

Communication seems to be improved due to openness and transparency. According to some interviewees the contractor is less inclined to hide defects or information from the client when using partnering. On the other hand, one of the interviewees stated that a game of hiding information to gain benefits was still occurring. It seems that partnering has not fully eliminated uneven information sharing in project A and B, but still the interviewees expressed that communication was improved due to joint goals.

Involvement

The collaboration between the different disciplines might increase the value of the organization but also tends to create conflicts due to different interests. Some of the interviewees, as well as theory, stated that involving designers and subcontractors in the partnering process could increase quality and efficiency of a project. This is not done in the studied cases, one reason might be the industry's traditional mindset that creates predefined views about project processes and roles within the organization. This makes it hard to implement new work habits such as early involvement of stakeholders. The collaboration and the early involvement can help to decrease adversarial relations because stakeholders get more time to build trust and they work together for a longer time which increases the information sharing.

Partnering was not implemented at the lower hierarchy levels in the organizations. By implementing partnering in the lower levels, efficiency could be increased due to better understanding and better collaboration in the production.

Problem solving

Joint problem solving seems to be one of the things that are greatly improved by using partnering. The interviewees state that the client is more engaged. The possible reason for this is that the client has an incentive to be involved and to contribute to economical solutions because of the cost plus payment method.

As the complexity of project increases, the risk awareness among stakeholders seems grow as the consequences of failing become more severe. This might encourage the stakeholders to decrease adversarial relations as much as possible because they know that the chance of success is higher when collaborating and sharing information.

Transparency

In traditional contracts, contractors are usually obliged to pay for defects, which might lead them to hide this information from the client. In partnering, it is more likely that this information is shared due to openness and payment method.

Cost plus seems to be the enabler of the stakeholder's transparency towards each other, encouraging open climate and decreasing the risk of hidden information. In traditional contracts with fixed price payment method, the client has usually little interest in finding solutions that could save resources during the production. The reason for this could be that the client will not get any part of the money that was saved. In partnering on the other hand, both of the stakeholders gain profit from saving resources.

6.5 Cultural effects

6.5.1 Division of Responsibilities

Unclear responsibilities and traditional procedures

- The client's middle manager 1 in project A said that the client took on some tasks that really were the contractor's responsibility.
- The client's project manager 1 in project A said "we go in and become too much of a contractor even though we are clients, we try to operate the work process, but there is a danger in that" he continued by stating that "It easily happens that the client takes over the contractors responsibilities when the organizations work so close."

It has been mentioned before that partnering projects have made tasks and roles within the participating organization a bit unclear. The reason for this could be that the actors become so focused on collaborating and therefore lose track of who's responsible for what. Brown et al (2001) stated that companies who entered a partnering project without changing their traditional procedures could lead the process into failure. In order to achieve successful partnering projects, companies needed to make fundamental changes on their contracts and processes.

These fundamental changes might not have been implemented well enough in project A. The reason for stating this is that it can be seen that problems with the division of responsibility occurs in project A. The reason why the problem is more visible in project A might be because of their use of more intense partnering, see chapter 6.2. Project A has more collaborative and joint activities between the contractor and the client which might increase the confusion about the responsibilities.

- According to the client's middle manager 3 in project A the conflicts that occur due to change requests in a traditional project were usually not a problem in partnering projects. The only problem related to changes and additional work was that it could become unclear who should be responsible for certain tasks. The difference from a non-partnering project is that while the mentioned problem would probably have led to a conflict, it becomes a more pragmatic negotiation in a partnering project. A practical negotiation in the sense that the parties mutually agree on dividing the tasks.

One problem that can be seen throughout the interviews is how the division of responsibilities is to be handled in partnering projects. This seems to be one of the problems that occur when partnering is actually working as intended. Because partnering is about collaboration, shared risks and about working together it becomes more difficult to separate the roles in the different organizations. Who should do what is the question on both an individual level but also on the organizational level.

Knowledge barriers

- The contractor's middle manager 3 in project A said that the main difference in a partnering project was that the client was more involved in the cost and planning. This had both positive and negative aspects. It had occurred that the client has tried to "help"

the situation when they felt that the contractor was lagging behind. To him, the problem was that the client had too little knowledge about the situations to be of any real help. The other side of the coin is described by the client's middle manager 1 in project A, he/she said that they tried to penetrate the contractors time planning when they felt that the contractor needed support but the client then felt that the contractor was not interested in collaborating.

This was probably due to the fact that the contractor did not consider the client knowledgeable enough and that the contractor did not let the client have part of enough information to understand the real problem. This is consistent with what the contractors in project A stated during the interviews.

- The project engineer 1 in project A experienced that the limited collaboration and inadequate competence in the client organization limited the possibility to handle time related delays together. The contractor's middle manager 3 in project A stated about solving problems jointly with the client. "We could have solved it better internally because they hadn't the proper knowledge".

This problem is connected to both joint problem solving and to the issues of division of responsibilities. When the client wants to participate and share responsibilities of solving problems the client is not always considered competent enough by the contractors. In these cases it seems like the contractor allows the client to participate without actually engaging them or listening to them.

- The client's project engineer 1 in project A said that partnering has made things more confusing. On the question "has partnering affected the organizations way of managing health and safety?" he/she answered "No. It is more difficult to understand each other. In an ordinary project everybody knows what they expect from the contractor and the buyer". It becomes more difficult to know who is responsible for what and obligations get pushed between the actors.
- The contractor's middle manager 1 in project A believed that the client were more involved in the health and safety issues. This is consistent with the views and opinions of the client's project engineer 1 in project A. The contractor middle manager 1 in project A also expressed concern over how much each party really should be involved. He/she said "Now we can see that the client is involved in small questions but I don't think it is necessary if you have a good big plan".

Sometimes the client seems to become too involved in the actual production and this is a problem since it can prolong some processes. The reason for this is that the clients use their resources on the contractor's tasks instead of their own tasks. It can also prolong the contractor's processes because when the client interferes, effort goes into discussions instead of production. Sometimes the client seemed to be eager to take over some of the contractor's responsibilities. This might be because most of the client's personnel have worked as contractors before and it was easy for them to step into the role of the contractor. Another reason might be that the client felt more in control when being involved in the detailed planning, which might be disturbing for the contractor.

