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Finding and reducing obstacles for implementing new logistics systems in the construction industry

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Abstract

The inefficient logistics in the construction industry is wasting vast amounts of time and resources. The major contracting firms are aware of the problem and have developed new logistics systems to reduce the waste, but all in vain. The developments are not accepted in practice. This thesis seeks to find and then reduce the factors that make implementation difficult. A literature review provides a theoretical framework. Both a quantitative and a qualitative study are addressed to site managers in larger contracting firms, as well as their suppliers. Results reveal that the three major obstacles are organisational inertia, communication difficulties and poor knowledge management. To overcome these problems, both current theories and empirical results suggest that problems and solution should be shared between production managers on seminars or similar. Know-how must be retained and shared between projects by developing standards for knowledge management on central level in the organisation.

Keywords: implementation, logistics, material handling, construction
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1. Introduction

This chapter serves as an introductory base for the thesis. The problem background is briefly described and the purpose of the paper is explained. Research questions are presented as well as the delimitations. Finally, the disposition of the paper is available for the reader.

1.1. General problem analysis

Supply chain management has never been the strong suit of the construction industry. When other industries followed the paradigm shift of increasing the total supply chain value, construction business stuck with the traditional narrow, short-sighted view. A range of studies has confirmed the inefficiency construction is dealing with. For example, workers are spending 10% of their time waiting, and 2-10% of ordered material is never used (Josephson & Saukkoriiipi 2005). A study by Agapiou et al. (1998; also cited in Bankvall et al. 2010) showed that 45% of arriving trucks were wrong in some way. Either it was the wrong time of delivery, wrong goods or wrong quantity. In total, Bertelsen (1993; also cited in O’Brien 1999) approximated the cost of the inefficient supply chain to add 10% to the total production cost. Problems related to logistics of incoming deliveries and material handling on site is some of the major inadequacies (Odeh & Battaineh 2002; Assaf & Al-Hejji 2006). The handling of materials is also where general contractors have the most power to affect the supply chain (Vrijhoef & Koskela 2000).

In short, there is a lot of undesirable waste in the logistics process, whether it is queuing trucks, damaged goods or other delays. For the major construction firms, this is no surprise. They are aware of the problem to some extent, and they are also familiar with terms such as supply chain management and just-in-time (Saad 2002). However, the attempts to implement any of these philosophies and tools have not worked very well, if at all (Svensson1).

Currently, several theories for the lacking results exist. Thompson et al. (1998) blames the adversarial contracts, which encourages parties to aim for short-term profit without regard to suppliers or customers. Gadde and Håkansson (1998) along with Dainty et al. (2001) emphasize the fragmented nature of the construction supply chain, with consequences being the main contractor loses control. Suppliers still deliver whenever it suits them, instead of on the

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1 Jon Svensson supply chain specialist Skanska, interview February 6th 2013. All further references to Svensson are referring to this interview.
appointed time. Subcontractors order in lots for discounts, without regard to the cost of storing the material on site.

Regardless of these theories about implementation difficulties are accurate or not, there are obviously some obstacles for introducing more efficient logistics systems. It is also likely that the different parties are experiencing diverse, and maybe contradicting problems (low price but good quality, and timely deliveries versus tight schedules for examples).

### 1.2. Consequences in practice

By playing a big role in the inefficient supply chain, a main contractor is severely affected. Project owners charge fines for delayed projects, a fine the main contractor has to pay, regardless of where in the supply chain the inefficiencies occurred. Hence, a main contractor often ends up with excessive costs. (Svensson)

Waste of valuable space, unnecessary and costly machinery resources, as well as wasted materials are all problems of the logistical inefficiencies (Josephson & Saukko, 2005). Sometimes goods are reordered with express delivery, as the goods of the original delivery has been damaged or lost. All major contractors struggle with these problems, both internally and externally (Rudberg²).

The main contractors are aware of these problems, however. Tools have been developed to deal with and improve the handling of materials. Nevertheless, the logistics remain inefficient, as these tools have not been widely accepted in practice (Rudberg). This paper sets out to find and explain the reasons and obstacles behind the lacking acceptance. By the use of current theories within the fields the complications span, models will be presented on how to overcome these barriers.

Every project conducted without considering more efficient materials handling wastes money. According to Svensson, the problem is urgent. Therefore, the main focus is not to find a way of reducing the barriers through philosophies and culture changes that takes decades to implement. Instead, there is more focus on small, practical and achievable means to deal with the problems, and finding solutions that are viable in the short term.

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² Martin Rudberg professor in construction logistics, interview February 19th 2013. All further references to Rudberg are referring to this interview.
1.3. Purpose

The purpose of this thesis is to map and describe, and then analyse and reduce the obstacles a main contractor is facing when trying to implement new logistics systems in the construction industry. The means to reduce the obstacles should be achievable in the short term.

1.4. Research questions

1. What are the main obstacles for implementing new logistics systems in the construction business?

2. How can a main contractor eliminate or reduce these problems?

1.5. Delimitations

As this paper is written as a thesis work composing one semester of 20 weeks, there is a range of boundaries connected to the time limit. As mentioned, a construction supply chain is very defragmented with a lot of parties with different interests. Yet, this paper will focus on the perspective of the main contractor and what that actor can do to increase the efficiency of the logistics. This is due to the relative power from sheer size a main contractor holds in comparison to subcontractors and suppliers, as the most powerful player affects the supply chain the most (Agapiou et al. 1998; Dainty et al. 2001).

The use of one main contractor only also limits the research. However, main contractors are assessed to be very similar in terms of operation and culture (Akintoye et al. 2000). According to Yin (2003), one case company would then be sufficient for generalising.

The diversity of the suppliers makes it hard to use them in the qualitative study. The amount of interviews needed to make the result generalizable is deemed to high to conduct within the current limitations. Interviews are done with production managers only.

Furthermore, interviews are, unlike the quantitative study, not spread all over Sweden, but limited to reasonable vicinity from Karlstad.
1.6. Disposition

An introduction with problem analysis, purpose and research questions have been given. The next chapter presents and explains the methodology that is used, first in a brief research strategy and then in detailed procedures. Chapter 3 comprises the theoretical framework. The framework presents the general characteristics of the construction industry, the logistics that defines it and then a description of the implementation difficulties. Chapter 3 ends with a summary of the framework. Empirical findings are presented in chapter 4, together with a description of the case company. These findings are discussed and compared to the theories in the analysis of chapter 5. The thesis is concluded in chapter 6, along with suggestions of further research. The references will be found in chapter 7, and appendixes in chapter 8.

1.7. Definitions

Case company: Refers to Skanska Sverige AB. The company has supported the author in the writing of this thesis, mainly by providing contacts and guidance. For more information on Skanska, see chapter 4.1.

Likert-scale: A tool for measuring attitudes in social sciences. The respondent is presented with a statement, and then chooses if he/she agrees or disagrees with the statement (Likert 1932). In a 5-point Likert-scale, the respondent have five options to each statement, ranging from strongly agree to strongly disagree.

Main contractor: A term used throughout the thesis to describe the contractor with responsibility for the overhead functions in a construction project, such as logistics. The formal title of the contractor depends on the type of contract (see 3.1.3).

Production manager: A person with the overall responsibility at the construction site. Also known as ‘site manager’ at other contractors. In the thesis three project members carried out tasks typical for a production manager, despite not having the official title (see chapter 4.4). Throughout the thesis, these three project members will also be referred to as ‘production managers’.

Subcontractor: A term used to describe the actors with smaller contracts and little to no overhead responsibilities. The formal title of the contractor varies
with the type of contract. Used somewhat synonymous with supplier throughout the paper.

Supplier: Supplies the contractors with materials and/or contracts. Used somewhat synonymous with subcontractor throughout the paper.

Supply chain management: A term that is referring to the management of the whole supply chain, and not just internally. The concept emphasises cooperation and coordination between actors, and the importance of working with suppliers and customer, instead of against them. (Cooper et al. 1997; Gibson et al. 2005)
2. Methodology

This chapter presents and motivates the methodology for gathering data used to answer the research questions. First, the research strategy is presented. A detailed description of the data collection follows, and then the sampling is explained. The weaknesses of the study are brought up through validity and reliability, including a non-response analysis.

2.1. Research strategy

Initially, a literature review is conducted (see figure 1), as it is the quickest way of gaining knowledge of a particular field (Björklund & Paulsson 2012). As the research purpose is explorative, the review starts in a general manner and is then narrowed down as more data is gathered. The literature review also serves the purpose to help reformulate the research questions into their eligible and appropriate current form.

The findings from the literature review are triangulated (a method of crosschecking data from different sources to ensure its validity, see Todd 1979 for details) with expert interviews. The interviews mainly serve an explorative purpose, but simultaneously act to validate the literature review. Information gained from this first part of the research strategy, is used to formulate a theory to the first research question: What are the obstacles for implementing a new logistics system in the construction business?

The theory is concurrently tested quantitatively and qualitatively (for an explanation of quantitative and qualitative method, see Tood 1979). The quantitative research is motivated by its descriptive nature, and as it provides a base for generalizing (Stukát 2011). A survey is chosen as a quantitative method, as it according to Yin (2003) is suitable to answer the question What? as in What are the implementation difficulties?.

Semi-structured interviews serve as the qualitative method for data gathering. The purpose of this qualitative research is both to explain and to validate the results from its quantitative counterpart. The results from these descriptive studies provide the answer to research question 1.

The result of the first research question provides a base to start the second literature review from. The research is normative, as it seeks to answer the question How? as in How can a main contractor overcome [result from research question 1]?). From the literature review, a hypothesis on the second research question is created.
The hypothesis is tested qualitatively through another set of semi-structured interviews. The qualitative research is motivated by its explanatory purpose. The result provides an answer to the second hypothesis.

Figure 1: A visualisation of the research strategy.

2.2. Data collection

The data used in this research paper is both from primary and secondary sources. The primary data used in this paper is gathered through the interviews and the questionnaire. By the definition made by Eriksson and Kovalainen (2008), the data from the literature review and the case company’s intranet would be secondary. Details on why and how certain data is gathered follows.

2.2.1. Literature review

Gathering data and information from studies scientific articles is the quickest way of gaining knowledge of a field, which is why it is a suitable start (Björklind & Paulsson 2012). Furthermore, the information given is peer reviewed and hence correct and unbiased. In a study similar to this research paper, Assaf and Al-Hejji (2006) explicitly started with a literature review.

Search terms related to supply chain management, construction industry, construction logistics and implementation are used in the databases of EBSCOhost, ByggDok, Jstor and Emerald. The search terms are also used in the search engine Google Scholar.

The literature review is conducted in two phases. First for providing a hypothesis to research question 1. Then a second time, based on the result of research question 1, to generate a hypothesis for research question 2.
2.2.2. Unstructured expert interviews

As the purpose is exploratory, the interviews are unstructured. It allows the interviewer and interviewee to wander, opening up for discussing new areas. A structured or semi-structured interview would have prevented this, as the conversation would have stayed within the line of questions (Bryman & Bell 2011; Lundahl & Skärvad 1999).

The interviewees are experts through either extensive practical knowledge, or researching. Lundahl and Skärvad (1999) support the choice of interviewing experts, as they provide a lot of answers and are unbiased.

The interviews are conducted by phone, between the author and an expert. Unstructured interviews provide the best and most accurate result when performed face to face (Daft & Lengel 1986; Lundahl & Skärvad 1999; Stukát 2011). However, the limitations of time and resources made it impossible to physically meet the experts.

For details, see appendix 4.

2.2.3. Questionnaires

A quantitative method is used as one of the measures to test the hypothesis, which is a preferred method when it comes to descriptive studies which aims to generalize (Stukát 2011; Yin 2003). Bryman and Bell (2011:634) supports the idea of proposing a hypothesis from explorative studies and then testing it quantitatively:

“Because of its tendency towards an unstructured, open-ended approach to data collection, qualitative research is often very helpful as a source of hypotheses or hunches that can be subsequently tested using a quantitative research strategy.”

As a final motivation, Akintoye et al. (2000) used this approach in a very similar study. Black et al. (2000) and Chang and Shen (2009) also used questionnaires in related studies.

The questionnaire comprises 32 questions in total, based on the implementation difficulties explained in chapter 3.3. It is designed to achieve valid results with a high response rate. A 5-point Likert-scale is used, as it is easy to compare and has potential for high response rates. As some questions might not be relevant for all subcontractors, there is also a Do not know option. Respondents are more prone to answer agreeable alternatives (Carifo et al.
Therefore, some questions are reverse-coded. The amount of questions are balanced between Bryman and Bell’s (2011) statement of the more questions, the more valid the result, and Langet and Wärneryd’s statement of the more questions, the lower response rate. A total of 32 questions are used.

Questions are designed to, as far extent as possible, not be leading, misunderstood or leave room for interpretation. Words that carry value are avoided. Despite the clear recommendation by Lundahl and Skärvad (1999) to always have identical questionnaires, subcontractors and the main contractor received questionnaires that differed ever so slightly. This is because certain words carry value to one party, but not to the other.

The questionnaire is mailed out with a missive to achieve maximum response rate. 100 internal production managers and 150 external suppliers receive the questionnaire. For details on questionnaire, respondents or missive, see appendixes 1, 2 and 3, respectively.

2.2.4. Semi-structured interviews, set 1

As mentioned in the research strategy, the first set of semi-structured interviews serves two purposes: first, to crosscheck the result from the questionnaires, and hence increase the validity (Bryman & Bell 2011; Yin 2003). By achieving the same (or similar) result in the interviews, it can be concluded that the questionnaire is interpreted in the intended way. Second, the interviews will explain the survey. While the questionnaires are of descriptive nature, the interviews are part of an explanatory study.

As with semi-structured interviews, questions were prepared on beforehand. However, they are not asked in a particular order, but rather how the conversation unfolds. Follow-up questions such as How?, Why? and please elaborate are asked. See appendix 5 for details.

2.2.5. Semi-structured interviews, set 2

The second set of interviews is used to test the hypothesis gained from the second round of literature studies. The study is mainly descriptive, but also seeks to explain the answers.
Except for the sampling (see chapter 2.3) the second batch of interviews are carried out in an identical manner to the first. Interview questions can be found in appendix 6.

2.3. Sample

To achieve a valid result, respondents are sampled to represent reality (Trost 2007). The research questions concerns both production managers at the case company, and its subcontractors. Therefore, both production managers and subcontractors are the respondents of the questionnaire. Production managers are found on the intranet of the case company and chosen randomly based on their surname. A sample of 100 production managers is arbitrarily judged to be enough. The subcontractors are sourced through the Nordic Purchasing Department (NPU). 150 suppliers are sampled from the requirement that they must handle a significant physical volume of materials to be able to affect the project. It does not matter if the supplier is local or nationwide. For example, a small, local supplier of isolation is included as the supplier has an impact of the projects it is supplying. But a Nordic-wide supplier of literature for apprentices is not, as its materials does not affect any of the large amount of projects it supplies.

Interviewees for both sets are sampled based on two criteria: they have reviewed their material handling, and geographic location (due to resource limits). For the first set, seven production managers close to Karlstad, Sweden are sourced. For the second set, two of the previous production managers are, by the author, judged not to have knowledge enough to participate. This decision is based on the inability to answer questions from the previous interview. Remaining five managers are sampled for a second interview. All production managers asked agreed to participate in an interview.

