Potential benefits of Lean oriented goods receiving

- A case study on how a Lean philosophy in the goods receiving process could affect a company’s value stream

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Abstract

Purpose – The purpose of the study is to explore how the lean philosophy can affect the value flow of a manufacturing company’s goods receiving. To answer the purpose two research questions have been asked:

1. Which lean tools or methods could be applied on a manufacturing company’s goods receiving?
2. How can lean-orientated goods receiving lead to improved value flow?

Method – To achieve the purpose a literature review and a case study have been conducted. The case study has had a deductive approach and used the both quantitative and qualitative data. The authors chose the data collection methods interviews, observations and document studies to collect empirical data which have then been analyzed against the theoretical framework with pattern matching to reach a result.

Findings – The study has showed that Lean philosophy affects the value stream performance in various ways depending on which tools or approaches the managers have. The authors explored different Lean tools and methods both separately and combined and noticed that to gain as much as possible from Lean tools and methods are most effective when combined to an approach. Although some Lean tools in goods receiving affect the value flow in a positive manner some would probably not. Due to the uneven flow of incoming shipments JIT was not seen appropriate to implement unless shipments could be assured to arrive as planned, when needed and with correct amount of goods.

Conclusions & recommendations – By the study findings the authors were able to base two conclusions:

1. To take full advantage of Lean tools and methods in goods receiving, these are best to be bundled together to an approach that is in accordance with the Lean philosophy at the organization.
2. Good and competent leadership in the Lean philosophy is crucial to ensure continuous improvements in the organization.
3. A Lean philosophy adapted in goods receiving is likely to ensure stability and reliability across the value stream which makes improvements possible and might lead to improved value stream performance.

Based on these conclusions the authors recommend that when implementing or working with Lean managers should practice participatory leadership to ensure the commitment of workers, to lead by example and to get the correct current state view. It is also recommended that when implementing Lean tools in to the goods receiving process the holistic view is of high importance.

Keywords – Goods receiving, inbound logistics, lean implementation, Lean leadership, Likers 14 principles, Kaizen
Abbreviation List

Just in time – JIT

Value stream mapping = VSM
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1 Introduction

This chapter contains the background of the study and the area of problem the study is based on. Further on the study’s purpose and research questions are presented. The chapter ends with the study's description of scope and delimitations together with a disposition.

1.1 Background

Today’s manufacturing industry applies many strategic concepts to become and/or stay competitive within chosen market segment (Porter, 1985). The lean manufacturing philosophy was developed at Toyota in the beginning of the 20th century and successfully changed the view of mass production methods and thinking to become competitive globally (Bevilacqua, Ciarpica, & Paciarotti, 2015; Holweg, 2007). Lean manufacturing acts as a culture and aims to continuously search for process improvements across the value stream (Apreutesei & State, 2013). The concept of lean manufacturing is to make the manufacturing process leaner which is achieved by removing wastes and reducing lead time to become more cost efficient (Naim & Gosling, 2011). Wastes or Muda’s as it is called in lean terms are a company’s process activities that doesn’t add value to the end customer (Cuatrecasas-Arbós, Fortuny-Santos, Ruiz-de-Arbulo-López, & Vintró-Sanchez, 2015). There are in total seven wastes in Muda and according to lean thinking and managers should try to eliminate these to gain lean manufacturing processes (Naim & Gosling, 2011).

To achieve the perceived quality in manufactured products and at the same time minimizing the logistic costs and lead-times, the lean practice and concepts are suitable to apply on companies’ value streams (Dombrowsky & Mielke, 2014). Just in time (JIT) is an approach within lean that aims to produce and deliver products in the right amount with the right condition and at the right time which reduces the need for inventory and lowers logistic costs (Claycomb, Germain, & Dröge, 1999). A consequence is that these concepts require complex manufacturing systems that can meet the JIT supplying requirements (Karimi, Srinivasan, & Han, 2002). According to Karimi, Srinivasan and Han (2002) the reduction of logistics costs is relevant in today’s logistics improvement efforts because logistic costs account for between 3 - to 20 percent of a product’s purchasing price. To lower these logistics costs managers have been eager to implement and try Lean practice which have meant that managers now think in a different and new way when it comes to operations, processes and manufacturing (Danese, Romano, & Bortolotti, 2012; Fawcett & Birou, 1992). The Lean way of thinking has led to implementation and usage of lean methods and tools on mainly manufacturing processes (Imai, 1997).