6.5.2 Atmosphere

- The contractor's project engineer 1 in project A thought that partnering made the atmosphere better and in order to improve it even more he/she suggested involving more stakeholders. The contractor's middle manager 1 in project B also said that partnering created a great change of atmosphere. "The biggest thing with partnering project is the atmosphere, open meetings, no secret agendas etc. The main benefit of using partnering is a more positive atmosphere".
- The client's middle manager 2 in projects A and B believed that the people involved in the project were more important than the partnering concept itself. He felt the climate was more positive and open. The fact that the contractors were allowed to access documents and information from the client facilitated the dialogue between the two stakeholders.
- The client's project engineer 1 in project A did find it unprofessional of the contractor to use their own internal partnering facilitator in the project and not an external partnering facilitator. He/she believed that it would not become professional if an external facilitator was not used.

Most stakeholders that were interviewed mentioned the atmosphere difference in partnering. What can be concluded from their statements is that openness and transparency seems to be factors that encourage the positive atmosphere. This also implies the importance of a positive attitude towards collaboration. In order to implement such an attitude in the entire organization a professional partnering support might be needed. This partnering support can direct the stakeholder's mindset into working as a team. According to the 4D collaboration investigation in chapter 6.2 the factor of open books was implemented in both projects but a partnering facilitator was only used in project A.

- The contractor's middle manager 1 in project A said that "when having a partnering project you need to be able to communicate, make decisions together and keep no secrets. This creates a great atmosphere."

This seems to be one of the main benefits of partnering; that it seems to be possible to create a positive atmosphere in an industry known for being fragmented and conflict ridden. This is probably possible because the adversarial culture is partly removed through the creation of incentives and a cooperative mindset leading to common objectives and open communication.

6.5.3 Organizational Characteristics

Traditional mindset

- The client's project manager 1 in project A pointed out that everyone brought up a pre-defined view on their own and other people's roles in the organization. In project A people started in the project by digging trenches and argue for the wrong reasons.
- The contractor's middle manager 2 in project B described a problem about different interests that usually occurred in projects; "the contractor wanting to do the work as cheap and fast as possible and the client wanting to receive a project as good as possible".

These mindsets are usually a collection of many years of experience from the industry. This is similar to what Hänggli & Kriesi (2012) describe in the framing theory. An action of framing is when the mind react defensive because of the predefined view of the opponent. This problem relates to the economic psychology theory of framing. An example of this is when the stakeholders have built their opinions of how to work and what roles to act in, based on their previous knowledge and experiences. When the ways of working changes and the roles become different the participants might become reluctant to changes because of the framing. This is also visible in the statements above.

- The contractor's project engineer 1 in project A mentioned that sometimes the client and the contractor forgot that it was a partnering project. The project engineer explained this by saying "The client was used to give orders and control. We did not know how much the client should control and how much we should work together. It took a couple of months to find a way to solve problems together"

This problem shows how wide and complicated the partnering concept can be. Implementing partnering would preferably need more detailed partnering support. This support should define roles and responsibilities to decrease the risk of collaborative confusion during the project. This also connects to a problem with framing where the individual might find it difficult to change habits which he/she has built up over certain period of time.

Acceptance of the concept

- There is a risk that people do not accept partnering because they are used to work in a certain way with other roles. In one way, partnering is very dependent on the individuals. The contractor's middle manager 2 in project B said that "you have to like it first of all and you have to be professional in order for it to work".

This is a problem that can be seen throughout the interviews; the problem with partnering is often that it is not taken seriously. This might be because partnering is a too general concept including too many aspects. This might make it difficult to separate between the partnering effects and the effects of other non-partnering related work procedures.

When people cannot clearly see the benefits of something it might become harder for them to accept it. It is also interesting that if people are not serious about partnering it probably won't work. This is a bad circle, if people do not see the benefits; they will not implement partnering in a professional manner. When the partnering are not properly implemented the possible benefits cannot be collected. If the potential benefits cannot be harvested the client might choose to not use partnering for the next project.

6.5.4 Innovation

Technical Innovation

- The client in project B expressed that many technical innovations in the project had been facilitated by partnering; both time and money have been saved. The client's middle manager 1 in project B described a situation where a new method could be used for

underwater works, which made it possible to use fewer divers and therefor save money and create a safer environment.

Partnering facilitates innovation in the sense that the contractor is given more freedom to find cost effective and innovative solutions. It is possible to deviate from the original specification in the contract if it is considered beneficial to both parties. In Winch (2010) it is stated that rigid control over the project, that often occurs when the client tries to avoid moral hazard and adverse selection, can destroy the contractor's possibility to innovate and increase their profit margins. Winch (2010) states that project partnering can help this problem and in this study we can see that the theory seems to work in practice.

It has been seen that partnering is encouraging more new development and innovation within projects since all stakeholders are more involved in the construction process. The interviews revealed that the contractors in project A and B experienced great amount of innovative solutions towards technical features of the process. Examples of such features are 3D geology mapping, tunnel work, immersions, rock work etc. while from the client's side some innovations concerning joint documentation and risk management could be seen.

Partnering contracts are most often chosen when stakeholders are entering projects of great complexity and high risk. It has been seen that such projects are most often followed by unexpected difficulties and new challenges. Because there are many challenges in complex projects, innovation is important in order to solve them in an effective way. Both the contractors in projects A and B shared their experiences of technical development and constructability improvements.

- According to the contractor's middle manager 2 in project B technical innovations were facilitated by partnering. In their project they had some problems during the rock excavation but because of the partnering they did not stop and wait for new orders as they might have done in a traditional project. Instead they worked together to solve the problem because both the contractor and the client had incentives to do so.
- The client's middle manager 2 in project A also agreed that technical innovations were facilitated by partnering, they were able to optimize in an early stage of the project by bringing down the volumes of excavation and concrete which saved them both time and money.

The fact that innovation is thought to be facilitated by partnering can be connected to the creation of a less adversarial culture in the project. When both the client and the contractor have incentives to innovate to bring down the cost, and increase profit, it is more likely that it will happen. As Winch (2010) states; to remove the adversarial relationships information needs to be balanced and both parties must have a possibility to make a profit.

Organizational Innovation

- One innovative solution in project B was when someone was slightly injured, they were provided another less demanding activity on site while recovering. This could be anything from cleaning, paperwork or fetching coffee.