2.4. Validity

Validity is used to describe how well a method of measuring something, corresponds to reality (Bryman & Bell 2011). For example, measuring graduates’ salaries is probably not a valid way of evaluating the quality of an education, as salary levels depend on a range of factors.

As shown in the research strategy, both the literature review and the quantitative research were triangulated with interviews to ensure the validity of gathered data. As none of the two unstructured expert interviews provides any
new data, but instead emphasized what has already been found, the literature review is considered valid and complete.

The quantitative research is based on people perceptions, and might not respond perfectly to reality. Production managers might respond that they are treating subcontractors fairly, while subcontractors respond that production managers treat them unfairly. The respondents are probably not lying, but they perceive the situation differently. By putting equal emphasis on the general contractors’ and subcontractors’ answers, the validity will increase. Although, one must remember that the answers are still based on perceptions.

Due to the perception of the individual, some areas are harder to examine through a questionnaire than others. To ask if a mail inbox gets flooded provides less room for the individuals' perception, compared to questions related to culture, for example. Hence, findings related to the area of organisational inertia, culture and understanding might not possess the desired validity.

Several weeks were spent at case company’s office in Karlstad to understand the environment thoroughly, to be able to ask the most suitable questions in the questionnaire. The questionnaire was tested on production managers and then revised three times. Yet, as the author is given better understanding for the environment for every week, there is no doubt better questions could be asked after spending more time in the construction business. But then again, time is limited to a total of 20 weeks.

A large portion of the theoretical framework is based on articles where the British construction industry is studied. Although that industry is similar to the Swedish, it remains uncertain if the theories are fully transferable.

2.5. Reliability

Reliability describes the accuracy of a research. A study with high reliability should provide the same result regardless of who performs the study, and regardless of when it is performed (Yin 2003). Quantitative studies are generally considered to have higher reliability compared to their qualitative counterparts, as the quantitative studies provide less room for interpretation (Stukát 2011). But there are factors influencing the reliability of both the quantitative and the qualitative studies in this thesis work.
As receiving a response rate as high as possible is seen as essential for the quantitative study, the name of the case company is used both in the missive and on the contact information. Trost (2007) claims that the response rate will be higher if the respondents have a relationship to the researcher, which they now have, on contrary to if Karlstad University was listed as sender. The downside however, is that some information can be seen as sensitive to the respondents, if the employer or customer is conducting a survey. Despite the promise of anonymity, there is a risk that questions regarding care for customers etcetera not will be answered truthfully.

According to Baruch and Holtom (2008), an average response rate in articles published in peer reviewed journals is 54 % on surveys sent by e-mail. This number is higher than other available distribution methods such as postal service or web links, justifying the e-mail distribution used in this thesis. However, the response rate of sent questionnaires finished at 48,4 %, which is slightly lower than the average in the study by Baruch and Holtom (2008). The lower response rate could make the sample skewed. For example, the type of people who care little for cooperation could be more likely to not care for a survey, making the sample appear as everybody are friendly towards cooperation. Although, Moser and Kalton (1971) claims that a response rate of more than 30-40 % does only contain random loss of answers. As Akintoye et al. (2000) used this argument in a similar study, it can apply to this research as well. See 2.4.1 Non-response analysis for details.

The method for transforming the Likert-scale into comparable numbers (see 4.3) does not take dispersion into account. Hence, the sum of two extreme answers might even out. The questionnaire did however receive mostly consistent responses, which would reduce the error of not respecting dispersion. An excel-file with every answer to each question is available upon request.

The author of this paper conducted the interviews alone. By utilizing two researchers during each interview, the research is likely to be more thorough. It provides the possibility to pay attention both to the actual words of the interviewee, but also body language and tone of voice, to reveal more data (Lundahl & Skärvad 1999). Data from the interviews and from the questionnaires are gathered simultaneously to avoid having expectations on the result from the interviews. By expecting a certain result, interviews are more likely to be interpreted towards that result, strictly reducing the reliability of the study (Kvale 1997). Performing the interviews at a place of the
respondents’ choice to make them feel comfortable increases the reliability. That the researcher is trying to remain indifferent during the interviews will also increase the reliability. The interviews are recorded to be able to recall later if any ambiguities would arise. (Bryman & Bell 2011)

2.5.1. Non-response analysis

A non-response analysis is conducted to ensure the reliability of the research (Lantz 2011). Subcontractors and production managers are chosen randomly and asked by phone the reason for their nonresponse. Except for a subcontractor who chooses not to answer the questionnaire “out of principle”, the non-respondents agreed: Their busy schedules and lack of time prevented them from answering the questionnaire. The last five answers provided no new reasons, and response saturation is considered achieved after its six answers.

Judging from those answers, there is a risk of systematic error. The responses on the questionnaire could show skewed results, compared to reality, when it comes to statements relating to time and too much responsibility. However, due the great total response rate, the error is likely to be small.
3. Theoretical framework

This chapter contains the framework within which the thesis work takes place. The facts and theories brought up in the chapter come from other scientists’ work, and are the base on which the remaining chapters rest. The theoretical framework comprises information that the reader will need to understand the subject and thesis. The subchapters start with general characteristics of the construction industry, followed by its logistics. Possible implementation difficulties are presented, as well as possible solutions. A summary concludes the framework.

3.1. Characteristics of the construction industry

Construction is a huge industry, with a turnover of more than 400 billion SEK, only in Sweden. 305 000 people are employed directly or indirectly (Sveriges Byggindustrier 2013). Most firms in the industry are small, employing less than 20 people each, but the three major contractors have more than 10 000 people employed each. (Gustafsson et al. 2003).

3.1.1. A project-based work form and decentralised nature

Construction is carried out in projects. The chain is started with the need of a commissioner, or project owner. Main contractors place offers, and then constructs the projected building. When the construction is finished and the hand-over is done, the project is complete. (Nordstrand 2002)

Despite the contractors being very large companies, they have a extremely decentralized culture. Each region has a self-managing office, and each project has a production manager in charge. Hence, the projects are independent of another. Economies of scale are barely exploited, as it is believed to be none, due to the uniqueness of the projects. (Nordstrand 2002)

3.1.2. The fragmented supply chain

The construction industry is known for its fragmented way of working and its range of subcontractors. Below the typical supply chain is described, but note that it can differ, depending on the type of contract (see chapter 3.1.3).

The commissioner initiates and owns the project. His need is handed over to architects that design the building. Consultants help the architect. The blueprints and specifications are handed over to a main contractor. For the parts that the main contractors cannot do, subcontractors are hired. In some situations the subcontractor can hire another set of subcontractors. Material suppliers provide the different contractors with material. Some contractors
hire third party logistics companies for the transports. All in all, there is at least seven to eight independent links in the supply chain. (Nordstrand 2002)

![Diagram of construction supply chain](image)

**Figure 2:** A visualisation of the fragmented construction supply chain, adapted from Sobotka et al. (2005).

### 3.1.3. Contract and delivery forms

There is a wide range of different ways for an owner to procure for a contractor. For the relevance of this thesis, there are mainly two types of contracts, here named *traditional* and *partnering* contracts (see figure 3 and 4, respectively).

Traditional contracts comprise types such as design-bid-build, shared design-bid-build and design-build contracts. The focus of the traditional contracts is the bidding process. A project is specified through specifications and a brief, and contractors then bid with their price for constructing said project. The contractor offering most value for the money gets the contract, and constructs the building according to the specifications. This model is popular, since it ensures that the customer gets his money’s worth. It is also an unbiased way of choosing contractor, as contractors are only reviewed from hard numbers. This way personal feelings and corruption are prevented, and past experiences matters not. The downside is that the commissioner is not closely involved, which is problematic as the specification often leaves room for interpretation. (Sobotka et al. 2005)

In this model, the main contractors in turn use the same traditional procurement methods to source for subcontractors.
Partnering is a quite recent development, which focus on cooperation to a greater extent. A task force is put together, in which a range of parties are represented, from owners and architects to contractors and subcontractors. All are involved from the early beginning. Instead of bidding on contracts, agreements such as sharing unexpected costs or profits among participants are common. Often the “open book-rule” is used, where the different participants are letting the others know the incomes and expenses they are having in the project. In terms of hierarchy, no contractor stands above another. The only party they must answer to is the commissioner. Mutual understanding and trust is therefore important in partnering. (Larson 1997)

3.1.4. Professional training

The construction business is an industry that utilizes the learning-by-doing approach of apprenticeships. Training recent graduated students from
vocational schools is the most common approach, although other forms exists as well. Educating other personnel on-the-job or trainees are examples of such. (Delgoulet et al. 2012; O'Donnel et al. 2008)

Basically there are two ways of advancing through the hierarchical structure in construction: The traditional way is to work ones way up from the bottom (Delgoulet et al. 2012). Another approach is the academic way. University-educated construction engineers starts on a higher level on the hierarchical ladder (Bowers-Brown & Berry, 2005).

In an article written by Bowers-Brown and Berry (2005), both these approaches are criticised. Construction companies in the UK have complained that graduated construction engineers lack certain hands-on knowledge. Simultaneously, graduates from vocational schools lack the academic knowledge of production and logistics, and they do not have a chance of achieving it, since vocational school graduates not are admitted to universities. In other words, there is a knowledge gap among construction managers (Bowers-Brown & Berry 2005). Josephson and Saukkoipi (2005) also mention the lack of holistic understanding among the construction workers, but claim that it would be possible to simply educate them on the job.

### 3.1.5. Information technology

Being a knowledge-intense industry involving a lot of organisations and employees, IT is highly beneficial in construction. Despite this, the use of IT is somewhat limited in construction, compared to other industries. According to Rezgui et al. (2011) there are a few reasons for this. The fragmented nature makes it difficult to implement the uniform IT-system that is required. As mentioned before, there are plenty of small or medium enterprises in the construction industry. The SMEs might not have the financial resources needed, as IT-systems in general are expensive. Carillo et al. (2004) suggested organisational inertia to be another reason for the slow IT acceptance.

### 3.2. Construction logistics

Despite the number of similarities between constructing buildings and constructing automobiles, the construction industry suffers from a range of factors, making it difficult to use the same methods as its related industry. This subchapter will demonstrate why benchmarking possibilities are limited. (Cox, 1997, 2001; O'Brian 1999).
3.2.1. Short lifespan
As construction is carried out in projects, the lifespan of a construction site is relatively short. For example, utilizing continuous improvement during a few years on a construction site will obviously not yield the same result as it would if it was practiced for decades in the same place, as it could be in manufacturing. Even known improvements and optimizations could be economically unviable, due to its short period of use. The same argument holds for educating workers to project-specific tasks. (Sullivan et al. 2010)

3.2.2. A set location
On contrary to most manufacturing industries, the product is not movable. When a good can move between stations or factories to add value, a construction is set in place. Hence, all materials do sooner or later converge to the very same place: the construction site. Clearly, the risk for congestion is higher, compared to factories. (Vrijhoef & Koskela 2000)

Factories can be located where land and/or work are cheap, or optimal for other reasons. The construction industry does not have this luxury. For construction projects such as buildings, area is usually very expensive and limited. There could be such strict limitations that there is impossible to fit more than one truck at a time, or store more than a few trucks loads worth of material. Limited space could also lead to limited machinery such as forklifts, cranes or bulldozers. (Sullivan et al. 2010)

3.2.3. Adversarial contracts and ineffective purchasing
According to Dubois and Gadde (2000), a general contractor spends 75 % of the total costs on purchased material and services, and Shohet and Frydman (2003) found that subcontractors perform 90 % of the value added work. Despite all these transactions, many purchasing procedures in the construction industry are ineffective and dysfunctional. As acquirement of general contractors and subcontractors usually is done with the use of a traditional procurement method (bidding), past experience in project matters little.

Despite the lack of incentives, there are plenty of relationships intended to last longer. Akintoye et al. (2000) found that 85 % of main contractors have some sort of long lasting relationship with customers and/or suppliers. Although, the same paper also discovered that in the majority of current relationships, businesses were strictly specified in contracts.
The extensive bidding process of traditional purchasing wastes both time and money. The actors that did not get the contract spent resources on something without yield. Dubois and Gadde (2000) found that both general contractors and subcontractors spend approximately 4-7% of their turnover on the bidding processes.

Thompson et al. (1998) claims that most contracts in the construction industry “actively encourage non-collaborative behaviour”. What Thompson is referring to is the nature of the industry where there is no market price, and making the best bid is most important among contractors and subcontractors. But as soon as a subcontractor has been assigned to a contract, the subcontractor and the customer starts pulling in opposite directions. The customer obviously want the subcontractor to perform the task as thoroughly as possible to get his money worth, while the subcontractor want to perform the task as cheaply as possible, thus increasing profit. Hence, the subcontractor and customer have different goals with the task.

3.2.4. Ad hoc-planning

The construction environment is rather unstable, and unexpected problems often occur. Production managers and foremen are used to adapting to changing situations. However, ad hoc-planning also brings problems. Agapiou et al. (1998) noted how deliveries and transports often were ordered with very short notice, leading to uncertainty and/or extra costs. Svensson has experienced the same problem with short-sighted transport planning.
3.3. Implementation difficulties

Several logistics systems and tools for handling material have been developed to deal with the logistical problems of the construction industry described in chapter 3.2. But these solutions are rarely accepted in practice. This subchapter explains possible reasons for why the construction industry is resistant to new thinking and new systems. Some of the following sources of obstacles are proven, others remain in theory. Note that the different schools if hindrances are very much interrelated, but for the sake of explanation they will be split as far as possible.

3.3.1. Communication difficulties

The bigger a project is, and the more people involved, the more important communication and coordination becomes (Shen & Chang 2011). Needless to say, in massive construction projects with hundreds of workers participating, communication is essential. But communication is lacking. Usually there are no standardized ways of contacting each other; every party has their own way. The large amount of people involved in combination with no common means of communication does indeed make it difficult. Shohet and Frydman (2003) mention this as clear obstacle.

To make things even harder, terms and expressions also differ between parties. Equipment and material does not have standardized names or measures. Actors have their own norms and expressions, which of course becomes problematic when communicating externally. (Sullivan et al. 2010)

In a meta analysis (22 studies) on hardships in implementing partnering, communication problems was listed among the more common problems. (Chan et al. 2003)

3.3.2. Inefficient communication

Just because people within the project manage to keep in contact, despite above-mentioned difficulties, does not mean the recipient received the information the sender tried to pass on. Too low or too high information flow is a common problem. Josephson and Saukkoriipi (2005) experienced people showing up late to meetings as a usual problem. The same authors also observed how contracts consisting of tens to hundreds of pages were sent, when only a few pages were needed for the recipient. According to
Patrashkova-Volzdoska et al. (2003) cases like these, with excessive or lacking amount of information, makes information inefficient and the message is lost.