Due to that Lean mainly focuses on eliminating waste and improving manufacturing processes companies often forget other important processes in the value stream (Rogers, 2009). A process that is interesting to take a deeper look at is the goods receiving process due to its key role in the overall value stream performance (Miemczyk & Holweg, 2004). Rogers (2009) states that in order to have a smooth material flow through the company the goods receiving process needs to run correctly to provide assurance that materials will be at the right place at the right time and in the right amount. If not, miscommunication and disruptions could occur which might have a ripple effect on downstream processes (Rogers, 2009). Another consequence that cause downstream ripple effect is a wide and complex product mix (Bartezzaghi, Turco, & Gianluca, 1992). Companies with a JIT approach strive a thin manufacturing process which results in complications if handling a wide product mix. This requires capable goods receiving processes or inventories to handle the uncertainty in the product mix. (Claycomb, Germain, & Dröge, 1999).

1.2 Problem Description

To gain competitive advantage on the market, manufacturers face many different obstacles, like provide competitive products, obtain the optimal level of customer service and maintain and improve in house processes (Porter, 1985). One way of improving in-house resources and gain improved value stream performance is using a Lean philosophy which achieves this by optimizing processes and minimizing waste (Stålberg & Fundin, 2016). One way to achieve efficiency across the value stream is the JIT approach that focuses on delivering the right item at the right time and in the right amount for a certain activity throughout a pull system to satisfy the demand (Claycomb, Germain, & Dröge, 1999). The goal is to optimize inventories and lead
Introduction

time by keeping the inventory levels as close to the demand as possible (Bowersox, Carter, & Monczka, 1993).

The goods receiving process plays a big part of the material flow efficiency through the company and errors that occur here will have a ripple effect on value stream processes (Rogers, 2009). The result of ripple effect is that companies often pile big inventories in front of processes due to making sure each process have the right products at the right time, which ties capital (Ivanov, Hartl, Dolgui, & Sokolov, 2014). This makes the goods receiving process a crucial operation for the company to improve in order to reduce inventory holding costs across the value stream. Previous studies about process improvements using lean methods have been made, although only a few mention optimizations in the goods receiving process, hence, it is a relevant area to perform further studies on. To make process improvement in goods receiving and achieve material flow efficiency, a holistic view over the value stream is needed otherwise improvements might lead to sub-optimization (Imai, 1997; Rogers, 2009)

In manufacturing plants, a goods receiving process often faces problems of supplying companies internal value stream with materials (Swietlik, 2002). These problems often origin from a wide product mix with a lot of product disparity and product variations (Malhotra & Mackelprang, 2012). With a wide product mix the company faces problems of supplying downstream processes with the right products, at the right time and with the right amount (Claycomb, Germain, & Dröge, 1999; Malhotra & Mackelprang, 2012). The solution to these problems often is excessive inventories in front of processes which increases the logistic costs. If inventory is to be reduced, internal processes needs to be flexible, which results in problems for the JIT practice since a wide product mix makes it difficult for the JIT practice to work (Bowersox, Carter, & Monczka, 1993). This makes the goods receiving process an important process to map and investigate to get a deeper understanding on how improvements affect value flow for a manufacturing company.