- Both the client's project engineer 1 in project A and the contractor's middle manager 1 in project B said that no innovations regarding health and safety had been done. They followed the laws and regulations and kept up with the company's goals of a safe and healthy work environment. The client in project A had a wish to use more personal safety equipment but that was not as easily accepted by the contractor.
- The contractor's middle manager 1 in project A could not think of any innovative methods or ideas they used in health and safety. Partnering affected health and safety in the way that the client was more involved. He/she explained that they didn't always implement all the clients suggestions because the contractor already followed the contract, the laws and company regulations.
- The contractor's middle manager 1 in project B expressed clearly and several times that partnering had not affected the health and safety works. The client's project engineer 1 in project A expressed a similar view that partnering had not affect the organizations way of managing health and safety. The contractor's middle manager 1 in project A said that the workers probably did not experience any difference in health and safety works because of partnering.

As Eriksson and Westerberg (2011b) state; the construction industry has a bad history when it comes to health and safety. This has caused the construction companies to have strong internal regulations regarding health and safety. This might be one of the reasons why there is not so much innovations regarding health and safety. There might be little room left and not enough resources to develop health and safety even more. The incentives and benefits partnering creates might not be necessary, the risk that a worker can become seriously injured are enough incentives to collaborate, communicate and work hard with health and safety. Even though these are reasons stated by the interviewees it is believed that partnering should be able to improve the health and safety on site. The improved communication, collaboration and transparency could also help to improve the work environment.

- The contractor's middle manager 1 in project B explained that their department was more or less forced to come up with new ideas due to interference from media. The contractor's middle manager 1 in project A also added that due to partnering, they developed their meeting strategies.

The clients in both projects share much of the risk which makes the client more interested in innovative ideas. A public client in a public project is also more concerned to maintain a good company image which forces the stakeholders to come up with new ideas to prevent negative publicity.

- The client's middle manager 3 in project B concludes that the quality of the project would have been good anyway whether they would have chosen to use partnering or not but what it really gave was a chance to be innovative, increased efficiency and it helped to build up a better organization.

Chan, et al (2003) wrote about the frequent innovative processes and that partnering projects are believed to increase the possibility of constructability improvements. Gambatese and Hallowell and Eriksson and Westerberg (2011, 2011) said that partnering lowers cost, shortens the schedule and may improve quality of the work.

The difference between the theory and the statement from practice is that the industry seems to believe that the quality is not affected by partnering while the theory states that it should. The interviewees stated that they follow the requirements regardless if it is partnering or not. The reason why the statements are different can also be because the authors and practitioners have defined quality in different ways.

6.5.5 Summarized Analysis

Division of responsibilities

Sometimes the client feels that the contractor is not organized enough and therefore tries to help. When this occurs it has been seen that the contractor can feel that the client lacks knowledge in order to fully be a support in the production. These can result with the contractor ignoring the client's suggestions. The effect of this issue can be seen both in collaboration and planning. Processes might be prolonged due to the client's interference. The interference might also create a negative mindset from the contractor towards the client's involvement which might cause the contractor to oversee important inputs from the client.

Atmosphere

From the interviews it can be seen that partnering seems to create a more positive atmosphere especially a more open atmosphere. Two things are thought to be important for partnering to work. First of all it requires stakeholders to have a positive mindset towards collaboration and secondly it is necessary to have an open mind towards the other stakeholders and new work habits.

Organizational Characteristics

It seems to be difficult to eliminate the traditional roles and work habits that need to be modified in order for partnering to work. Because the partnering concept is too general, it seems to become difficult to separate between partnering effects and effects from other work procedures. If the benefits are not clear enough, it will be hard to gain acceptance for partnering in the organization.

Innovation

Partnering enables less rigid control in the project which can increase the contractor's possibility of being more innovative. Projects of great complexity often use partnering due to the risk allocation. Complex projects are often followed by high risk and difficult challenges which is why innovation can be considered more important for these kinds of projects. There is not so much innovation regarding health and safety in the industry which seems to be because of the already existing strict control of regulations.

7. Discussion

It can be concluded that there are many opinions regarding the effects of partnering. It seems unfair to draw one conclusion regarding project satisfaction due to partnering when comparing the differentiated opinions of all the interviewed participants. The hierarchy level, the

background and the expectation of each interviewed individual probably had a great impact on their opinions regarding the outcome.

It is important to be aware of the fact that other dimensions also affect the project. The conclusions that are made in this research are surely affected by these other dimensions. Examples of other dimensions that can affect a project is the construction industry culture, individuals previous relations to other participants, laws and regulations, contractual forms, organizational structure, professional differences and the use of knowledge management. All these dimensions surely affect the project and the project outcome, in this research the focus is partnering and partnering correlation to the project.

What could have been improved in this research is to make a more thorough background investigation of the proposed interviewees. In some cases the interviewees had neither knowledge about partnering nor any opinions about the effects of it. This could have been prevented by including a small check with the interviewee about their interest and experience in partnering. The reason why this is a problem is because in order to investigate the effects of partnering the interviewee must have the knowledge to answer the questions. If the interviewees are lacking knowledge about partnering they are not aware of what is connected to partnering and what is connected to other processes in the project.

The interview questions could have been improved by collecting more theoretical models before structuring the questions. This thesis was more focused on practical theories when creating the interview questions, but it is believed that the questions could have been developed by an early contribution from more theoretical knowledge.

The researchers had the opportunity to choose between a few cases and decided to study one that started with partnering from the beginning and one where partnering was implemented during the project. It might have been easier to make clearer conclusions with two projects with the same partnering implementation method.

If the respondents would have been encouraged to elaborate more on their perception of partnering it is likely that the result of how they define partnering would differ. During the interviews that were held mostly in English, the English language and the naming convention in partnering are probably a communicational barrier. It might be difficult for the respondents to realize what is considered as a partnering tool and what is not. It might also be difficult to find the English terms for what they think partnering is, causing the researchers to miss some factors or the respondents to not mentioning some factors.

8 Recommendations

The following recommendations are based on a combination of theory and empirical findings. It is important to understand that these recommendations are based on only two cases studies of very specific infrastructure projects. This means that the applicability of the recommendations is limited.

8.1 Recommendations for contractual aspects

1. Try to decrease the alterations and the discussions regarding target price. The target price creates contradicting interests which induces conflicts.

2. Contractual framework needs to be developed. The distribution of responsibilities, profit and risk must be adapted to the partnering way of working.
3. The bonuses should be arranged to motivate the contractors. The bonus goals should be clear.

In order to carry out recommendations the authors have made some suggestions.

One option might be to remove the overall target price and instead create economic goals for different parts of the product. The smaller goals would be structures as a bonus system where the contractor would gather points depending on how much money he could save for each part of the product. This could possibly remove the contradicting incentives that are created when the client and the contractor conflicts about increasing or decreasing target prices.