### 3.3.3. Organisational inertia

Inertia is, to some extent, present in every organisation. Inertia means that people within an organisation will resist change. It does not mean that people actually are against the new idea or concept, but they do not like the change itself. A mild form of organisational inertia would be apathy towards the change, whereas people in organisations with heavy inertia could actively resist change and encourage others to do the same. (Schön 1971; more recently cited in Jarvis 2012)

As inertia is correlated to stability, stable organisations experience more inertia than the less steady companies. Thus, a business that is well established, has existed for a long time, and employs many people does experience very heavy inertia once a big change is taking place. If the change does not result in an immediate improvement, inertia is likely to increase. Would the change in short term bring more costs or higher workload than before, the involved employees will be very resistant to change. Lack of information regarding the intended change will also make it harder. (Ahrne & Papakostas 2002; Hannan & Freeman 1984; more recently cited in Thornton et al. 2012)

Hedberg and Ericson (1997) defined two different kinds of organisational inertia. Insight inertia is the time gap between noticing the change of the environment and realising the need for change within the organisation. Action inertia is the lag between the realised need for change and action taken. March and Olsen (1975; also cited in March 2010) and Kim (1993) found factors increasing action inertia:

- Role constriction. Employees perceive themselves to have a too narrow role, or too little power to influence the organisation. The need for change is realised, but the responsibility for it to happen is not.
- Audience persuasion. The employee cannot persuade colleagues or managers to take action.
- Superstitious understanding. Employees believe there will be negative consequences from the actions taken. Therefore, they delay or refuse to take action.
- Opportunistic learning. Occurs when an employee solves a problem, but does not share the solution with the rest of the organisation. Does mostly occur in ”very decentralized organizations that do not have the networking capability to keep the parts connected” (Kim 1993:46).
Again, organisational inertia refers to the individual’s resistance to the change itself, rather than the result of the change. As change forces the individual to step outside of his or her comfort zone, the individual becomes anxious. This anxiousness puts the individual in defensive position, and new ideas are met with scepticism and critique. (Allcorn & Godkin 2011)

Carillo et al. (2004) conducted a survey on the major difficulties for implementing a knowledge management system among construction firms. 49% perceived resistance from the organisation to be a problem.

3.3.4. Power imbalance

In terms of size, there is a great range in the construction business: from the sole proprietorships to large construction companies, employing thousands of people and having hundreds of projects active at the same time. The smaller actors are more dependent on the big, than vice versa. This creates an imbalance that subcontractors and suppliers are unhappy with. This imbalance prohibits trust and cooperation in general, which is to the advantage of no one. (Cox & Ireland 2002; Agapiou et al. 1998)

In a study by Dainty et al. (2001) subcontractors said in interviews that they are treated very unfairly and that the major contractors are aware of this power imbalance and use it to their advantage. On contrary, Rudberg argues that the major players is not exploiting their power enough, and relates to the automotive industry where original equipment manufacturers exercises their power to create efficient supply chains. The fragmented nature and flat organisational structure in the main contractors, results in the general contractors are not that big in practice. This in turn, makes it hard to exercise their power.

3.3.5. Lack of understanding

Not possessing the knowledge needed brings problems on many levels. When management is trying to implement something that is not understood thoroughly, it will be met with reluctance (Bushnell 1999). An example of this situation is provided by Svensson: There is a cost for using some logistics systems, which will be invoiced and is therefore very tangible. The saved money however, only shows as lower costs for tradesmen, which is incomparable between projects anyway. A site manager without proper understanding will interpret joint replenishment as a waste of money.
Sobotka et al. (2005) argued that the majority of smaller enterprises do not have an expert on logistics, yet less a full department. And if no one is familiar with the concept of supply chain management, it is logical that the logistics systems are met with scepticism. In a paper written by Dainty et al. (2001:168), the authors discovered that

"Some had become so sceptical that they regarded supply chain management merely as a way of making subcontractors finance projects."

Without a doubt, someone who is feeling taken advantage of, is not very fond of implementing new systems for logistics.

The roles could also be reversed, which is just as bad. Bushnell (1999) gave instances of management trying to implement procedures they did not themselves have proper knowledge of. There are examples of purchasing departments ordering in discount packages that are too heavy for workers to handle, etc. (Vrijhoef & Koskela 2001).

Lack of understanding between parties exists as well. Results from interviews display how subcontractors perceive the general contractors to show little understanding for their business (Dainty et al. 2001). In the same study, it is claimed by the subcontractors, that the general contractors have expectations so high they cannot possibly be met, which results in discontent in both parties. In some cases, subcontractors were not allowed to participate in meetings regarding the project, as it was judged that the early processes did not concern subcontractors. In the study, the subcontractors did not agree.

Svensson on the other hand, perceived it as the subcontractors and suppliers need more understanding. They do no grasp the importance of keeping the appointed delivery times, and the consequences that bring. The meta study by Chan et al. (2003) confirmed that deficient understanding was a common problem, but the study did not specify which actor who lacked.

Lindén\(^3\) is opposing these arguments. In his experience, employees from all actors have been in the industry long enough to have full understanding for each other’s businesses. Instead, Lindén claims knowledge is irrelevant in this case, as it is the tight schedules and contracts preventing suppliers to deliver as preferred.

\(^3\) Samuel Lindén operations manager Bygglogistik, interview February 8th, 2013. All further references to Lindén is referring to this interview.
3.3.6. Poor knowledge management

As the constructions produced are highly customized, it is hard to rely on routines or standards. Instead, knowledge is more important. Knowledge management means the management of knowledge, which includes creation, sharing and retention of knowledge. Usually, there are a few experts with a lot of knowledge. According to a survey conducted by Carillo et al. (2004), only 37% of participants in a construction supply chain have a plan for knowledge sharing. Hence, the projects are dependent on a few people. Rudberg follows the same train of thought and says that a few people in construction projects have more tasks and more responsibility than what might be appropriate.

Knowledge and lessons learned from past projects is rarely documented to be used in future projects, and Carillo et al. (2004:53) continues:

“This is most obviously demonstrated in the lack of detailed post-project reviews that involve the entire supply chain and the subsequent dissemination of lessons learned. Unless this is done in a systematic manner, errors will be repeated, at cost, with no resultant learning.”

3.3.7. Adversarial relations and lack of incentives

The traditional procurement methods and adversarial contracts turn parties against each other, as the goals differ. The subcontractor wants to build as cheaply as possible, whereas the customer wants value for his money. This is not a very firm ground to base a relationship on. (Sobotka et al. 2005; Bresnen & Marshall 2000)

The competitive bidding does not provide incentives for lasting relationships. As the benefits of using the same partner continuously is realized, it is getting more common to focus on a relationship approach. However, of the 85% of contractors who claimed they had some longer relationships, only 31% based these relationships on anything else (trust for example) than strictly arranged contracts. (Akintoye et al. 2000)

According to Berggren et al. (2001) there is little strive for satisfied customers, but excessive focus on fulfilling the minimum the contract requires. By adapting to each other’s needs (implementing the same software or way of communication for example) there would be potential for more efficient collaboration. However, that would make the parties more dependent on each other, which none of them desire (Dubois & Gadde 2000).
To continue on Bresnen and Marshall's (2000) studies, they explain why relationships are so tense. The short relationships that comes with the project environment makes it very difficult to get to know a partner's organisation, whether it is the people, the way of working or the culture. And as the organisations do not know each other, it is difficult to produce trust. These factors make it hard to foster a lasting relationship. In Chan's et al. (2003) relationship problems was the by far most common difficulty for implementing partnering.

3.3.8. Conservative culture

The supply chain of the construction industry has been highly fragmented for a long, long time. The fragmented way of working has over the years led to the different parties have lost respect for each other. The different parties have problems cooperating, and everyone wants to have as little responsibility as possible. There have been cases where workers refuses to participate in meetings relevant to them, simply because they were not responsible for the outcome of the subject discussed on the meeting. (Pocock et al. 1996; also cited in Al-Tmeemy et al. 2011)

When Vrijhoef and Koskela (2000) examined control problems in a construction supply chain, they could derive the cause of said problems to cultural and strategic issues. There were few common targets and a prevailing self-interest. These cultural concerns were not found in any specific part in an organisation, but in all of them, from operational to managerial level.

According to Rudberg the destructive culture is indeed one of the main issues the construction industry is dealing with, and confirms that this culture is present on all hierarchical levels, in both general contractors, subcontractors and suppliers. In the KM-implementation survey by Carillo et al. (2004), 75 % of the respondents thought the culture to be an obstacle.

As shown, there are plentiful of examples on conservative behaviour. People within the chain of supply are quick to confirm that the culture is conservative. However, there are no studies actually proving that people in construction would be more conservative than others. Instead, a theory exists on that the culture is simply an excuse, or an attempt to justify the current working practice (Josephson & Saukkoriipi 2005). Only three out of 22 studies ranked the culture as an obstacle for implementing partnering, and thus supports Josephson and Saukkoriipi’s theory (Chan et al. 2003).
3.4. Overcoming the difficulties

Though the difficulties explained in chapter 3.3 do bring problems to implementation, research suggests there is ways of reducing or defeating said difficulties.

At first glance, lacking communication would be the easiest to solve. Simply communicate more. But the key lies on how. Daft and Lengel (1986; more recently cited in Miller 2011) brought up media richness. Face-to-face communication is a rich media, as facial expressions and tone of voice helps conveying the message. The opposite would be a written rule, which is limited to the words on the paper. Equivocality and misinterpretations is prevented through rich means of communication, while uncertainty is reduced through less rich means, such as the written word where the user can reread the information if needed. According to Daft and Lengel (1986), uncertainty is more common than equivocality in construction. Hence, Daft and Lengel proposes that the increased communication should be in a less rich format.

For face-to-face meetings and mail conversations communication is related to performance in a curvilinear manner. More frequent meetings and e-mails lead to a better performance, but only to a certain limit. Past that limit, e-mails are lost and meetings only waste time. This curvilinear relationship could not be shown in telephone communication. Therefore, increasing telephone communication would most certainly increase performance. (Patrashkova-Volzdoska et al. 2003)

Chang and Shen (2009) partly support that hypothesis. Their study found that communication is positively related to performance, but that informal meetings does usually not reach the intended goals of the meeting. All other means of communication reaches their respective communications goals in at least 80% of the cases. Shohet and Frydman (2003) do not show if some means or ways of communication are more efficient than others. But they emphasize the vast amount of informal communication taking place in construction, and points to the risk with not being able to recall the information in a later stage. Whether the meetings are informal or not, Patrashkova-Volzdoska et al. (2003) mentions the importance of having a so called gate-keeper, to make sure less talkative participants will be given a change to share their opinion.
When it comes to organisational inertia, no uniform way of defeating it seems to have been found, but there are several theories on how to reduce it. Both Argyris and Schön (1978) and Diamond (1986) claim double loop learning could reduce the problems, by questioning the old ideas as well as the new ones. Alcorn and Godkin (2011) doubts this however, as they believe it will only lead to more anxiousness and disorientation, arguing the switch to double loop learning is a change in itself. Following Kim’s (1993) reasoning, action inertia could be reduced by sharing problems and solutions with the rest of the (often decentralized) organisation.

Friedman (2003) found personality traits especially suitable to withstand organisational inertia. Ambitiousness, limit awareness, understanding and critical viewing are such traits. As is cooperation skills, while sticking to your own perspectives. Unfortunately, people holding all these traits are rare in organisations, since they are less likely to get promoted or hold key positions (Frohman 1997).

A series of steps is proposed by Friedman (2003) to make changes with lowest possible inertia. Firstly, the people working closest to the problem should be asked to describe the situation in detail. Friedman names this procedure a “reality check”. Then middle and top managers are asked to do the same. The gap between the two scenarios is to be discussed between the parties, until they agree on one scenario and problems caused by it. This serves the purpose of giving both sides understanding. It is important that each and everyone understand how the problem is affecting them personally. The two parties should then agree on what actions should be taken. After the change, time should be spent on reflecting how the change went.

Communication and organisational inertia are obviously highly related to knowledge management. In combination with the knowledge intense industry, knowledge management is doubtlessly of importance. In construction, it is a common problem that there is no time to reflect on knowledge between projects. But Davenport and Prusak (1998) argues that time should be taken to create and retain knowledge between projects, as it will save time in the future. Kamara et al. (2001) follows the same track and claims that the best effect is gained by involving all firms in when reflecting on past projects, and not just internal participants.

Carillo et al. (2004) found the culture to be a hindrance for implementing knowledge management, which suits the argument provided by Wenger et al.
(2002): a change towards knowledge management should not be forced. The involved personnel should desire the KM system. However, once there is a plan for managing knowledge, Carillo et al. (2004) believes the best result is achieved if one person is given the responsibility for the management.

Among construction firms in the United Kingdom, conferences and seminars was voted the best way of sharing knowledge. In the very same study, having too many ways of sharing knowledge was perceived inefficient. (Carillo et al. 2004)

3.5. Framework summary

The logistics and material handling of the construction business has been criticized for being extremely ineffective, wasting both time and money. The inefficiencies are calculated to add approximately 10% to the total production cost (Bertelsen 1993). The logistics associated with handling materials on site has been shown to carry the heaviest cost (Vrijhoef & Koskela 2000).

It is problematic to benchmark more successful industries, as construction is unique in many ways (Cox, 1997, 2001; O’Brian 1999). The work is carried out on a project basis, locations are not flexible and there is no payback time for local optimizations (Nordstrand 2002; Sullivan et al. 2010; Vrijhoef & Koskela 2000). Furthermore, conservative and adversarial procurement methods characterize the industry, including extensive bidding processes and short-term relationships (Dubois & Gadde 2000; Thompson et al. 1998).

However, the bigger companies in the construction industry are aware of the inefficiencies and have managed to develop logistical tools and systems to handle the problems (Saad 2002). But these tools are in general welcomed neither internally nor externally with subcontractors, and the main contractors are still struggling to implement the tools (Svensson). Throughout the theoretical framework eight interrelated but different theories for the implementation problems have been discussed:

• Communication difficulties – There are no common means of communication. Despite the need for communication in large projects, there are no standardized ways of communicating. (Chan et al. 2003; Shothet & Frydman 2003; Sullivan et al. 2010)

• Communication inefficiencies – Even though interaction does occur, it is done in an inefficient manner. The topic includes unproductive meetings, and information lost or misinterpreted due to lacking or excessive amount of information. (Josephson & Saukkoriipi 2005; Patrashkova-Volzdoska et al. 2003)
• Organisational inertia – People are resistant to change, especially in large stable organisations. (Alcorn & Godkin 2011; Carillo 2004; Hannan & Freeman 1984)

• Power imbalance – The smaller firms are more dependent on the larger corporations than vice versa. Small firms experiences that they are not being respected and no trust is established. There are also theories that the large organisations could exploit their power to a larger extent to create a more efficient supply chain. (Agapiou et al. 1998; Cox & Ireland 2002; Dainty et al. 2001)

• Lack of knowledge – There has been studies showing that the actors do not understand each other’s business, and people on different hierarchical levels do not understand each other. Not understanding the concept that is being implemented is also a problem. (Chan et al. 2001; Dainty et al. 2001; Svensson)

• Poor knowledge management – Lessons learned in projects are not taken care of, and the wheel has to be invented again in the next project. Knowledge and responsibility is concentrated in a few people. (Carillo et al. 2004; Rudberg)

• Adversarial relations and lack of incentives – Parties are trying to collaborate, even though their goals differ. Some actors does not have any incentives for implementing new logistics systems as they will not benefit from the saving, but actually lose profit in extreme cases. (Akintoye et al. 2000, Bresnen and Marshall 2000; Chan et al. 2003)

• Conservative culture – Cooperation is against the incorporated culture of the industry. People do not want to change, because they do not want to change. As the work force of the construction industry never has been proven to be more conservative, theories exist that the culture is just used to justify poor work practices. (Carillo et al. 2004; Pocock et al. 1996; Vrijhoef & Koskela (2000)

There are not a lot of theories on how to overcome these difficulties, but a few have been discussed in the framework. Communication problems should be solved through the use of proper communication means. Uncertainty should be handled through written communication, whereas equivocality should be dealt with face to face (Daft & Lengel 1986). Ideas on how to reduce organisational inertia ranges from double-loop learning to rely on certain personalities within the organisations (Diamond 1986; Friedman 2003). More knowledge is retained if subcontractors and production managers are participating in formal final meetings (Davenport & Prusak 1998; Kamara et al. 2001). Seminars have been shown to be a successful way of sharing knowledge (Carillo et al. 2004).
4. Empirical results

The reader is introduced to the case company and the logistical tools developed. Results from the questionnaire and the three series of interviews are presented and explained.