1.3 Purpose & Research Question

According to Porter (1985), manufacturing companies need to be cost efficient and have a streamlined manufacturing process to become or remain competitive. In order to have the manufacturing processes streamlined and achieve JIT manufacturing, either redundant inventories or flexible material supply is needed to handle wide product mixes and variations. The goods receiving process is chosen to be investigated due the its importance for downstream material supply. Flaws in the goods receiving process can according to Rogers (2009) cause ripple effects on downstream processes that affects the overall value stream performance which makes it a key process to investigate. Hence the purpose of this study is;

- Explore how the lean philosophy can affect the value flow of a manufacturing company’s goods receiving.

To help achieve the purpose, two research questions was formed. By collecting the necessary information to answer the following two research questions the authors were able to explore how lean philosophy affected the value flow. The first research question was formed to provide the authors with knowledge about which lean tools were applicable to a company’s goods receiving. Therefore, the first research question is:

1. Which lean tools or methods could be applied on a manufacturing company’s goods receiving?

According to Liker (2009) a manufacturing company receive higher quality, higher productivity and utilize equipment and surfaces better and more efficiently when the company shorten the takt time and focus on keeping the production line flexible. Imai (1997) explains that the reasonable and safe way to reach improvements is by following Kaizen or commonly known as continuous improvements. With the lean way of thinking, it is according to Liker (2009) possible to improve the value flow through a manufacturing company. When improving the flow of value and materials through the company a key process to investigate is according to Rogers (2009) goods receiving due to its influence on
downstream processes. To explore the potential impact lean can have on the material and value flow second research question is:

2. How can lean-orientated goods receiving lead to improved value flow?

1.4 Scope & Delimitations
The scope of this study is to explore challenges and the impact of implementation of lean tools in goods receiving a manufacturing company and what these might lead to. To get depth in the study, delimitations has been made to only include improvements in the goods receiving process, marked with the red line in Figure 1. To explore what effects the implementation of Lean tools and methods in goods receiving has for the value stream a wider consideration is needed. Therefore, the effects are explored within the case company’s own value stream, marked with the dotted red line. Delimitations to only include implementation of Lean tools and methods in goods receiving results in that effects from these tools and methods becomes more visible and interpretable. Figure 1 shows the main processes in the value stream from supplier to customer in the case company. The red box shows the case area for implementation of Lean tools and methods and the dotted box shows the analyzed effect the tools and methods have for the value stream.

Figure 1 Scope & Delimitations

1.5 Disposition
The report starts with chapter 1, Introduction, and will end with chapter 6, Discussion & Conclusions. The Introduction chapter will describe the background together with problem description. This will lead to the study’s purpose and research questions and answer these will be the aim of the study. The first chapter finishes with Scope & Delimitations that describe which areas the study will be delimited to. The second chapter, Method & Implementation, begin with explaining the link between research question & method. Following that the chapter focus on the method and methods that were used to gathering relevant data.

Chapter 3, Theoretical Framework, and chapter 4, Empirical Data, are both chapters that consists of data, both qualitative and quantitative. Chapter 3 gather the data and information from literature review and chapter 4 gather it from the case company. Further on, this data will be analyzed in Chapter 5, Analysis, that lead us to the Discussion & Conclusion, Chapter 6. This chapter presents the whole study. There will be a discussion about the study’s result, the method used during the study and conclusions from the study. In addition to this the chapter will consist recommendations for further studies.
2 Method & Implementation

This chapter provides an overview of the study’s work process. The study’s approach and strategy will thereafter be described. Continuing with presentation of the study’s data collection and data analysis. The chapter end up with discussion about the credibility of the study.

2.1 Link Between Research Question & Method

To answer this study’s purpose and research questions different scientific methods were used. In Figure 2 the link between methods and research questions is presented, the arrow indicates which methods that is used to answer each research question. Explanation and logic why these methods was used to answer the research questions is handled in each individual section.