Today most construction contracts are based on one of The Construction Contracts Committee's contractual frameworks (Bygghandets Kontraktskommitté, u.d.). This causes difficulties when using partnering. The reason for this is that the normally used contract frameworks for design-bid-build and design-build contracts are not adapted to the risk sharing and the collaboration in partnering. Therefore the partnering contracts often requires a lot of work to be applicable in combination with The Construction Contracts Committee's contract frameworks. A solution to this can be for the industry to collaborate with The Construction Contracts Committee and develop a suitable contractual framework for partnering.

One way of creating goals that will motivate the contractor is to carefully consider if each bonus goal is S.M.A.R.T. That is to formulate specific, measurable, achievable, realistic and timely goals. In order to know if the bonuses fulfill the S.M.A.R.T requirements the client can have workshops with the contractor to consider his opinion.

8.2 Recommendations for the collaborative aspect

1. More extensive involvement of stakeholders
2. The involvement of designer; benefits such as more production adapted design and safer design for the workers.
3. The involvement of subcontractors and in-house workers; benefits such as more efficient resource planning, knowledge sharing and more time to develop confidence between each other.
4. Take advantage of the improved joint problem solving to improve quality, decrease time and decrease cost

In order to carry out recommendations the authors have made some suggestions. Include the designers in the partnering contract so they work with similar incentives as the other parties, this will create common goals. Procure sub-contractors with similar incentive based contracts, will create joint goals and facilitate optimization in time and quality.

Include the workers, foremen and project engineers in the partnering activities to encourage the collaborative mindset. This can increase collaboration between actors in the production and by that increase efficiency.

Clarify the participant's competences and combine the participants into specialized problem solving groups that can be assigned to various problems. Include participants from all

stakeholders. Practice problem solving in these groups as kick-off activities, this will create a group that can perform already at the start of the project.

8.3 Recommendations for the cultural aspect

1. Encourage a positive attitude towards new work habits and new processes
2. Try to remove the predefined views of roles and characteristics of other actors

In order to carry out recommendations the authors have made some suggestions. Any implementation of new strategies within the organization should be established and supported by the top management. In this way new concepts gains acceptance among the employees.

A professional facilitator could be a support when implementing new work habits. The facilitator could help in conflict resolution, teamwork sessions and education in the concept. If the partnering participants understand the benefits of partnering the implementation will probably be smoother. The professional facilitator could help the participants to find their new roles and attitudes towards each other by clarifying each participant's responsibility early in the project. This should preferably be done in a team sessions so that project participants are aware of their coworkers roles.

To decrease the predefined view of roles which are caused by a traditional mindset integration of the different professions could be promoted. This could be done by collaborative teams activities, discuss values and discuss and expose the predefined views that exists.

8.4 Future Research

In order for the construction industry to accept partnering the possible benefits of partnering needs to be clarified. When the companies understand the possible value it can create, they are more likely to adopt it in a professional way. One reason why it might be hard to collect and realize the benefits of partnering can be because the implementation of partnering is not standardized. It could be interesting to explore how this problem could be resolved. One suggestion is to investigate whether knowledge management between partnering projects could support a solution.

The researchers have found that the lower levels in the organizations are not as involved in the partnering as the higher levels. It would be interesting to investigate the advantages and disadvantages of including these levels in the partnering.

One thing that has been discovered during the thesis, which is vital to partnering, is that incentives do not only motivate the contractor but can also inflict problems. These problems can affect the collaboration as well as the management of the project. A suggestion for research within this area would be to investigate more thoroughly the effects of incentive systems in construction projects.

9. Conclusion

9.1 The contractual, collaborative and cultural model – The three C's

A model has been developed in order to describe the effects that partnering has on construction projects. During the analysis, three categories of practical implications from partnering were recognized. These categories are characterized by changes in the contractual, collaborative and cultural aspect of projects. The contractual changes include aspects such as how the flexibility, the payment method and risk management have been affected by partnering. The collaborative changes include aspects such as how communication, involvement, problem solving and transparency have been affected by partnering. The cultural changes include aspects such as how divisions of responsibilities, atmosphere, organizational characteristics and innovation have been affected by partnering.

The three contractual, collaborative and cultural categories are believed to be important for the partnering process to function. What has been discovered in the empirical data are certain problems and best practices within these three aspects. The model can assist the industry to gain deeper understanding about the problems and benefits related to partnering. The reason for emphasizing on these three categories is that they represent the stakeholder's general perception of which core aspects are thought to be most affected by partnering, see figure 17. These aspects, which can be found in almost every project, are affected in different ways by partnering. One aspect can experience both positive improvements and disadvantages at the same time. An example is the collaborative aspect which is both improved in communication and problem solving but can create certain disadvantages when it comes to division of responsibilities.

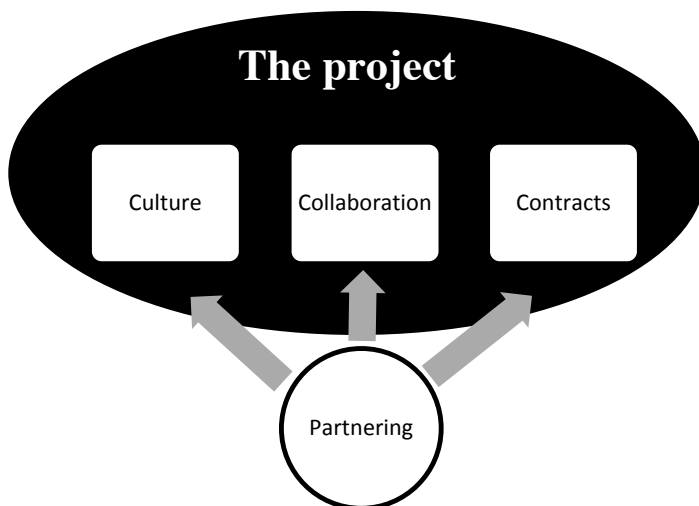


Figure 17. A conceptual model describing what aspects partnering can affect in a project.

Figure 17 describes the cases that were used for the research and how partnering affected certain aspects within these projects. The black ellipse symbolizes the projects and the white squares are

the aspects within a project that are affected by partnering. The partnering circle outside the partnering ellipse symbolizes how a concept from “outside” have the possibility to affect a project. One of the projects were a design-bid-build contract with cost plus payment method and incentives while the other was a design-build contract with a payment method that changed from fixed price to cost plus with incentives during the project. One of the projects employed partnering from the start while the other implemented partnering in the middle of the project.