4.1. Case company: Skanska Sverige AB

Founded in Sweden 1887, Skanska has grown to become a big actor in the construction business, both globally and domestically. Today Skanska employs 53 000 people worldwide, of which 11 000 are based in Sweden, making it one of the three major actors in the Swedish market. Skanska performs constructions ranging from residential houses to highways and skyscrapers. Customers include both private and public. (Skanska 2012)

4.1.1. Organisation

Just like the industry in general, Skanska is an organisation with clear hierarchical structure. Regional managers are in charge of district managers who in turn are responsible for the project managers. The project managers have an overall responsibility for an amount of construction projects, but a production manager is ultimately responsible for each single project. Hence, in the end of the day, the production manager makes all final decisions. Although, it is usually in consensus with the project manager and the foremen. This type of decentralized organisations is very common in the construction industry. (Svensson)

The support functions, like logistics and purchasing, are outside of this hierarchical network.

4.1.2. Tools for dealing with logistics

Skanska are aware of the pending logistics problems. The three tools Skanska have developed and currently are using, or trying to use, is explained by Svensson.

4.1.2.1 Joint replenishment

As the amount of deliveries to site pose as one of the main logistical problems, joint replenishment seeks to reduce the number of arrivals. By utilizing a terminal run by a third party logistics company, deliveries are repacked and reloaded in an optimal way, by a type of truck most suitable for the construction site. The number of arrivals is kept to a minimum, and limited to
a specific time, allowing tradesmen continue their work uninterrupted the rest of the week.

The logistics company keeps track of when certain materials are needed, and if they have not been delivered to the terminal in time, the supplier is contacted. Production managers at Skanska are not bothered unless unsolvable irregularities occur. This way, Skanska spend no time chasing supplier, but is still kept informed.

Note that projects using joint replenishments are charged with a cost, depending on to what extent the service is used. Though, at the end of the day the investment has been shown to be profitable. There are a few projects that have been using joint replenishment to some extent. When constructing the frames of a building, 39 % of unloading costs were saved. Another construction site used joint replenishment for a share of the material throughout the project and managed to save 0,6 % on the total production cost.

4.1.2.2 Coordinator

Some construction projects features a coordinator, whose task is to keep track of where and when deliveries will arrive. In smaller projects, the production manager or a foreman could take on the role as the coordinator, whereas in larger projects there could be one or several people just coordinating. By coordinating scheduled deliveries, staff for unloading and a constant information flow, arrival and departure of trucks are swift and damaged material is kept to a minimum. A prerequisite for this tool to work is that the coordinator is kept informed regarding delays or changes, both from the contractor’s and supplier’s side.

As Skanska has not yet managed to implement an official coordinator role in a project, there are no empirical records of savings, although previous studies are showing potential.

4.1.2.3 Interactive calendar

An online calendar has recently been developed and will soon be taken into use. The main function of the calendar is to provide the construction site workers with a visual overview of incoming transports. The calendar features colour coding for different unloading zones and types of transport. This
calendar will be available for Skanska’s personnel without charging the project with a cost.

4.2. Unstructured expert interviews

The information gained from the three expert interviews are used in the theoretical framework. References to Lindén, Rudberg or Svensson indicates that the referenced data comes from one of these unstructured interviews. The three expert interviews provided more, or emphasised previous information on the following topics:

- Logistical inefficiencies
- Ad-hoc planning
- Lack of understanding
- Power imbalance
- Poor knowledge management
- Conservative culture

For more details, see methodology chapter 2.2.2 or appendix 4.

4.3. Questionnaire

As explained in chapter 2.2.3, the quantitative study consists of a questionnaire. Of the sampled 250 respondents the questionnaire was sent to, 121 usable results were received. 48 responses came from production managers, and 73 from suppliers. This equals a total response rate of 48,4 %. Table 1 shows which type of implementation difficulty each questions seeks to examine.

<table>
<thead>
<tr>
<th>Question 1-4</th>
<th>Communication difficulties</th>
</tr>
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<tbody>
<tr>
<td>Question 5-8</td>
<td>Inefficient communication</td>
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<tr>
<td>Question 9-12</td>
<td>Organisational inertia</td>
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<tr>
<td>Question 13-16</td>
<td>Power imbalance</td>
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<tr>
<td>Question 17-20</td>
<td>Lack of understanding</td>
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<tr>
<td>Question 21-24</td>
<td>Poor knowledge management</td>
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<tr>
<td>Question 25-28</td>
<td>Adversarial relationships</td>
</tr>
<tr>
<td>Question 29-32</td>
<td>Conservative culture</td>
</tr>
</tbody>
</table>

Table 1: An overview of which area of implementation difficulties the questions seek to examine.
Table 3 on the next page shows a compilation of the received answers. For each question, the average score is shown for the production managers, and for the subcontractors. The questions are colour coded to the implementation difficulty they are examining. For each area of implementation problem a total score is calculated both for the production managers and suppliers. The total score is the average between the supplier and production manager score.

To make it comparable, the Likert-scale is rearranged into numbers according to table 2. The answer ‘Do not know / irrelevant’ was removed in the analysis.

Table 2: The Likert-scale options are transposed into corresponding numbers.

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slightly agree</td>
<td>+1</td>
</tr>
<tr>
<td>Neutral</td>
<td>0</td>
</tr>
<tr>
<td>Slightly disagree</td>
<td>-1</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>-2</td>
</tr>
</tbody>
</table>

In the reverse-coded questions ‘Strongly agree’ is valued -2 and vice versa. For each question in the questionnaire, one mean value is calculated for the production managers and one is calculated for the subcontractors. The averages for each question within a school of implementation difficulties (see chapter 3.3) are added up. This way, the major implementation difficulties perceived by each party is revealed. There is also a total score for each area, where the score for subcontractors and production managers are each weighted 50 %, without regard to number of responses each party received. All questions are listed in appendix 1. For statistics and detailed answers on each question, an excel-file is available on request.
Table 3: The higher the score, the more likely the implementation difficulty is to cause problems.

<table>
<thead>
<tr>
<th>Question</th>
<th>PM score</th>
<th>PM area score</th>
<th>Sub. Score</th>
<th>Sub area score</th>
<th>Total area score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>0,63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td>-0,09</td>
<td></td>
<td>-0,16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td>-0,11</td>
<td></td>
<td></td>
<td>0,95</td>
<td>1,16</td>
</tr>
<tr>
<td>Question 4</td>
<td>0,93</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 5</td>
<td>-0,93</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 6</td>
<td>0,87</td>
<td></td>
<td>-0,73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 7</td>
<td>-0,48</td>
<td>0,35</td>
<td></td>
<td>-1,15</td>
<td>-0,40</td>
</tr>
<tr>
<td>Question 8</td>
<td>0,89</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 9</td>
<td>0,20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 10</td>
<td>0,25</td>
<td></td>
<td>-0,08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 11</td>
<td>0,22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 12</td>
<td>1,24</td>
<td></td>
<td></td>
<td>1,37</td>
<td></td>
</tr>
<tr>
<td>Question 13</td>
<td>-0,77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 14</td>
<td>0,54</td>
<td></td>
<td>0,61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 15</td>
<td>0,43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 16</td>
<td>-0,51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 17</td>
<td>-0,16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 18</td>
<td>-0,87</td>
<td></td>
<td>-0,86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 19</td>
<td>-0,52</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 20</td>
<td>-0,11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 21</td>
<td>0,80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 22</td>
<td>-0,61</td>
<td></td>
<td>0,37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 23</td>
<td>0,22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 24</td>
<td>-0,18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 25</td>
<td>-1,33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 26</td>
<td>0,53</td>
<td></td>
<td>-0,54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 27</td>
<td>0,80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 28</td>
<td>-0,55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 29</td>
<td>-0,47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 30</td>
<td>-0,44</td>
<td></td>
<td>-0,04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question 31</td>
<td>0,63</td>
<td></td>
<td></td>
<td>-0,57</td>
<td>-0,31</td>
</tr>
<tr>
<td>Question 32</td>
<td>0,23</td>
<td></td>
<td>0,6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For a visual overview and comparison, the total area scores are used to create a chart. The bars follow the same colour coding and order as table 1.

![Chart 1: A visualisation of the total area score achieved in the questionnaire.](image)

As shown in the graph above, four areas of possible implementation difficulties received positive scores, and four areas received negative scores. Inefficient communication, lack of understanding, adversarial contracts and the culture are areas that received negative scores, thus deeming them improbable of causing the friction in implementation. Most clear is the result regarding understanding. In general, both the production managers with the main contractor and the subcontractors agree they understand both their own and their partners business.

It was also clear that none of the parties experienced adversarial relationships, but that they could see the upsides of collaborating. Worth noting though, is that production managers can see benefits from using traditional procurement, whereas subcontractors cannot.

In total score, inefficient communication was not ranked as a cause of problem. But when the subcontractors perceived their communication to work smoothly, the main contractor did not. Production managers had quite strong opinions on how they received a lot of e-mails without relevance, and meetings they attended to sometimes wastes time. Except for those two points, both parties agreed that inefficient communication not is a probable source.
According to the results, the culture is not a major problem when implementing new logistics systems. Although both parties perceive the culture to be more conservative compared to other industries, they also claim they trust and help each other.

Problems related to power imbalance received a slight positive result. Noteworthy is that production managers claimed they try to please everyone, whereas subcontractors' score revealed that they do no perceive it this way. In the same manner, subcontractors view it as the main contractors clearly use their power. But the main contractors do only slightly agree with that statement.

Poor knowledge management received a positive score and can hence be considered as a potential source for implementation difficulties. The main driver for the score is that both main and subcontractors say there is only one person to contact on each site when problems occur. Production managers have formal meetings to reflect on completed projects, but in general, subcontractors do not.

Subcontractors and production managers were in agreement through the communication difficulties section. If the two sides communicated more frequent, and developed common terms for material, construction projects could be performed more efficient. Those statements make the total score strictly positive and could hence source the implementation difficulties.

The most clear positive score comes from organisational inertia, which ranks high both among subcontractors and the main contractor. The main driver is the comfortableness with routines, which the both parties share. Responses subcontractors to other statements is quite neutral, but production managers are claiming that they are handling material today as they did five years ago, and change causes problems.

4.4. Semi-structured interviews with production managers, set 1

Seven production managers are contacted and asked to participate in an interview regarding material handling. All production managers agreed to participate, but three of them suggested other project members to be interviewed instead. The production managers motivated these suggestions by explaining that they themselves had delegated the responsibility of handling the material to said project members. Hence, the interviewees consist of four production managers, two project managers and one foreman. All seven are
ultimately responsible for reviewing the handling of materials in their respective projects.

In the table found below ‘Positive’ means the interviewee displayed a clear belief towards that a particular source of implementation difficulties is causing trouble. ‘Negative’ hence means that the interviewee displayed a clear disbelief towards a source of difficulties. If nothing is stated, no clear beliefs were shown. When summing up, each ‘positive’ equals 1 point, whereas each ‘negative’ equals -1 point.

Table 4: The interviewees’ opinions on the source of the implementation problems.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewee 1</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 2</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 3</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 4</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 5</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 6</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Interviewee 7</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

As shown in the table, interviewees do not believe communication difficulties are to blame for the lacking implementation of new logistics systems. Four participants explained that communication works well, both with subcontractors and especially with the logistics department. The two positive responses referred to the lacking communication between production managers and subcontractors. Two of the interviewees that said communication with subcontractors worked well, also mentioned that it is because of the local area. In their experience, communication and collaboration is tighter in smaller towns, where suppliers are few, on contrary to big cities.

Out of seven interviews, one had experienced that information got lost among large amounts of emails, and provided an example. A foreman had been sent information from a supplier, with the intent to share the information within the project. The mail had gotten lost, including the information. The same interviewee also thought that meetings taking too much time. One interviewee did not believe at all that communication was ineffective. The remaining objects remained indifferent, and so did the summation.

Organisational inertia was without doubts the factor in which the interviewees showed the most consensus. Six out of seven clearly believed organisational inertia to be an obstacle when implementing new logistics systems. A few
arguments arose during the interviews: Some interviewees thought the current systems are working well enough and did not need improvement. There were a few cases of explicitly saying that change is difficult and wastes time. Two production managers had experienced situations where they had tried to implement new logistics systems, but had been met with reluctance and scepticism for no real reason. There was one example given of a foreman who did not want to start using Excel to send data to a third party logistics company, as “he had never done it that way before”. One production manager mentioned the connection between age and inertia.

Questions regarding power imbalance also raised a lot of opinions. Some claimed that there was a clear power imbalance between Skanska and subcontractors, and that could cause interference. Others agreed to that there was an imbalance, but that it is needed to implement new logistics systems. In the same manner, some production managers said they do not have any significant amount of power over subcontractors, as some areas have very few suppliers and needs them to be treated well to stay. They were not sure whether it affected implementation difficulties or not. All in all, three managers said power (whether its too much or too little) is likely to be the cause of the difficulties, and just as many said that power imbalance does not cause logistic difficulties.

Two out of seven believed lack of understanding could be a cause of the implementation difficulties. However, they did not experience that their boss or subcontractors lacked understanding, but Skanska’s logistics department. According to the two production managers, the department wanted to implement logistics systems not suited to the situation.

The two negative responses on knowledge management are based on the production managers’ way of delegating responsibilities and acquiring knowledge from other production managers. Some PMs had never heard of the successful implementation cases, and some perceived their responsibilities to be too many. These reasons make up the four positive responses. One production manager said that production managers and foremen are very good at adapting to the quick changes (delayed delivery for example) that happens on site, but not so good at later finding the source of the problem. Since no actions are taken, it is not unusual that the same problem occurs again.

Two out of seven PMs would prefer the subcontractors to participate in potential new logistics systems, despite they could not find a reason to do so
from the subcontractors’ perspective. Three negative responses were based on that the production managers could pin point to win-win-situations. On one occasion a production manager had offered to pay the subcontractor the costs associated to the implementation. But there were also situations where the subcontractor had negotiated “free” (the cost is likely included in the price) delivery with their suppliers. Skanska then tried to make the subcontractor pay for terminal usage, and in other words let the subcontractor pay for delivery twice.

All four responses believed there is a more conservative culture in construction, but only half of them said it would cause a problem. The other half instead said that the culture indeed is conservative, but it also makes the workers loyal and prone to commit to projects, even if it meant new logistics.

4.5. Semi-structured interviews with production managers, set 2

The second set of interviews was carried out with the same interviewees, with the exception of two. Based on the previous experience, the undersigned judged interviewee 6 and 7 not to have sufficient knowledge to answer the questions of the second set. Interviewees 1-5 agreed to participate in the second set of interviews.