9.1.1 Contractual

Partnering seems to create flexibility and the possibility for the client to make changes during the process. Cost plus payment method has a great influence on the client-contractor relationship in a partnering project. The reason for this is that the open books, often related to cost plus, are important for the transparent environment. A transparent environment seems to be creating a positive atmosphere and an organization with fewer hidden agendas. It also encourages the client to be involved in problem solving and cost control throughout the project. The payment method and the created possibility for a win-win situation also seem to create incentives for the client to be innovative together with the contractor.

The cost plus payment method often employs incentives and bonuses which are one of the characteristics of partnering. This system has both advantages and disadvantages. Some of the disadvantages are that it is difficult for the client to create relevant bonuses that can be clearly measured. The risk is that the contractor might lose his motivation if the bonus goal is not clearly attainable. Incentives related to the target price might also create opportunistic behavior since each stakeholder will try to maximize their own possibility to get higher profits. This problem can occur when the stakeholders incentives contradicts. The advantages with incentives and bonuses are that the client has a possibility to guide the contractor according the clients wishes. The sharing of the profit and the loss of money in the project encourages the stakeholders to create common goals which can facilitate problem solving. Since the cost plus does not have a fixed price, the incentives help with decreasing the cost of the project. The adversarial culture is partly removed because of incentives and cooperative mindset which leads to aligned interests and transparency.

Both theory and practice state that risk is one of the most important factors when choosing the appropriate procurement form. Partnering is seen as a way to spread the risk in a complex project. Risk awareness among participants seems to increase in complex projects. This encourages stakeholders to use partnering and try to decrease adversarial relations. The project participants seem to be aware that they have a higher chance to succeed in the project if they collaborate and share knowledge. It would be beneficial to create a contractual framework that would take responsibilities, commitments and risks that are related to partnering into consideration. Earlier presented theory also states that in order to achieve successful partnering project, organizations must make alterations on their contracts and work processes to support the implementation.

9.1.2 Collaborative

Partnering seems to improve communication although problems in communication and planning can be seen between contractor, sub-contractors and side-contractors since only one of them had partnering contracts in the investigated cases. Long communication paths between the main contractor and the side-contractors can hinder effective communication and time management.

Theory states that client interaction, designer interaction, flow of information and links between construction and maintenance should be able to improve health and safety. These improvements were not clearly visible in the investigated cases. Problems were identified in the collaboration between the client and the contractor. The client has interest in being involved in order to keep control over the project. The contractor on the other hand sometimes believed that the client was not knowledgeable enough and that his interference delayed the process. Partnering seems to have problems of being implemented in the lower hierarchy levels in the organizations which might decrease the possibility for improvements within the production.

Some of the interviewees expressed that stakeholders also hide information in partnering projects in order to gain benefits. In matters regarding cost and time, which are closely related to the incentives, hidden agendas seems to occur. In matters regarding factors such as work environment and environmental impact, it seems that communication and collaboration is more open and transparent. The reason for this is probably because it is more to gain when hiding information about time and cost. Both stakeholders in the cases expressed that the collaborative mindset in partnering made it easier to solve problems which resulted in better quality. This is consistent with other researcher's conclusion within the subject.

9.1.3 Cultural

The division of responsibility seems to be one of the problems when partnering is working as intended. The close collaboration between the stakeholders can result in unclear duties for different roles. An example of negative consequences that can occur because of this is when the health and safety of the actors involved in the project might be threatened due to unclear obligations.

Most actors mentioned that the atmosphere was more positive in partnering projects compared to traditional projects. This was partly due to the increased transparency and joint goals. The issues that was believed to hinder effective implementation of partnering was among other things the predefined views of project processes and of other disciplines behavior and roles.

The rigid control that usually exists in traditional contracts to control adversarial relations and moral hazard, limits the possibilities to innovate. Partnering on the other hand, employs other methods to remove adversarial relations and moral hazard. These methods create opportunities for innovation due to collaboration, flexibility and common interests.

9.2 Concluding remarks

The interviewed stakeholders responsible for time, quality and cost in the projects seemed to be more aware of the benefits that partnering produced compared to the interviewees responsible for environmental impact and work environment. The joint problem solving and innovation was seen as beneficial factors for time, cost and quality but not so much for work environment and environmental impact. The stakeholders explained that this was because work environment and environmental impact are very developed and regulated areas. Overall beneficial factors seem to be the openness and the ease of communication this causes.

It can be concluded by reading the 4D collaboration investigation in chapter 6.2 that partnering has been implemented differently in the two projects. While project A had an extensive implementation, project B did not have the same duration or intensity in the implementation. The conclusions in this chapter have tried to highlight the problems and benefits that could be seen in both projects due to the implementation of partnering, even though the implementation varied.

One problem that can be seen throughout the interviews is that the effect of partnering is not clear. This confusion can lead stakeholders to not take partnering seriously and if that happens, the partnering will probably not be implemented in a serious way and benefits cannot be collected. This can cause the client not to choose partnering for the next project. Other researchers agree with this and state that clients have to know the effect of partnering on the project outcome if a new procurement form is going to be accepted by the industry. The solutions for this could be to clarify the concept of partnering. More knowledge about the concept could improve awareness of the benefits it creates. One reason why it is hard to understand partnering is because there are many definitions of partnering. The other reason might be that partnering is a wide concept containing everything from work methods to mindsets.

The effects that were identified to be caused by partnering were categorized into collaborative, contractual and cultural effects.

10. Bibliography

- Ahmed, S. M. & Kangari, R., 1995. Analysis of Client Satisfaction Factors in Construction Industry. *Management in Engineering*, Volym 11, pp. 36-44.
- Atkinson, A. & Westall, R., 2010. The relationship between intergrated design and construction and safety on construction projects. *Construction Management and Economics*, Volym 28, pp. 1007-1017.
- Australia, C., 1996. *Partnering: Models for success*. Australia: Partnering Task force, Construction Industry Institute .
- Banverket Östra banregionen, 2006. *Administrativa föreskrifter, AF (FU 2000) Totalentreprenad, Avseende Projekt Citybanan i Stockholm Entreprenad b5-9525, Söderströmstunneln*. Stockholm: Banverket.
- Banverket; JV Söderströmstunneln, 2008. *Projektplan Projekt Citybanan i Stockholm entreprenad b5-9525 Söderströmstunneln*. Stockholm: u.n.
- Bennet, J. & Jayes, S., 1998. *The seven pillars of partnering*. London : Thomas Telford.
- Bergin, J., 2005. *Microeconomic Theory: A Concise Course*. New York: Oxford University Press.
- Bhattacharjee, A., 2012. *Social Science Research: Principles, Methods, and Practices*. Florida: Creative Commons Attribution.
- Black, C., Akintoye, A. & Fitzgerald, E., 1999. An analysis of success factors and benefits of partnering in construction. *Internation Journal og Project Management*, 23 June, pp. 423-434.
- Bresnen, M. & Marshall, N., 2000. Building partnerships: case studies of client-contractor collaboration in the IK construction industry. *Construction Management and Economics*, Issue 18, pp. 229-237.
- Bresnen, M. & Marshall, N., 2000. Motivation, commitment and the use of incentives in partnerships and alliances.. *Construction Mangement and Economics* , Volym 18, pp. 587-598.
- Brown, D. C., Asleigh, M. J., Riley, M. J. & Shaw, R. D., 2001. New Project Procurement Process. *Journal of management in engineering* , Volym 17, pp. 192-201.
- Byggandets Kontraktskommitté, u.d. *Kontraktsformulär*. [Online] Available at: <http://www.foreningenbkk.org/kontraktsformular.asp> [Använd 22 05 2014].
- Chan, A. P. C. & Chan, A. P. L., 2004. Key performance indicators for measuring construction success. *Benchmarking: An International Journal*, 11(2), pp. 203-221.
- Chan, A. P. C., Chan, D. W. M. & Ho, K. S. K., 2003. Partnering in Construction: Critical study of problems for implementation. *Journal of Management in Engineering*, pp. 126-135.

- Chan, A. P. o.a., 2004. Exploring critical success factors for partnering in construction projects. *Journal of construction engineering and management*, pp. 188-198.
- Chan, A. P., Chan, D. W. & Ho, K. S. K., 2003. Partnering in Construction; Critical Study of Problems for Implementation. *Journal of Management in Engineering*, Issue 19, pp. 126-135.
- Cheng, E. W. L. & Li, H., 2004. Development of a Practical Model of Partnering for Construction Projects. *Journal of Construction Engineering and Management*, Issue 130, pp. 790-798.
- Chinyio, E. & Olomolaiye, P., 2010. Construction Stakeholder Management, Chapter 11. i: *Culture and Leadership in Stakeholder Management*. Oxford, UK: Wiley-Blackwell, pp. 174-192.
- Chong, D. & Druckman, J. N., 2007. Framing Theory. *Annu.Rev.Polit.Sci*, Volym 10, pp. 103-126.
- Cox, A. & Thompson, I., 1997. 'Fit for purpose' contractual relations: determining a theoretical framework for construction project. *European Journal of Purchasing and Supply Management* , Volym 3, pp. 127-135.
- Crane, T. G. o.a., 1997. Partnering process model. *Jornal of Management in Engineering*, 13(3), pp. 57-63.
- Eisenhardt, K. M., 1989. Agency Theory: An Assessment and Review. *Academy of Management Review*, 14(1), pp. 57-74.
- Eriksson, P., 2008. Procurement Effects on Coopetition in Client-Contractor Relationships. *Journal of Construction Management*, Volym 134, pp. 103-111.
- Eriksson, P.-E., 2008. Procurement Effects on Coopetition in Client-Contrtactor Relationships. *Journal of Construction Engineering and Management*, pp. 103-111.
- Eriksson, P., 2010. Partnering; what it is, when should it be used and how should it be implemented. *Construction Management and Economics*, Issue 28, pp. 905-917.
- Eriksson, P., 2011a. *Partnering and the four dimensions of collaboration*. Aalborg, Danish Building Reseach Institute Aalborg University.
- Eriksson, P. E. & Nilson, T., 2008. Client perceptions of barriers to partnering. *Engeering, Construction and Architectural management*, pp. 527-539.
- Eriksson, P. & Westerberg, M., 2011b. Effects of cooperative procurement procedures on construction project performance; A conceptual framework. *International ournal of Project Management*, Volym 29, pp. 197-208.
- Eriksson, P. & Westerberg, M., 2011b. Effects of cooperative procurement procedures on construction project preformance: A conceptual framework. *International Journal of Project Management*, Volym 29, pp. 197-208.

- Gadde, L. & Dubois, A., 2010. Partnering in the construction industry - Problems and opportunities. *Journal of Purchasing & Supply Management*, Issue 16, pp. 254-263.
- Gambatese, J. & Hallowell, M., 2011. Enabling and measuring innovation in the construction industry. *Construction Management and Economics*, 29(6), pp. 553-567.
- Hapanava, T. & Al-Jibouri, S., 2010. Influence of process performance during the construction stage on achieving end-project goals. *Construction Management and Economics*, Volym 28, pp. 853-869.
- Hare, B., Cameron, I. & Duff, R., 2006. Exploring the integration of health and safety with pre-construction planning. *Engineering, Construction and Architectural Management*, 13(5), pp. 438-450.
- Hänggli, R. & Kriesi, H., 2012. Frame construction and frame promotion (strategic framing choices). *American Behavioral Scientist*, Volym 3, pp. 260-278.
- Ingrige, B. & Sexton, M., 2006. Alliances in construction. Investigating initiatives and barriers for long-term collaboration. *Engineering, Construction and Architectural Management*, Volym 13, pp. 521-535.
- Investeringsdivisionen Projekt Citybanan, 2008. *Entreprenadkontrakt, EK, Entreprenad B2-9523 Norrströmstunneln*. Stockholm: Banverket.
- Josephson, P.-E., 2013. *Produktivitetläget i Svenskt Byggnad 2013*, Göteborg: SBUF.
- JVS, 2010. *Safety Management Plan-JV Söderströmstunneln HB (JVS)*, Stockholm: JVC.
- Kaming, P., Olomolaiye, P., Holt, G. & Hattis, F., 1997. Factors influencing construction time and cost overruns on high-rise projects in Indonesia. *Construction Management and Economics*, Volym 15, pp. 83-94.
- Khalfan, M. & Swan, W., 2007. Mutual objective setting for partnering projects in the public sector. *Engineering, Construction and Architectural Management*, 14(2), pp. 119-130.
- Kohn, A., 1993. Why incentive plans cannot work. *Harvard business review*, pp. 1-7.
- Kärnä, S., 2004. Analysing customer satisfaction and quality in construction-the case of public and private customers. *Nordic Journal of Surveying and Real Estate Research*, Volym 2, pp. 67-80.
- Larson, E., 1995. Project partnering: result of study of 280 construction projects. *Journal of Management in Engineering*, 2(11), pp. 30-35.
- Larson, E., 1997. Partnering on Construction Projects: A study of the relationship between partnering activities and project success. *IEEE transaction on Engineering Management*, pp. 188-195.
- Lecheler, S. & de Vreese, C. H., 2011. Getting real: The duration of framing effects. *Journal of Communication*, Volym 61, pp. 959-983.