During the interviews, the main problems from chapter 4.3 were discussed. Eight situations/statements on how to overcome the problems were also presented and discussed. The statements are listed in table 5. Please note that the statements were not presented literally as they are listed, but rather in a natural and unbiased way.

<table>
<thead>
<tr>
<th>#1</th>
<th>I am prepared to communicate more to increase cooperation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2</td>
<td>The increased communication should be done by phone.</td>
</tr>
<tr>
<td>#3</td>
<td>Informal meetings should be made formal.</td>
</tr>
<tr>
<td>#4</td>
<td>Double loop-learning is a good way of dealing with organisational inertia.</td>
</tr>
<tr>
<td>#5</td>
<td>By making sure everyone understands the change, inertia will decrease.</td>
</tr>
<tr>
<td>#6</td>
<td>A good way of retaining knowledge would be meetings with feedback after each finished project.</td>
</tr>
<tr>
<td>#7</td>
<td>These meetings should also include suppliers.</td>
</tr>
<tr>
<td>#8</td>
<td>I believe seminars are a good way of sharing knowledge.</td>
</tr>
</tbody>
</table>

Table 5: The second set of interviews contained these statements in some form.

The interviewees’ opinions and attitudes were noted on these statements. As with the previous set of interviews, ‘Positive’ indicates that the respondent
showed a positive attitude towards the specified situation/statement, and ‘Negative’ indicates a negative attitude.

Table 6: The interviewees’ opinions on measures to be taken to overcome implementation problems.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
<th>#6</th>
<th>#7</th>
<th>#8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>2</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>5</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
</tr>
</tbody>
</table>

| Sum | 3 | 0 | 1 | -2 | 3 | 5 | 2 | 4 |

Several production managers thinks more communication would make cooperation, and in turn, logistics easier. The other two claim that communication would of course not make things worse, but they cannot see how things would improve either.

Only one production manager believes telephone would be the way to increase communication, and motivates his opinion by saying that it takes less time than meeting, but it still does not get lost in the e-mail inbox. Saying that telephone communication is informal and it is hard to backtrack decisions taken on phone motivates the negative response.

All production managers agreed that informal meetings are risky, especially when it comes to decision-making, and making them formal would reduce the risk. However, three of the managers say that it is not a possible approach to take, as it would waste time to gather every involved party to make a formal decision, time that does not exist. One respondent says, although he agrees with the pros of having a formal meeting, there is no need for him to make informal meetings formal. Instead, he quickly documents his informal meetings either by recording the conversation or by making quick notes. Several respondents say that despite its riskiness, informal meetings have their pros: conclusions and decisions are made quickly without wasting time.

In general, people are not open towards double-loop learning. The concept is perceived as difficult, the managers do not believe the way of working could be carried out in an effective manner.
There are mostly positive opinions on reducing inertia by understanding. Two production managers had experience from carrying out a change, and both of them focused on making sure everyone was on board with the idea. One of the two gave an example on how he let subordinates decide minor things to make them feel as the change “was theirs”. One production manager claimed he grasped the importance of understanding, but could not see how it would make the difference in big changes.

All production managers believed having final meetings after a finished project would help retain the knowledge gained during the project. Some said they are already having it, others that they know they should, but did not take the time to. One production manager claimed that final meetings are a part of Skanska’s guidelines on how a project should be carried out.

Most production managers could see the benefits of inviting the main subcontractors to these meetings, as they do indeed affect the handling of materials. However, there were opinions that it would be cumbersome and difficult to arrange these meetings if too many people were involved. One manager saw the benefits, but did not think the subcontractor would, and was probably not going to show up. The answers regarding who would be in charge of arranging these meetings ranged from delegation to foremen and the logistics department to that this responsibility was impossible to give to anyone except the production manager.

The idea of having seminars appealed to most production managers, and several said that they believe it would be easier to learn from someone who has been in the same situation, compared to someone from the logistics department. They would also be prepared to share their own experiences on meetings with others, provided their regular work would not suffer. One of the interviewees thought that the people needing these meetings the most would also be the ones not bothering to visit. One interviewee said he is part of “K2”, which is a group of production managers made solely for sharing ideas. Another interviewee said he already uses an online forum for sharing knowledge, called VBB.
4.6. Results summary

The case company, Skanska, is a very large Swedish main contractor. Just like the industry in general, the organisation is very decentralised, with the production manager being ultimately in charge in every project. Skanska is aware of the pending logistics problems and have developed several tools for handling materials in a more efficient way.

The main obstacles for implementing these tools experienced by production managers and suppliers are, in descending order:

- organisational inertia
- communication difficulties
- poor knowledge management.

The first set of interviews showed that organisational inertia, poor knowledge management and lack of understanding brings trouble. Communication was by the interviewed production managers not assessed to be an obstacle.

The second set proposed that several means would be suitable for overcoming the difficulties. In descending order, these means are:

- have formal ending meetings with the purpose to retain knowledge
- share the knowledge gained through seminars together with other projects
- focus more on understanding with internal and external project members
- increase communication
- include external parties in the knowledge retention meetings
5. Analysis

The empirical results is linked to the theoretical framework to support and refute theories and statements. Answers are sought to the research questions by connecting the two parts. First the paper is discussed in general. Then the analysis of possible implementation difficulties starts, followed by analysis of suitable measures to be taken to reduce the difficulties.

5.1. General analysis

As the problem analysis reveals, there are severe problems related to logistics and materials handling within the construction business. As long as these inefficient ways of dealing with logistics are in use, money and time is wasted every day. The problem is of high priority. Large contractors do possess a few tools and improvements to the materials handling. Some of them have been proven efficient, such as joint replenishment, which has shown positive numbers in every project undertaken. But the industry still clings to the old, ineffective ways. As mentioned before, studies has shown that a large main contractor has the most possibility to affect the supply chain (Vrijhoef & Koskela 2000). Above-mentioned facts motivate the research questions and thesis in general. The need for urgent change justifies the angle of starting from a large main contractor.

5.2. Mapping of implementation difficulties

Just as mentioned in the theoretical framework, the implementation difficulties are intertwined. In reality it is very difficult, if not impossible, to sort them out. For example, Friedman (2003) suggested that increasing the understanding should decrease organisational inertia. By utilizing knowledge retention meetings (as a part of knowledge management according to Davenport and Prusak 1998) understanding is likely to increase. But Carillo et al. (2004) found that culture is the biggest obstacle for implementing a knowledge management system. As shown, all topics relates to each other.

Following the reasoning above, one could argue that the first research question (What are the obstacles for implementing a new logistics system in the construction business?) have somewhat lost its purpose, as all the difficulties are really just one big problem. Instead, the undersigned argues that the first research question points to where the one big problem should be attacked.

Below, each of the eight possible implementation difficulties is analysed.
5.2.1. Lack of communication

The questionnaire is clear: lacking communication does lead to implementation difficulties. However, the interviews just as clear: lacking communication is not a problem. The differing result could question the validity of the survey, and one could claim that the questionnaire did not measure what was intended. Another theory on the difference is the sample. While the questionnaire was sent to 100 random production managers all over Sweden, the interviews were limited to production managers within 1-2 hours drive from Karlstad. Two interviewees mentioned the tougher working climate in highly populated areas, as they are more competitive. It is possible that the interviews were conducted with a skewed sample, as Värmland County is sparsely populated. The conclusion that can be drawn from this information would be that lack of communication causes problems in Sweden in general, but less so in sparsely populated areas. Some interviewees should have been sampled from bigger cities and southern Sweden to confirm the theory.

Sullivan et al. (2010) claimed that the different terms and expressions for materials and quality cause misunderstandings. Out of the communication questions in the survey, this was the area that generated the strongest opinion, supporting the statement made by Sullivan et al. (2010). The survey generated similar result as the study conducted by Chan et al. (2003) where bad communication was found to be one of the major problems when implementing a new way of working (partnering).

The question regarding if software-differences is causing communication problems received a slight negative response in the questionnaire, and similar in the interviews. This does not disprove Rezgui’s et al. (2011) theory, as it simply states that IT is underused, and refers back to Nordstrand’s (2002) fragmented supply chain as the reason. It is possible that it is underused, but the production managers might not be aware of it, or realise the problems it is causing. One interviewee provided a perfect example of how organisational inertia hindered IT acceptance, as stated by Carillo et al. (2004).

Overall, the theories provided by Shohet and Frydman (2003) and Shen and Chang (2011) are supported in empiricism by the bigger sample.

5.2.2. Inefficient communication

In general, the communication was not considered inefficient in the questionnaire, although the production managers had some experience with
both meeting taking an excessive amount of time, and an overflow of emails. One of the production managers had experienced the very same thing (information lost due to receiving too many mails) as Patrashkova-Volzdoska et al. (2003) brought up. Despite the similarity with the theoretical framework, the interviews and questionnaire did not assess inefficient communication to be a major player among the implementation difficulties.

On a side note: Josephson and Saukkoriipi (2005) observed project members showing up late to meetings. The interviewees did not share their experience. Ironically, the undersigned did experience one case where a production manager rescheduled the interview with very short notice, and two cases of production managers being 15 minutes late. Maybe the phenomenon is so common that the production managers do not notice.

5.2.3. Organisational Inertia

The structural inertia was the clearest reason, both in interviews and questionnaire. The answers of the production managers were the most obvious, and they seemed to have bad experiences from change. Even though the answers were not quite as obvious among the subcontractors, they also showed signs of inertia. The comfortableness with routines is one example. That heavier inertia is found in Skanska than in the suppliers’ organisations can be derived from Hannan and Freeman (1984). As Skanska is a bigger and older/more stable organisation than most of its subcontractors it is only reasonable that Skanska experience more inertia. One could believe that the decentralisation emphasised by Nordstrand (2002) would lower the inertia within the sub-organisations, but this does not seem to be the case. Kim (1993) argued that decentralised organisations with poor networking capabilities would have more inertia, as the wheel must be reinvented in every sub-organisation. From these arguments it is understandable that Skanska, and other large main contractors, experience heavy inertia, as they are all big organisations with low interaction. That the logistical tools developed by the logistics department usually brings a cost and/or a workload in the short term does not make things easier. This is emphasized by Ahrne and Papakostas (2002) and expressed as superstitious understanding by Kim (1993).

There was no age perspective on questions in the interviews or the questionnaire. But as the survey answers were consistent and age was barely mentioned in any interviews, one can assume that age matters little for inertia. Allcorn and Godkin (2011) mention the comfortable zone. As younger
workers, or people new to the industry would not yet have such zone, they should be less resistant to change. It is possible that the newcomers simply inherit the comfort zones of their supervisors throughout the apprenticeship, as age does not seem to affect inertia.

The theory provided by Hedberg and Ericson (1997) regarding insight and action inertia gains support by the interviews. Some production managers has not yet realized there is a change for need, other have realized it, but does not act on their insight. A few production managers tried to take action, but could not make their ideas heard among co-workers, which correspond perfectly to the audience persuasion difficulty provided by March and Olsen (1975). March and Olsen’s role constriction factor also makes sense in the context, as there is a clear hierarchical structure and solely the production manager is in charge.

Half the respondents to the study by Carillo et al. (2004) perceived organisational inertia to be a problem when trying to implement a new system. The high number corresponds well to the empirical results.

5.2.4. Power imbalance

In total, the interviews provided similar result as the questionnaire. What is interesting is the difference in questionnaire answers from production managers and subcontractors. The production managers say they to a large extent treat subcontractors kindly, whereas subcontractors are not so sure they are being treated well. This shows very well how diverse respondents perceive situations different, and points to the lacking objectivity a questionnaire comprises.

It is no surprise that the smaller contractors are feeling somewhat used, as it corresponds well to the studies of Cox and Ireland (2002) and Agapiou et al. (1998). However, the results were in no way as extreme as in the case by Dainty et al. (2001).

The questionnaire takes the focus on how implementation is difficult due to the power exploitation by the main contractor. The results were slightly positive. By using Rudberg’s theory instead, that the main contractor must exploit their power to create an efficient supply chain, one could argue that the questionnaire result is the opposite. In a situation where suppliers had a low questionnaire score and felt treated well, the biggest problem could occur. In the current situation, where the result is slightly positive, could instead mean that there is a slight opinion that power imbalance does not cause a problem.
However, as the result was relatively close to zero, there is no major problem related to power imbalance, regardless of which theory is used. There is also a third way of interpreting it: a score close to zero indicates that the power is not used enough to benefit from Rudberg’s theory, but the relation is neither fair enough to receive the benefits Cox and Ireland (2002), among others, pointed to. Following this slightly farfetched reasoning, a score close to zero would indicate the biggest problem.

In traditional contracting forms the main contractor is the customer of the subcontractors. In those cases Skanska can specify in contracts what exactly is expected of the subcontractor, which obviously gives the main contractor more power. But when working in a partnering project (explained by Erik Larsson 1997 in chapter 3.1.3) no actor is above others. As partnering is expanding in popularity, it shows that it is possible to work in a project without power imbalance.

The hierarchical structure within most large contracting firms affects the way logistics systems are implemented. The decentralized nature makes district and regional managers somewhat disconnected to the actual projects and have little insight on how material handling should be dealt with. On the other hand, the logistics department are working solely on making logistics efficient. But as the logistics function is one of the support functions outside of the hierarchical ladder, they have no power to force implement their findings. Again, it is all up to the production managers.

5.2.5. Lack of understanding

The results from the survey are very clear: the subcontractors understand the main contractor and vice versa. This corresponds very well with Lindén who clearly stated that all parties have been in the business long enough to have full understanding of one another. Simultaneous, Dainty et al. (2001) is rejected as they stated the opposite. However, the interviewees are not quite as convinced. There were few clear opinions, but two of the production managers revealed an entirely new perspective. They do feel that the subcontractors understand them, but that it is the logistics department that does not. The two production managers have experienced the logistics department suggesting logistics solutions that are unsuitable for their particular project.
Bushnell (1999) gave example of management trying to implement something they did not thoroughly understand, but that this happened to a specialist department was a new angle. As the new angle was not discovered during the literature review, it was not part of the questionnaire. However, as it was only two out of seven interviewees who brought up this matter, it is not very likely to be a major concern. It would of course have been an interesting perspective to have in the questionnaire though.

Bushnell (1999) and Svensson provides yet another example of how the implementation difficulties are related. Both mention situations where lack of understanding leads to scepticism and reluctance, which is typical for the organisational inertia. Ironically, organisational inertia was, according to the empirical studies, the most likely implementation difficulty, whereas lacking understanding was the least likely.

The extreme result could come from the self-assessing nature of the questionnaire, that everyone is convinced that they themselves have full understanding. It is not surprising to achieve such a result, but unfortunately, it makes the validity of the study lower. But whether or not the score is accurate matters little in this case, as all actors agreed that they understood one another. The studies by Chan et al. (2003), Dainty et al. (2001) and Sobotka et al. (2005) does not correspond to survey results, regardless of if the score is exact or not.

5.2.6. Poor knowledge management

Both the respondents to the interviews and questionnaire perceived the knowledge management to be bad. The clearest argument is that few people have too much responsibility and tasks. The interviews explained that the production managers are ultimately responsible for most things in a project. These answers support Rudberg’s statement, and also emphasises the hierarchical structure of the construction industry. What goes against the decentralised nature of the construction industry is that both subcontractors and production managers claimed they sometimes contact people from other projects for guidance.

Production managers tend to have a final meeting at the end of every project to retain knowledge, on contrary to subcontractors who usually does not. Nordstrand (2002) highlighted the project based work form that characterizes the construction industry. It is possible that the suppliers do not perceive their
work as project based to the same extent, and would hence not have use for any concluding meetings.

During an interview, an example of a situation similar to Carillo et al’s. (2004:53) quotation surfaced: Production managers are very good at adapting to sudden problems occurring on site (ad hoc-planning emphasised by Svensson and Agapiou et al. 1998). But as soon as the problem is temporarily solved, it is forgotten, and the source of the problem is never examined. The risk for it to happen again is not reduced.

Bowers-Brown and Berry (2005) provided a situation where poor knowledge management is shown: there is an obvious and wide knowledge gap between the know-how of the experienced workers and the holistic knowledge provided by the university-educated staff. A good example of a situation like this is the logistics department versus production managers addressed in this very thesis. Well-educated workers at the logistics department has come up with ways of making logistics more efficient, but is not greeted with happiness among production managers with extensive experience and practical knowledge. This clear knowledge gap has shown itself throughout the other implementation difficulties as well.

5.2.7. Adversarial relations

The survey and the interviews generated the same result. In the questionnaire, production managers and subcontractors agreed on all questions except the one regarding traditional procurement. It is not very surprising as traditional procurement usually maximises the short-term profit for the buyer, and minimises the profit for the seller. Furthermore, the 4-7 % of turnover spent on offering (Dubois & Gadde 2000) makes this method unpopular among subcontractors. The main contractors are in the very same situation when it comes to offering for projects, but the production manager is not very involved in this phase, which could be why they mostly have positive views of traditional procurement.

As Akintoye et al. (2000) found, both the main contractor and subcontractors prefer lasting relationships, which corresponds well with the questionnaire. The questionnaire also showed that both actors puts more focus on making their own firms profitable, and less on making the total value chain profitable, which is in accordance to Berggren et al. (2005). However, the interviews showed several exceptions. For example, one production manager had paid a
subcontractor’s fee connected to the advanced logistics needed for a project. It could also be that the two parties had the same goal in this particular situation, on contrary to the situations provided by Thomson et al. (1998). But then again, the interviewees are sourced from the same geographical area, where there is a limited supply of subcontractors. The exceptions from the interviews might not be representative for the country in general.

An example of the ineffective purchasing explained by Dubois and Gadde (2000) and Shohet and Frydman (2003) is brought up in one of the interviews. The main contractor is suggesting the use of joint replenishment, which in practice would mean that the subcontractor paid twice for the same delivery.

Bresnen and Marshall (2000) blames the dysfunctional relations on the project-based work form and short time spans emphasised by Nordstrand (2002) and Sullivan et al. (2010), and claims that there is no time to get to know each other. This perspective was not brought up in any interviews. It is possible that the limited amount of suppliers in the area the interviews was conducted makes long term cooperation easier, and the project based work form less obvious.

5.2.8. Conservative culture

Culture is very diffuse to discuss. It covers all the above areas, yet it is difficult to pinpoint. Pocock et al. (1996) relate the culture to Nordstrand’s (2002) example of the fragmented supply chain, when Vrijhoef and Koskela (2000) bring up the adversarial relations again. In the studies examined in 3.3.8, many say that the culture of the construction industry is conservative and out-dated, which also seems to be the accepted view (Carillo et al. 2004; Pocock et al. 1996; Rudberg). Yet, there are others saying there is no reason that the construction industry would be more conservative than other industries, and no studies have shown that the people within construction would be more conservative than others (Chan et al. 2003; Josephson & Saukkoriipi 2005).

The studies claiming that the industry is more conservative are often based on perceptions and opinions. That the culture has been listed as a problem in studies is mainly because the participants in the study have listed it as a problem.

This subjective way of measuring returns in the questionnaire of this thesis. Both production managers and suppliers agree on that they perceive the construction industry as conservative. But suppliers are more convinced that it
is just an excuse for working in an inefficient way. This could be because suppliers might have insight from several industries, whereas the production managers have maybe only been active in construction, and perceive that culture as natural.

In general, the questionnaire went hand in hand with the interviews. One aspect that was brought during an interview was that the culture could have a positive effect on materials handling. One production manager said that the loyalty that is found within the culture is strong. This loyalty would then come with many benefits that another culture maybe could not. That is an interesting angle that was not brought up in the questionnaire and could be subject for further studies.

5.3. Overcoming the difficulties

Needless to say, there is no quick fix for the existing problems. The construction industry has been struggling with the difficulties for a long time. However, the thesis aims towards a viable solution that is possible to carry through in the short term. Suggesting implementing lean construction or a concern wide IT-system (Rezgui et al. 2011) would most surely increase the performance, but then we are stuck with another problem: how should a huge IT-system or a lean philosophy be implemented? Instead, this thesis is aimed towards the smaller part-solutions that might not save the full 10 % Bertelsen (1993) suggested, but are instead easier to carry through.

Just as changes in general, organisational inertia is difficult to deal with. And just as the other problems the industry is fighting, there is no quick fix for the inertia either. Maybe the changes need to take time. Wenger et al. (2002) said that changes should not be rushed, as the result will be affected negatively.

Throughout the paper organisational inertia has been treated as something bad. That is not entirely true. Hannan and Freeman (1984) related inertia to how stable an organisation is. Allcorn and Godkin (2011) connected inertia to comfortableness. And stableness and comfortableness could indeed be positive aspects as well. The problem occurs when the environment is changing, and the organisation is too stable to change with it. It is a vicious circle. Like Argyris and Schön (1978) and Diamond (1986) that suggested double loop learning. It was not popular among the production managers, as it is a change in itself, which is in accordance with Allcorn and Godkin (2011).
The few projects that have implemented a new logistics system are likely to have a production manager less affected by the inertia. If their personalities match Friedman (2003) is not known. But what is known is that they are, according to Frohman (1997), likely to be rare within the organisation. Almost all production managers were in accordance with Carillo et al. (2004) and believed that seminars is a good way of sharing and gaining knowledge with other production managers. Why not let the production managers from the few successful implementations share their story? On a quick side note: one production manager provided another example of the vicious circle of organisational inertia. The managers that resist change the most are the ones most likely to skip these seminars.

Surprisingly, two production managers mentioned two different, existing platforms for sharing knowledge. According to Carillo et al (2004) this is not as effective as it could be. When there are several different ways serving the same purpose, there is a risk the information ends up only in one of the places, or the user could be confused.

Friedman (2003) suggests a series of steps to increase the understanding of the parties involved in the change. As several production managers seem to believe in this theory, it might be a way of handling change. Mutual understanding could indeed be useful, especially considering the knowledge gap acknowledged by Bowers-Brown & Berry (2005). The first set of interviews revealed that the logistics department lacks understanding sometimes. It is possible that focusing on understanding and “reality checks” during the meetings with the logistics department could lower the inertia.

Both the literature and the production managers say that communication is lacking. (Patrashkova-Volzdoska et al. 2003) found that having too many meetings leads to a worse performance. This relates to how production managers in interviews said that having more meetings would take up too much time. Daft and Lengel (1986) claimed that uncertainty and lack of information is a lot more common than equivocality and misinterpretation within construction. Such a problem should not need meetings to be solved. When it comes to simple information sharing (delays etc.) e-mail or a phone call should work fine. However, the production managers are not very fond of either idea, as many of them already spend more time than preferred on mailing and ringing. The theory regarding curvilinear relationship between communication and performance makes itself felt again (Patrashkova-Volzdoska et al. 2003). A simple real time IT-system could probably solve the
problem with transport bookings and changes. But then again, construction is behind is this area, and there would still be the problem of organizational inerta (Rezgui et al. 2011). More communication might not be such an easy fix after all.

According to the interviews, there is apparently some sort of standard within the case company that there should be final meetings to retain knowledge after each project. However, several production managers did not carry out such meetings, as the time was short. This response is foretold by Davenport and Prusak (1998), who claims that despite the time consumption, meetings for retaining knowledge should still be arranged, as it saves time in the future. But at least the managers seemed aware of the importance. Kamara et al. (2001) suggested that external project members should participate as well, which production managers in general had a positive attitude towards. There were also thoughts that external parties would not be interested, as it was not as much of a concern for them. This reasoning corresponds well to Pocock et al. (1996). Production managers agree with Carillo et al.’s statement that a single person should be given the responsibility for these meetings. Hopefully this responsibility is delegable, as production manager often have more than an optimal workload. The proposal regarding giving the logistics department this responsibility provided a new angle not found in the framework.

When it comes to informal meetings, several production managers do not agree with Chang and Shen’s (2009) statement that the informal meetings does not lead to their intended goals. Instead, they think the goals are reached quickly compared to formal meetings. But they do however see the riskiness with the inability to backtrack decisions that Shohet and Frydman (2003) pointed to. The conclusion that can be drawn here would be that it is difficult to remove informal meetings, but the decisions taken should at least be brought up the next formal meeting. After all, the point of a decision is harshly reduced if co-workers are not aware of the decisions made.
6. Conclusion and further studies

This chapter concludes the thesis and summarises the major findings. Areas for further studies are suggested. The chapter and thesis ends with a final reflection from the author.

6.1. Conclusion

Although the logistics of the construction industry is extremely inefficient, it is not only a logistical problem, but also a pedagogical problem. The developed tools for increasing efficiency are not accepted in practice. By studies performed quantitatively and qualitatively, the major problem has been located to three different but intertwined areas:

- Organisational inertia is natural in the large and decentralised organisations that the main contractors often are. Nevertheless, it makes production managers highly reluctant to implementation of new logistics systems. Both production manager and suppliers has in the thesis been shown to be very comfortable in routines.
- Communication difficulties are the source of many troubles. Lacking communication between production managers and suppliers makes collaboration needed for implementation difficult. Poor networking capabilities further enhance the organisational inertia. Developing common terms for material and quality would be beneficial for all parties.
- Poor knowledge management leads to previously experienced problems occurs again and again. Successful implementations are not shared within the organisation. Responsibility is not delegated, limiting the production managers’ focus on implementation possibilities.

Opportunities to overcome these problems have been found. A method that is supported both in theory and empiricism is seminars (or similar) where ideas could be shared among production managers. The few “change agents” that have resisted the inertia and successfully implemented a logistics tool would be great speakers.

According to the framework, inertia will be reduced if every party involved has a full understanding of the subject, a theory that is supported by empiricism. Production managers should follow the template for gaining mutual understanding explained in chapter 3.4. This model ought to be used both between production managers and suppliers, but also between production managers and the logistics department.

Structures for knowledge retention and sharing need to be developed and emphasized. There is also the possibility to include major subcontractors in these procedures.
The cultural similarities between main contractors (Carillo et al. 2004), especially in Sweden (Rudberg; Svensson), make the findings generalizable and relevant for contractors other than the case company.

To sum up, current theories, empirical studies and analyses have been used to answer the research questions as follow:

1. What are the obstacles for implementing a new logistics system in the construction business?

The three main problems for implementing new logistics system are organisational inertia, communication difficulties and poor knowledge management.

2. How can a main contractor eliminate or reduce these problems?

Suggestions include arranging seminars where production managers share problems and solutions. The successful implementations should receive more attention. Standards for knowledge management must be developed.

6.2. Suggestions for further studies

According to the empirical results, organisational inertia was the biggest issue for implementing new logistics. But the literature review provided surprisingly little information on how to overcome that particular problem. Especially when the focus is on very decentralized organisations. It would be interesting to see more studies on organisational inertia in decentralized businesses in general, and the construction industry in particular.

The angle of the thesis has been how the main contractor can make the logistics more efficient. That angle is used as the main contractor has the overall responsibility, suffers the most among the contractors and has the biggest opportunity to affect the supply chain. But at the end of the day, it is the end customer who pays the inefficiencies in a supply chain. The end customer in construction is the project owner. Hence, it is in the commissioner’s biggest interest to reduce these inefficiencies as well. How can a project owner affect the inefficient logistics in a construction supply chain?

Throughout the thesis, the conservative culture has been seen as a problem. But during the qualitative study it was pointed out that the culture in construction also brings a lot of positive effects, such as loyalty and stability.
Another area of study would be what other industries could learn from construction.

6.3. Final words

This thesis has examined the difficulties a main contractor experiences when trying to implement a new logistics system. The major difficulties have been found, and methods for defeating these obstacles have been proposed. But what one must keep in mind is that all the results are to some degree based on perceptions from the sampled participants. Due to the case company’s similarity to other main contractors, it is likely that another sample would produce matching responses, but they are still perceptions. Exactly how well it corresponds to reality is hard to tell. But that is the nature of social sciences.

As mentioned in the thesis, some projects have successfully implemented some of the logistical tools. And as discovered in the paper, organisational inertia was one of the main factors influencing the implementation difficulties. Probably the tools are already spreading within the organisation. Maybe the problem examined is not a problem after all, if the time-perspective is just long enough. But hopefully this thesis will make a contribution to the implementation frequency of the construction industry. In the worst case, the suggested actions will just reveal the next hindrance and stop the implementations dead again. In the best-case scenario, the actions will not just reduce the intended difficulty, but also reduce several areas due to their interrelated nature. How big of an impact this thesis will have in the end, only time will tell.
7. References


8. Appendixes

8.1. Questionnaire questions

In cases where the questionnaire differed between internal and external respondents, it is presented as “Statement to production managers / statement to suppliers”. Note that the numbers corresponds to the numbers in the thesis, but not in the actual questionnaire, as it is randomised. Questions are translated from Swedish.