- Li, H., Cheng, E., Love, P. & Irani, Z., 2001. Co-operative benchmarking; a tool for partnering excellence in construction. *International Journal of Project Management*, pp. 171-179.
- Li, H., Cheng, E. W. L. & Love, P. E. D., 2000. Partnering research in construction. *Construction and Architectural Management*, pp. 76-92.
- Liu, A. M. & Walker, A., 2010. Evaluation of project outcomes. *Construction Management and Economics*, 2(16), pp. 209-219.
- Love, P., Skitmore, M. & Earl, G., 1998. Selecting a suitable procurement method for a building project. *Construction Management and Economics*, Volym 16, pp. 221-233.
- Lu, S. & Yan, H., 2007. A model for evaluating the applicability of partnering in construction. *International Journal of Project Management*, pp. 164-170.
- McQuaid, R., 2000. Draft version of: The theory of Partnership - Why have Partnerships?. i: S. Osborne, red. *Managing public-private partnerships for public services: an international perspective*. London: Routledge, pp. 9-35.
- Nalebuff, B. & Brandenburger, A., 1997. Co-opetition: Competitive and cooperative strategies for the digital economy. *Strategy & Leadership*, 26(6), pp. 28-35.
- Naoum, S., 2001. An overview into the concept of partnering. *International Journal of Project Management*, Volym 21, pp. 71-76.
- NCC AB, 2010. *Vi bygger Norrströmstunneln, en del av Citybanan*. [Online]
Available at: <http://www.ncc.se/Projekt-och-koncept/Projekt/Citybanan/>
[Använd 20 02 2014].
- NCC AB, 2013. *Detta är NCC-koncernen*. [Online]
Available at: <http://www.ncc.se/sv/OM-NCC/NCC-koncernen/>
[Använd 20 02 2014].
- Norrströmstunneln AB, 2008. *Arbetsmiljö- och Säkerhetsplan*. Stockholm: Trafikverket/NCC.
- Norrströmstunneln AB, 2009. *Projektplan Entreprenad B4-9523 Norrströmstunneln*. Stockholm: Trafikverket/NCC.
- Nyström, J., 2007. *Partnering: definition, theory and evaluation*, Stockholm: Royal Institute of Technology.
- Olawale, Y. & Sun, M., 2010. Cost and time control of construction projects: inhibiting factors and mitigating measures in practice. *Construction Management and Economics*, Volym 28, pp. 509-526.
- Oxford University Press, 2014b. *Oxford Dictionaries*. [Online]
Available at: <http://www.oxforddictionaries.com/definition/english/opportunist>
[Använd 27 05 2014].

- Oxford University Press, 2014. *Oxford Dictionaries*. [Online]
Available at: <http://www.oxforddictionaries.com/definition/english/adversarial>
[Använd 27 05 2014].
- Pehrsson, L., 2008. *PM- Samverkan i genomförandeskedet*. Stockholm: Banverket.
- Peters, H., 2008. *Game Theory - A Multi-Leveled Approach*. Berlin Heidelberg: Springer.
- Pinto, J. & Slevin, D. P., 1988. Project success: Definitions and measurement techniques. *Project Management Journal*, 1(19), pp. 67-72.
- Sandahl, U., 2012. *Sammanställning samverkansenkät 2012*. Stockholm: Norrströmstunneln AB.
- Slater, T. S. & P.E., 1998. Partnering: Agreeing to agree. *Journal of management in engineering*, Volym 14, pp. 48-50.
- Swan, W. & Khalfan, M., 2007. Mutual objective setting for partnering projects in the public sector. *Engineering, Construction and Architectural Management*, 2(14), pp. 119-130.
- Teece, D. & Jorde, T., 1989. Competition and Cooperation: Striking the Right Balance. *California Management Review*, 31(3), p. 25.
- The Joint Contracts Tribunal, u.d. *Traditional /Conventional*. [Online]
Available at: <http://www.jctltd.co.uk/traditional-procurement.aspx>
[Använd 27 05 2014].
- Trafikverket, 2011. *Tillägg till Entreprenadkontrakt avseende Entreprenad B5-9525 Söderströmstunneln*. Stockholm: u.n.
- Trafikverket, 2014. *Entreprenader*. [Online]
Available at:
<http://www.trafikverket.se/Privat/Projekt/Stockholm/Citybanan/Byggnation/Entreprenader-/>
[Använd 20 02 2014].
- Trafikverket, u.d. *Om Trafikverket*. [Online]
Available at: <http://www.trafikverket.se/Om-Trafikverket/>
[Använd 20 02 2014].
- Walker, A. & Wing, C., 1999. The relationship between construction project management theory and transaction cost economic. *Engineering, Construction and Architectural Management*, 6(2), pp. 166-176.
- Varnäs, A., 2008. *Enhancing Environmental Performance by Green Procurement : A study of environmental procurement preferences in the construction industry*, Stockholm : KTH: KTH, Miljöbedömning och -förvaltning.
- Warsame, A., 2011. *Preformance of Construction Projects - Essays on Supplier Structure, Construction Costs and Quality Improvement*. Stockholm: The Royal Institute of Technology.
- Weston, D. & Gibson, G., 1993. Partnering-project performance in US Army Corps of Engineers. *ASCE Journal of Management in Engineering* , pp. 410-425.

Winch, G. M., 2010. *Managing Construction Project*. 2nd red. West Sussex: Blackwell Publishing.

Von Neumann, J. & Morgenstern, O., 2007. *Theory of Games and Economic Behavior*. 60th anniversary ed. red. United States: Princeton University Press .

Züblin Scandinavia AB, 2013. *Om Züblin Scandinavia AB*. [Online]
Available at: <http://www.zueblin.se/sv/om-oss/>
[Använd 14 02 2014].

11. Appendix

11.1 Appendix A – Interview guides

11.1.1 Introduction in all of the interviews

Experience

Our names are Kristján Ari Úlfarsson and Evelina Widén and we are Master students at KTH, so thank you again very much for helping us with our research here today.

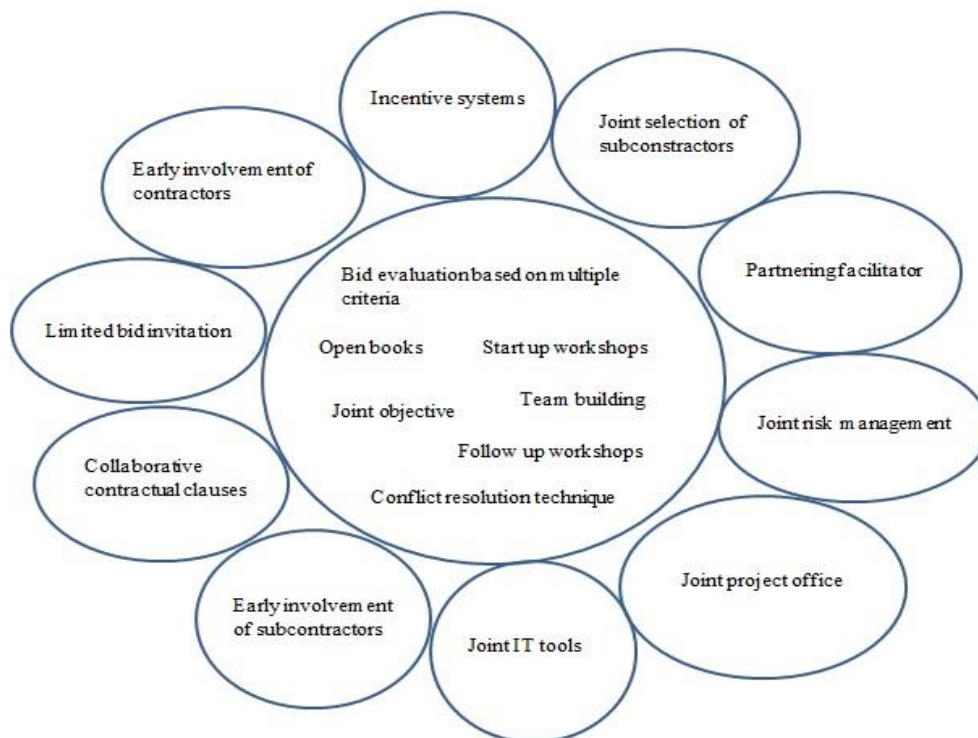
- So tell us, how long have you worked here at?
- Where did you work before?
- Did you study in Stockholm?
- Have you worked in partnering projects before?
- So we are wondering, based on your previous experience, how do you feel about partnering?
 - Could you try to define what you believe partnering is?
- Can you tell us about your general expectation of partnering? In what way did you think that partnering was going to affect this project before you started?

11.1.2 4D collaboration

We are interested to know more about why it was decided to work with partnering in this project. Do you know why?

- *Width:*
 - We are interested to know how many stakeholders are involved in the ongoing project? Such as how many Sub-contractors, suppliers and consultants?
 - Do you think that more stakeholders should be involved? More than there are now?
- *Depth*
 - If we take a look at partnering in the project, can you elaborate which hierarchy levels, from end-users to blue collar that are involved?
 - In these different hierarchy levels, do you know which levels are mostly engaged in the partnering activities?
- *Duration*
 - If we look at the time aspect of partnering it is interesting to know when and for how long the stakeholders are involved. How does it work in this project?
 - Were there any stakeholders that were involved very early in this project?
- *Intensity*

For this question, we have created a small map of the procedures in partnering. help us and mark those procedures you believe are used for this project?



11.1.3 Interview guide for Quality specialists

1. How would you describe quality?
2. So, how has partnering affected the way in which the project works with quality?
3. Can you list some of the most common quality issues in a construction project?
 - a. How has partnering affected those issues?
4. Where there any other stakeholders involved early in the process of planning the quality control?
 - Benefits?/Disadvantages?
5. If we talk a little bit about the outcome of the project at this stage, how has partnering affected the quality of the result?
6. What has partnering meant for your department regarding new methods or innovative ideas concerning quality? Can you give us some examples?

11.1.4 Interview guide for Environmental Impact specialists

1. If we talk a little bit about the outcome of the project at this stage, how has partnering affected the environmental impact of the project?
2. Can you list some of the most common environmental issues in a construction project?
 - a. How has partnering affected those issues?
3. Where there any other stakeholders involved early in the process of evaluating the environmental impact of the project?
4. According to you, has partnering affected the project's way of dealing with unexpected environmental problems when they occur?
5. What has partnering meant for your department regarding new methods or innovative ideas concerning environmental impact? Can you give us some examples?
6. It would be interesting to know how partnering has affected the projects way of dealing with external parties. Can you tell us a little bit about that?

11.1.5 Interview guide for Time Management specialists

1. How would you say that the time planning was affected by using partnering in this project?
2. Can you list some of the most common time issues in a construction project?
 - How has partnering affected those issues?
3. In the project plan, we read about joint planning. Can you elaborate on how the client and the contractor use joint planning in this project?
4. Can you give us some examples of how partnering affected how the project handled delays?
5. In the project plan, we also saw that an incentive plans was used. Do you think that the use of incentives affected the time planning in this project?
6. What has partnering meant for your department regarding new methods or innovative ideas concerning time? Can you give us some examples?
7. Was there any early involvement of stakeholders (such as suppliers, clients, contractors) when making the time plan?

11.1.6 Interview guide for Cost Management specialists

1. How do you think partnering has affected the cost estimations, the procurements and the cost control in this project?
2. Can you list some of the most common cost issues in a construction project?
 - a. How has partnering affected those issues?
3. In the project plan, we noticed that an incentive plan was used. Do you think that the use of incentives affected how you managed costs?
4. What has partnering meant for your department regarding new methods/tools or innovative ideas concerning cost? Can you give us some examples?
5. Was there any early involvement of stakeholders (such as suppliers, clients, contractors) when making the cost estimation?
6. Do you think that the benefits of partnering are enough when considering the cost that goes into implementing partnering?

11.1.7 Interview guide for Work Environment specialists

1. How has partnering affected the organizations way of managing health and safety?
2. Can you list some of the most common health and safety issues in a construction project?
 - a. How has partnering affected those issues?
3. Were the other stakeholders involved early in the process of identifying work environment risks?
4. Has partnering affected the projects way of dealing with health and safety problems when they occur?
5. What has partnering meant for your department regarding new methods or innovative ideas concerning health and safety? Can you give us some examples?