1. If the main contractor and the suppliers communicated more frequent, my job would be easier to perform.
2. That the firms use different software makes my job harder.
3. When I during a project try to contact suppliers and/or subcontractors, it is usually difficult to reach them.
4. I think it would be easier to handle material, if common terms for material and quality were developed.
5. I do my best to invite all contractors and suppliers to project planning meetings that could be relevant for them. / I perceive I get invited to all project planning meetings that are relevant to me.
6. I receive mails and/or phone calls that are unimportant to me.
7. When I communicate with my boss or subordinates I never experience any ambiguities.
8. I experience that meetings I attend takes too much time.
9. I experience changes within production as free of problems.
10. The firm I work for is working with material handling the same way as we did five years ago.
11. Changes related to material handling usually requires more effort than it is worth.
12. I am most comfortable when I am working on a routine basis.
13. As a production manager, I try to please every party involved. / I experience that the production manager is trying to please everyone.
14. I perceive the large contractors to have more power than the smaller.
15. It is part of the industry that the larger firms use their power over the smaller firms, when it comes to requirements.
16. If I would take everybody’s opinion into account the project would be harder to carry through. / If the project manager would take mine and other suppliers’ opinions into account, the project would be harder to carry through for all of us.
17. I understand the time- and resource limits my suppliers are dealing with. / In my experience, the main contractor does not have understand my time- and resource limits.
18. I believe my boss has a good understanding of how construction projects are carried out in practice.
19. In my experience, subcontractors and suppliers understands the importance of keeping scheduled times. / I understand the importance of keeping the times scheduled by the main contractor.
20. Tradesmen from different contractors should help each other with tasks such as carrying and unloading materials, despite it is not their primary task.
21. When questions arise during a construction project, I am always the one people come to. / When questions arise during a construction project, I always contact the same person.
22. When a project is finished we have formal meetings to reflect and retain knowledge from the project. / When my firm’s part in a project is finished we have formal meetings to reflect and retain knowledge from the project.
23. I perceive there are people within construction that has more responsibility than appropriate.
24. When I am faced with a problem I contact people from other projects that might have been in the same situation.
25. Developing lasting relationships with contractors and suppliers would lead to lower costs for me, I think.
26. I believe traditional procurement is a good way of making business.
27. In my experience, all firms in a construction project mainly look into their own financial interests.
28. When new ways of handling materials is proposed, there is nothing in it for me.
29. I prefer others to have the responsibility for unloading and handling materials, instead of I.
30. I believe contractors and suppliers fulfil their promises, regardless if specified in contract or not.
31. I perceive innovation is harder in construction compared to other industries.
32. The conservative culture is only a way of justifying old-fashioned working methods.
8.2. Questionnaire respondents

8.2.1. Internal respondents

(All are production managers)

- Andersson Lars-Åke
- Andersson Sten-Olov
- Anheim Henrik
- Arnell Ulf
- Bergsell Joakim
- Carlstedt Carl
- Dahlström Fredrik
- Dalhed Mats
- Edensvård Jonas
- Eriksson Mikael
- Fransson Andreas
- Genz John
- Gradin Tomas
- Haglund Kristian
- Hjertquist Gustaf
- Håkansson Bo
- Isaksson Dennis
- Johander Fredrik
- Johansson Markus
- Johnsson Fredrik
- Jonsson Börje
- Lindberg Johan
- Lindborg Claes
- Lindell Kenth
- Lindén Christina
- Lindgren Per-Olov
- Lundin Björn
- Lönn Tommy
- Magnusson Gunnar
- Matthed Patrik
- Nilsson Anders
- Nilsson Lennart
- Nilsson Magnus
- Nilsson Mats
- Nissinen Petteri
- Olsson Reidar
- Olsson Sven-Gunnar
- Pegner Hans
- Persson Jan
8.2.2. External Respondents

(Names and organisations are according to the NPU database at Skanska)

- Anders, GNF
- Anders, Pretec
- Anders, Sjödells
- Andersson Magnus, Daloc
- Bernhardsson Peter, Aluman
- Björn, Miljötankar
- Bosse, Mirro
- Bosse, Prevex
- Börjesson Per, VVLBC
- Carlsson Håkan, Byggbeslag
- Christiansson Martin, Skaala
- Cumleus Torleif, Tools
- Dahl Thomas, Sprängkonsult
- Dahlin Jan-Åke, Ahlsell
- Dan, Demex
- Edwardsson Anna-Karin, Vedum
- Eva, Interdoor
- Fredrik, Betongteknik
- Gamla Jernboden
- Granberg Peter, Stavdal
- Green Jonas, Thermod
- Hammarlund Jan, Onninen
- Hamrin Anders, Birsta
- Holmlund Lisa, Kährs
- Håkansson Rikard, Ekströms Trävaru
- Jacobsson Ola, Comphiss
- Jakobsson Mats, Benders
- "JL", Brukspecialisten
- Jonsall Anders, SPFönster
- Kallenberger Rüdiger, Ilmonte
• Kenneth, ZC
• Källberg Anna, Lappset
• Lager Peter, Viacon
• Lars, Perssons Träteknik
• Lindell Anders, Optimera
• Lindhe Robert, Myresjökök
• Lundgren Seth, Kojapo
• Lycke Per, Alu-S
• Lyding Jan, Nexans
• Lövsågen
• ”M”, Dalahus
• Malin, Haucon
• Martensson Fredrik, Sydsten
• Martin Arne, Nordan
• Mats, JJ-Gruppen
• Matthias, Ventisol
• Michael, Constella
• Mårten, Ergosafe
• Olof, Granab
• Olsson André, Velux
• Otto, Elkington
• Peo, TimHyrUt
• Per, Holgers
• Peter, Berlex
• Peter, EBH
• Petersson Olof, Träförädlingen
• Pär, Interni
• Rapp Christer, Lindab
• Ringström Michael, Elektroskandia
• Stefan, Slottsbro
• Strehlow Kai, Sundolitt
• Strundfuss Thomas, Würth
• Ström Thomas, Specialgardiner
• Ståhlgren Hasse, lnwido
• Svefors Jonas, Paroc
• Swärdhammar Jimmy, Beijer
• Tejbrant Göran, Team Tejbrant
• Thomas, GSH
• Tommy, Swedsign
• Törnkvist Göran, Byggmaskiner
• Ulf, Rentex
• Vedin Peter, Nordströms
• Venhammar Mats, Spectra
• Ygemar Ulf, Bordörren
8.2.3. Missive

The following missive was attached to the questionnaire requests. The sender e-mail address was connected to Skanska. (Translated from Swedish)

Hi production manager!

Currently there is a survey taking place, examining how Skanska is working together with their supplier, when it comes to materials handling and related areas. Therefore, you as a production manager have a very important role in the survey. It is your opinions that show us what we are currently doing well, and where there is room for improvement.

The survey consists of check-questions and takes 5-10 minutes to do. For best result, try to answer in an honest and spontaneous way. The responses are treated anonymously. Click the link below to start the survey.

[Link]

If you have questions you are welcome to contact me on [e-mail address] or [phone number].

Kind regards

Erik Johansson, in cooperation with Karlstad university

Hi supplier!

Currently there is a survey taking place, examining how Skanska is working together with their suppliers of materials and contracts, when it comes to materials handling and related areas. Therefore, you as a supplier of contracts or materials have a very important role in the survey. It is your opinions that show us what we are currently doing well, and where there is room for improvement.

The survey consists of check-questions and takes 5-10 minutes to do. For best result, try to answer in an honest and spontaneous way. The responses are treated anonymously. Click the link below to start the survey.

[Link]

If you have questions you are welcome to contact me on [e-mail address] or [phone number].

Kind regards

Erik Johansson, in cooperation with Karlstad University
8.3. Interview protocol unstructured expert interviews

Discussion topics and responses are translated from Swedish.

8.3.1. Topics of discussion

- Your research/profession
- My thesis work
- Characteristics of construction logistics
- Main problems connected to logistics
- The cause of these problems
- The fragmented supply chain
- Problems connected to trust and understanding
- Incentives for dealing with logistics
- Holistic view, from the perspective of the main contractors and subcontractors
- Integrating the subcontractors in the supply chain
- Cooperation in Sweden and other countries
- Other opinions

8.3.2. Samuel Lindén, Operations manager Bygglogistik, 2013-02-08

Lindén is an operations manager for the company Bygglogistik (Construction logistics). Except for a master’s degree on the subject, he has spent many years working solely with construction logistics.

The uniqueness of the projects characterises the logistics. Many solutions are for one project specifically, and the problem must be solved again the next time.

The planning is extremely bad when it comes to handling materials. Often materials are ordered the very same day, or the day before they are needed.

In construction few people have a lot of responsibility. The production manager, who is responsible for the construction in general, also has the rather specific responsibility for the logistics. In manufacturing there is usually a role for handling logistics.

Lindén mentions the culture, where doing the same thing as usual always is accepted. If the production manager would try something new and it would fail, the manager looks bad, in comparison to just play it safe.

There is no lack of understanding in the business, the actors have been there long enough to understand each other. It is more likely that tight schedules
cause delays. Instead there is a lack of knowledge connected to hiring logistics consultants. In the papers, it will appear as an extra cost, even though the production managers probably saved money on less wasted time. But it is the extra invoice that makes it seem more expensive.

Often the tradesmen’s time is not valued. Educated plumbers may be forces to carry materials or sweep the floors. In Lindén’s experience subcontractors does not care about quality to a very large extent, as the industry is not dependent on brand reputation. The tenant who eventually uses the work of the plumber has no idea who installed the leaking sink. The plumber and his firm are too far up the supply chain to even be noticed about the error. Tradesmen do not care very much for customer relations, and there a larger acceptance of “shit happens”.

There is very little common terminology, which Lindén believes causes a lot of trouble. But apparently there are organisations working for standardisations. Until then, communication is key, both internally and externally.

Lindén concludes by saying that even though the logistics is terribly inefficient, people are much more aware of the problem now than five years ago.

8.3.3. Martin Rudberg, Professor in construction logistics, 2013-02-19

Rudberg is a professor in construction management and logistics at Linköping University.

In his research Rudberg has noticed that one of the core problems is that production managers have too much power. This leads to problems when trying to implement new logistics. The main contractors in Sweden have different approaches to this. According to Rudberg, Skanska uses a bottom-up approach, teaching new logistics direct in projects. Peab on the other hand, tries to convince various managers to implement new logistics and hopes it spread through the organisation. Peab, NCC and Skanska all have these implementing problems.

It is very difficult to unite the supply chain. Rudberg says that subcontractors do not want to give up their deliveries to the main contractor. If they did, they could loose the quantity discounts with their supplier, and the profit from the delivery cost would also be lost. According to Rudberg, the main contractors
should be able to use their power to create a more efficient supply chain, and mention the way Volvo is handling its supply chain.

The defragmented supply chain in combination with tight project schedules makes it hard to retain the knowledge between projects, which is a big problem.

Rudberg have experienced that the major actors are more accommodating now than past years, and it is obvious that they have discovered the inefficiencies.

8.3.4. Jon Svensson, supply chain specialist Skanska, 2013-02-06

Svensson’s job as a supply chain specialist at Skanska is to encourage the production managers to review their logistics systems, as they are inefficient. Svensson makes parallels to the automotive industry where the supply chain works better. The first tier suppliers to the original equipment manufacturer (OEM) is usually located nearby, and the OEM does not need big stocks as the materials are delivered just-in-time. If the suppliers fail to deliver in time, the supplier has to pay a penalty of huge sums of money for every delayed hour. This forces the first tier supplier to keep big stocks.

The construction industry does not charge these fines. Therefore production managers order materials in advance to make sure it will arrive in time, as the project owner still charges Skanska a fine for delays. This leads to massive amounts of materials on site.

Deliveries can be ordered to a specific date, but it is expensive to order a specific time, Svensson continues. It is also expensive to order with a specific kind of truck (removable roof for example). Often transports are scheduled with very short notice, making it impossible for the transporter to fulfil the demanded time and type of vehicle.

The project is planned to build to get “tight house” as soon as possible, to be able to store material indoors. To build “tight house” there is several different materials needed with short intervals. Sometimes they arrive in the wrong order, forcing worker to move and remove materials on site.

Every project work as their own firm. When something goes wrong with a delivery, the project manager reschedules ad hoc to make the best of the situation. However, the cause of error is never checked, and the very same mistake might happen again.
Svensson explains the tools he and the logistics department has developed to deal with the problems.

First joint replenishments. As the amount of deliveries to site pose as one of the main logistic problems, joint replenishment seeks to reduce the number of arrivals. A short distance away (usually less than 20 minutes) is a terminal located. In this terminal space is rich, on contrary to most construction sites. The ordered goods of Skanska and subcontractors are delivered to the terminal a few days before the goods are needed on site. Here the wares are repacked. Instead of having all windows loaded on one pallet, tile on another, plasterboards on a third and so forth, pallets are loaded chronologically. All windows, tiles, and plasterboards needed on the first floor are loaded onto pallet number 1, and everything needed for the second floor are loaded onto pallet 2.

In the terminal the unloading capabilities are plenty, and the reload can then be onto a vehicle that suits the site. If a pallet is needed on the eighth floor, a truck with a removable roof, allowing cranes to hoist straight from the truck, will deliver it.

The terminal is run by a third party logistics company, with which Skanska has a close cooperation. The logistics company keeps track of which materials should be delivered to site on specific times, and if the terminal has not received these goods on time, they call straight to the supplier. If everything is solved, nothing happens from Skanska’s point of view. However, if something has gone wrong, the supplier is not ready on time for example, the terminal contacts the construction site to let them know of any irregularities. Skanska can then adjust the schedule. The phone calls to Skanska are kept to a minimum, no time needs to be spent on chasing materials, and eventual delays are reported as soon as possible. For urgent needs there is still the option to send a truck or delivery van straight from the supplier to the site.

The deliveries from the terminal to the construction site can be scheduled in detail. By concentrating the deliveries to site to a few hours a week, a wheel loader can be rented for those specific hours. Tradesmen spend the specified hours on unloading, and can continue their work uninterrupted during the rest of the week.

Note that projects using joint replenishments are charged with a cost, depending on to what extent the service is used. Though, at the end of the day
the investment has been shown to be profitable. There are a few projects that have been using joint replenishment to some extent. When constructing the frames of a building, 39% of unloading costs were saved. Another construction site used joint replenishment for a share of the material throughout the project and managed to save 0.6% on the total production cost.

Then the coordinator is explained. Some construction projects features a coordinator, whose task is to keep track of where and when deliveries will arrive. In smaller projects, the production manager or a foreman could take on the role as the coordinator, whereas in larger projects there could be one or several people just coordinating. When a truck enters the site, the coordinator will be prepared for it, and have someone ready to unload the goods, allowing for a swift arrival and departure for the truck. The coordinator distributes information regarding delayed or damaged goods to relevant personnel.

A prerequisite for this tool to work is that the coordinator is reached by all information regarding delays or reschedules, both from the construction site and the suppliers.

And last the interactive calendar is explained. An online calendar has recently been developed and will soon be taken into use. The main function of the calendar is to provide the construction site workers with a visual overview of incoming transports. The calendar features colour coding for different unloading zones and types of transport. This calendar will be available for Skanska’s personnel without charging the project with a cost.

Svensson finishes his explanation.

Svensson says Skanska is not very good at spreading the knowledge gained from the few successful projects. But Skanska do have a forum or similar, called Best practice, where ideas and solutions can be shared.

Svensson talks about Incoterms, and which party is responsible for each delivery. A large part of the deliveries are contract-bound to be delivered on site, in accordance with incoterms.
8.4. Interview protocol semi structured interviews, set 1

Questions and responses are translated from Swedish. Recordings of full interviews are available upon request.

8.4.1. Interview guide

- What is your background? Education/career?
- Have you heard of any of the logistics tools Skanska has available? How?
- Are you in charge of whether to implement these tools or not? How much is the foremen or project manager influencing? And the logistics department, do they have any power? Can anyone tell you what to do?
- Who have you been in contact with about these tools, and who convinced/tried to convince you to use them?
- What do you think would be the hardest part of the implementation? / What was the hardest part?
- How has the communication with the logistics department worked? Was it frequent? Who was driving it? Were you fed with all the information you needed, or did you have to search/ask for it?
- Did you have meetings regarding this? How were they? Did you feel that the meetings were necessary or abundant? Are you flooded with telephone calls and/or e-mails in general? Why?
- How did you feel before the decision? Risky? What would the consequences be with a failure? Why/why not play it safe, and you would have no risk at all?
- The ideas from the logistics department, do you share them with others? Are you discussing these ideas with other individuals within the project? Or maybe with people from others projects, especially those who did use the tools? The choices made of implementing or not, are they reflected upon afterwards?
- In your opinion, is innovation harder in construction compared to other industries? Why is that?
- Let's switch focus to the supplier and subcontractor-side. Have you ever presented the logistical tools to them? Why/why not? How did they feel about it? Did you try to convince them one by one or all together?
- Do you experience the communication in general to be good between you and the subcontractors? Is it hard to reach the people you want to speak to? If changes happen, do they let you know immediately? How do you usually keep in contact, by mail, phone or meetings? What do you prefer? What do they prefer? Does it cause you extra work that your suppliers use different software and computer systems?
- Do you attend a lot of meetings? Too many? Excessive amounts of mail? Are there any ambiguities? Do you feel every meeting fulfil its goals?
- Employed by a big company, how hard are you in negotiations? Do you ever not care for their opinions and do it your way? How did that work out?
- Do you perceive the subcontractors to understand schedules? And the other way around, are you aware of the limitations your subcontractors have?
• As a productions manager, is your job too extensive with too many responsibilities? Why/why not?
• These logistical tools Skanska provide, can you see how they would be profitable for the subcontractors? How? How much do you care for maximizing Skanska’s profit, in comparison to maximize the profit of all involved parties?

8.4.2. Interviewee 1: Fredrik Karlsson, project manager, 2013-03-18

Studied civil engineering and have a long career at Skanska. Learned about these tools from a regional seminar where a supply chain specialist from the logistics department lectured about joint replenishment. He gave an example from a successful project that utilized joint replenishment.

In construction, one just accepts the poor delivery precision. The fines for delayed deliveries are too small. Despite that the supplier performs badly, production managers are forced to use the same supplier next time, due to pre-made agreements. But the suppliers are not very good at following these agreements.

The project manager Karlsson called the supply chain specialist who travelled to meet him. Karlsson experienced he got enough information and support from the logistics department. The production manager also attended most of these meetings.

The production manager is very comfortable in his way of working. Karlsson says that there are very little incentives for older people to change way of working, as the old ineffective way still is very accepted. The only possible incentive would be that an older production manager does not want to perform worse than a younger one.

The subcontractors showed positive attitudes towards joint replenishment, but Karlsson cannot say what their incentives would be. As a main contractor it is possible to place demands on the subcontractors, and the main contractor is supposed to do so, out of respect for the commissioners money. But Karlsson would like to work more with partnering contracts. People respect each other. But Karlsson says that the climate in bigger cities is harder, and one can place even harder demands on subcontractors as the competiveness is tougher.

Karlsson is sceptical to traditional procurement as he is aware of the pressure it puts on the subcontractors’ resources.
The main difficulty with using joint replenishment is that people tend to work like they always have (editors note: the project ended up not using joint replenishment). Maybe it would be easier to convince people if the space were extremely sparse, like in the bigger cities. One downside of joint replenishment is that the pre-made agreements include delivery cost to site, and the freight cost must then be paid twice to delivery to the external terminal.

In general, subcontractors do not let the production manager know of any changes. It is often hard to reach subcontractors. Production managers are very good at adapting to changes in short notice, but after they have done so, they rarely look for the source of the problem.

8.4.3. Interviewee 2: Fredrik Persson, production manager, 2013-03-21

Persson has a Bachelor in construction engineering, and has previously worked as a foreman.

The main reason for implementing joint replenishment was the extremely limited unloading space. His superior, project manager Daniel Ekström, taught him about joint replenishment.

The criteria were in the contracts before procuring for subcontractors. I.e. the subcontractors did not have a choice, but were forced to use the system.

Persson emphasizes that this is kind of a pilot project in the area, especially with the new computer system that is used together with DHL. Persson was very open to participate in the pilot project, as this is his first project as production manager. Hence, he did not have an ‘old’ way of working. One of the foreman was sceptical to using excel sheets for sending and receiving data to/from DHL, has he never done that way before.

Not all material can go through the external terminal, since the pre-made agreements prevents the supplier to deliver there.

Persson believes he was well supported, mainly by DHL, but also from the logistics department. Only Skanska’s employees were invited to these meetings, but subcontractors will be invited soon.

Persson prefer traditional procurement, but says that he often not chooses the lowest bid, but the subcontractors that he has worked successfully with before.
He claims he has way too much to do, and too much responsibility to do it all well.

The major reason for the lacking results in implementation these tools Persson believes is because people are unaware of them. Furthermore, in short term there is more work associated with the implementation, which of course is unpopular among already busy production managers. Also, many people are happy with ‘good enough’.

There is some lack of understanding, as people are sceptical due to the fees associated with the implementation of the tools. Persson experiences a knowledge gap between some production managers and the logistics department.

According to Persson the only downside of joint replenishment is that it requires some time to set up.

8.4.4. Interviewee 3: Jon Tjärnström, production manager, 2013-03-27

Tjärnström has used joint replenishment. It started with an intern who had worked with this procedure before in another project. The intern supported Tjärnström with all the information he needed. He is glad he had someone on site to help him, as mails tend to get lost.

Tjärnström immediately saw the benefits of the new system, and was not afraid of a failure. As a production manager, he is the one to decide whether to use the system or not, but it is important that the subordinates agree with him, or it will be difficult to carry out the project.

The only thing he perceived difficult with joint replenishment was halfway though when it was a lot harder to make small changes, compared to if the deliveries had come straight to the site from the supplier.

He could not get the subcontractors to be in on the system. But as he himself now has shown it to work, he is prepared to force the subcontractors to join in the next project.

He always carries through a traditional procurement for materials and contracts, but he does not always choose the cheapest one, but base his decision on past experiences as well.
Usually, the information flow is good on his site, but some problems arise when someone has forgotten to share some information, or an important e-mail is lost.

He is pleased with the atmosphere where he works, where all tradesmen working at the different contractors respect each other, but he has experienced a tougher climate when he worked in Gothenburg. There every single detail had to be bound by contract, or the contractors would slack.

He believe the main reason for his success in implementing one of Skanska’s logistical tools was that he does not have the traditional construction background, and could hence come with a different view of the problem.

8.4.5. Interviewee 4: Kristoffer Moberg, production manager, 2013-03-18

Moberg just finished his construction degree, and after working a year as a foreman he became production manager at age 22. He used joint replenishment, as he could not see why the traditional way would be better. Furthermore, it was not very traditional to him. He got a lot of support from the logistics department, which is also how he heard of it.

The subcontractors did not want to join, which Moberg think is weird, since they tend to loose just as much material as Skanska. He will try to get them to join again during the next project. He is not very hard on the subcontractors. After all, the contracts have already been written, and if they do not want to test the new idea, he cannot force them.

He does not think he has too much responsibility, as he is good at delegating the responsibility. Also, he often rings other production managers to ask for guidance.

In his project meetings are quick and no time is wasted.

Tjärnström do think that the construction industry is conservative, but that people are kind and listens to his ideas.

The main reason that people fail to see the pros with using Skanska’s tools would be that people are usually sceptical to new ideas. Also, lacking understanding makes it seem that these tools only costs money.
8.4.6. Interviewee 5: Martin Ström, production manager, 2013-03-20

Martin Ström heard of joint replenishment from his office neighbour, who happened to be a supply chain specialist. Coincidence. Due to the closeness, information was no problem. The specialist provided support throughout the project.

Subcontractors are not very fond of implementing the tools developed by Skanska. Ström says they only see the costs, and not the improvements. The union also makes it difficult. The union forces the subcontractors to charge for the time they are carrying materials, which they will not need with joint replenishment. Still, Skanska have to pay for it. Paying for carrying materials twice. Same situation for the subcontractors, who usually order with “free delivery”, which means they have to pay twice for delivery if they pay for the third party logistics in joint replenishment.

Ström says he puts pressure and negotiates with the subcontractors, but not too much as the does not want to make enemies. The market is not big enough for that.

According to Ström, there are two major reasons for the lacking results: Resistance to change among older production managers, and lack of understanding mainly among the production managers, but also in the logistics department. Ström gives an example of situations where the logistics department tried to convince production managers where the logistics was not a problem in the first place. In general, the logistics department should be better at marketing.

8.4.7. Interviewee 6: Daniel Ekström, project manager, 2013-03-21

He was forced to implement joint replenishment as weather protection was needed for the materials. There was no space for a roof or shelter, so the just-in-time manner joint replenishment uses helped. There was a supply chain specialist who proposed this solution.

The hardest part was to convince the production manager to use the system, as he had never worked with it before. Things like just using a new type of spread-sheet in excel made the production manager reluctant.
The subcontractors also needed shelter for their goods, but they were still sceptical to joint replenishment. Ekström offered to pay for the extra cost associated with joint replenishment, but hoped that they are willing to use it in the future, even if they have to pay by themselves.

**8.4.8. Interviewee 7: Mia Levein, foreman, 2013-03-19**

Levein has recently graduated from the Skanska high school. This is her first project as a foreman.

A supply chain specialist visited before the project start-up to make them evaluate their logistics system and present the tools Skanska provides. Levein and the production manager agreed after several meetings that they do not need any new logistics systems. Especially since the third party logistics company in charge of some of them have previously performed badly, according to the production manager. Furthermore, Levein and the production manager both have the feeling that the supply chain specialist lacked practical experience from construction projects.

Levein emphasizes the importance of keeping good relations with subcontractors and suppliers. She does not pressure them very much, but instead she will avoid using the same suppliers in the future. In general, the subcontractors help each other to a large extent, and performs well overall. But all requirements are strictly specified in contracts.

In her projects the production manager has been delegating work and responsibilities well, and no one have had too much or too little to do.

Levein have had experiences where the purchasing department ordered lots too big to handle in a good manner on site.
8.5. Interview protocol semi structured interviews, set 2

Questions and responses are translated from Swedish. Recordings of full interviews are available upon request.

8.5.1. Interview guide

I tell the interviewee about the findings from the first research question. Any opinions?

One improvement would be to communicate more. What is your opinion about that? How would you communicate, which ways do you prefer? Pros/cons?

Are there a lot of informal meetings? Is there a purpose with these meetings, and is the purpose usually fulfilled? Risks? Would it be possible to formalize these meetings? Pros/cons?

Organisational inertia, do you experience that? So new ideas are questions, but are the old ways ever questioned? Why not?

If you have conquered the inertia, would you like to share with other production managers how you managed to do so? If not, would you like to hear from others? What do you think would be a good forum to share ideas?

Inertia can be conquered by mutual understanding. Do you take the time to make sure every party involved in the project has understood the problem? Do you think that would help? What if you tried to come up with a solution together with the involved parties?

Knowledge management was another topic causing problems. I explain knowledge management. How do you work with knowledge management? Are there formal meetings after each project to retain knowledge? Why/why not? Are subcontractors and suppliers invited to these meetings. Why/why not?

Who is responsible for knowledge management? Would it be possible to make someone responsible for it?

8.5.2. Interviewee 1: Fredrik Karlsson, project manager, 2013-04-19

To reduce inertia it would help to see a successful example. Either from a project visit or a seminar. Production managers who has made a successful
implementation could come to talk to all production managers in Värmland for example.

There are rarely any meetings to retain knowledge, because of the tight schedules. It is not prioritized. Karlsson says that there is actually in the guidelines provided by Skanska, that there should be a final meeting to discuss such things. But Karlsson agrees that it would probably help a lot to actually have these meetings.

Karlsson believes it would be beneficial to have suppliers and subcontractors on these meeting, but that it would be hard to involve every party and that there is a risk that the meetings will become too big to carry through. Instead, the result form the internal meeting could be shared with relevant parties.

Karlsson proposes that instead of suppliers, the logistics department could be involved in these questions, to reflect on how the material handling worked. And they should be the ones initiating it, as according to Karlsson, these meetings sounds like something the support function (note: the logistics department is one of the support functions) should do.

Communication is not good and there are no formal ways to communicate. It is not prioritized to communicate. But it would save time to keep in frequent contact, according to Karlsson, as less time would be spent chasing the suppliers etc. There are no best ways of keeping in contact though. Mails get lost. Telephone conference could be a solution.

Karlsson says there are a lot of informal meetings, and that is a problem. Decisions made during these meetings should be written down, and then brought up on the next formal meeting. It is difficult to reduce the amount of informal meetings, as formal meetings are no good substitute. Quick, informal meetings are needed for quick decisions.

8.5.3. Interviewee 2: Fredrik Persson, production manager, 2013-04-17

In general, Persson perceive the communication as good. Sure it could be better, but it is not in the communication the problem lays.

There are indeed a vast amount of informal meetings. Persson tries to save the bigger decisions on formal meetings of possible. But sometimes quick decision needs to be made.
In his experience, Persson says that his projects usually question the old way of working as well. He says that it is just as important as questioning the old, and that his subordinates in general agrees.

He would like to have final meetings with the intent to retain information and knowledge. Persson thinks it would be both in Skanska’s and the subcontractors/suppliers interest to have these meetings. After all, inefficient logistics affects them all.

He would be glad to share his success story on seminars, and he thinks production managers would be open to it. However, the most conservative production managers with the most inertia would probably not attend.

8.5.4. Interviewee 3: Jon Tjärnström, production manager, 2013-04-15

The communication could indeed be better. The best way to reduce errors, according to Tjärnström, would be to meet face to face.

There are a lot of informal meetings, but that is not a problem. Informal meetings are a lot quicker. The problem is that the decisions are not documented. Formal construction meetings is no use, it is better to have shorter meetings that are visualized.

It is very likely that having successful production managers show other production managers what the logistics tools are like reduces inertia. Tjärnström have actually had a few visits from other production managers so they could learn.

There is a team within Skanska called K2 which are helping each other with these types of questions.

Seminars could help a lot, and Tjärnström believes that it would be interesting for most production managers. But it is important to keep a humble attitude to gain the respect and attention of the most stubborn managers.

When Tjärnström implemented joint replenishments he made sure that everyone in the project understood the procedure. During the meetings he let the subordinates have opinions and appeared to take them into account. It is a lot easier to implement something if the subordinates think of it as their idea, Tjärnström continues.
Tjärnström usually have formal final meetings to retain knowledge. Sometimes the subcontractors with the biggest parts are included as well. They appreciate that. It is the production managers’ sole responsibility that knowledge is managed.

8.5.5. Interviewee 4: Kristoffer Moberg, production manager, 2013-04-16

There is indeed a lack of communication, and a lot of searching for the right people at suppliers and contractors. But Moberg says that it should not be needed. The suppliers/subcontractors should be able to perform their work without checking up on them.

There is a lot of informal meetings, and many of them should be made formal. That way one gets more opinions on the matter, and it will be properly documented. All the formal meetings Moberg attends have been great. But that could be because the project is based on partnering, and there are hence less self-interest.

Moberg does not see how one would question the old ways of working. The old ways are never questioned, only the new.

Moberg says he often takes advice from other production managers, but not always the other way around. It could be because some managers are too proud or prestigious. It would be great to meet others and share ideas more. Seminars are a good idea.

So far he has not conducted meetings for retaining knowledge, and he says things have worked fine despite that. Therefore he cannot see a need.

8.5.6. Interviewee 5: Martin Ström, production manager, 2013-04-15

It is hard to reach certain suppliers and subcontractors, which is a problem. Telephone is the most suitable way to increase communication, as it takes little time and mails get lost.

It is very hard to question old ways of working. Ström are aware of that the current ways of working are not very good, but it is still hard to question them.

He would love to share ideas on seminars, but he does not have the time. But the attitude spreads quickly among production managers. He knows that if he
attended, even more people would. There is a knowledge bank (WBB) that is used for sharing ideas.

He carries out final meetings to retain knowledge, but subcontractors are not invited. Maybe they should be. But it is not worth the trouble in smaller projects.

Again, Ström blames the logistics department for not having proper arguments to convince the production managers.