![Figure 2 Link between research questions and methods](image)

2.2 Work Process

To gain a suitable work process the overall layout of the study was segmented to smaller phases. These phases represent different activities that were performed during the case study until final report hand-in at week 52. The phases are;

- Problem Description
- Literature Review
- Collection of Data
- Analysis of Data
- Writing the Report

The Problem Description phase is the start-up of the case study. By defining and describing a problem, a purpose and research questions for the case study was created. With relevant purpose and research questions it is easier to achieve a “red thread” throughout the report. This phase was carried out from week 3 until week 7. Literature Review takes place when the problem description is in its final stages. This phase provided knowledge and strategies that helped achieve the purpose of the study. The literature was collected from week 5 until week 24. This was because new unpredictable events in the case study was of interest and a wider literature review were therefore needed. The Collection of Data took place from week 15 until week 24. This phase collected the empirical data for this study with the previously described methods. When enough data was collected the Analysis of Data began to match patterns from collected empirical data with the literature review. The analysis took place from week 16 and continued until week 52 at report hand in. The biggest phase is the Writing the report and is a part of every previously mentioned phase. It began at week 3 and continued until hand in at the end of week 52. A weekly schedule of study phases is presented in Figure 3.
2.3 Approach
Within the problem area of this case there are already established theories but there is a lack of knowledge which makes this case study have an exploratory orientation (Patel & Davidsson, 2011). Due to this lack of knowledge in the case area this case study focused more on display the connection between processes in the value stream than on finding a definite result (Sreejesh, Mohapatra, & Anusree, 2014).

The fact that the case study is based on existing theories makes a deductive approach suitable to the case study (Yin, 2006). The way the data collection methods derive from the literature framework also shows that the study has a deductive approach. The study has with help of the theoretical framework compiled interview questions which is in accordance with what Patel & Davidsson (2011) describes as a deductive approach.

The case study collected both qualitative and quantitative data. With observations, interviews and document studies qualitative data and information about the case company's current situation was gathered. Through these methods primary data was collected and later compared and analyzed towards secondary data from literature framework to find patterns and reach accurate conclusions.

2.4 Strategy
To answer the research questions and achieve the purpose, a case study has been carried out at a global manufacturing case company. The strategy has been to design and implement a case study with a "single-case-design". The case study strategy has been chosen due to the line of work a case study requires to follow to become reliable and sustainable (Yin, 2006). Case study was also chosen because it is a proven method to use in order to answer the research questions in the study. The authors have chosen to perform a single case design to answer the research questions and reach the purpose. To achieve this the case company needs to be representative for the industry, which means that the company should be seen as a “typical” manufacturer in the particular part of industry (Yin, 2006). In this case, a multinational manufacturer of heavy trucks is chosen as the case company. By performing a “single-case-design” it requires a careful consideration of the case to minimize the risks of obtaining or providing a distorted image of the problem and to maximize the possibility to gather the correct information about the case (Yin, 2006).

2.5 Literature Review
The case study began with the search and the reading of literature to get a deeper understanding about the case field and to form a preliminary theory which simplifies the collection of primary data (Yin, 2006). The literature review includes literature, textbooks and scientific articles.

Literature review has been carried out prior and during the collection of empirical data. This is to get a deeper understanding about the case field and to form a preliminary theory which simplifies the collection of primary data (Yin, 2006). With wider and deeper theoretical knowledge, the authors could construct more precise and accurate questions for other data collection methods. Textbooks and literature have been provided from the library at Jönköping
University. Scientific reports have mainly been located from the library at Jönköping University's database but also with Scopus. To ensure the scientific content only articles that are peer reviewed are chosen for the case study. From the literature review the theoretical framework is created which later is used to analyze the empirical findings. Table 1 present the search terms used and the number of hits. Hits have been sorted to only include articles and relevance to the search terms. The most relevant articles have primary been chosen.

Table 1 Keywords & hits

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Combination of search terms</th>
<th>Number of hits</th>
<th>Number of peer reviewed articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value stream mapping</td>
<td>&quot;Value stream mapping&quot; AND &quot;Lean production&quot;</td>
<td>2299</td>
<td>1270</td>
</tr>
<tr>
<td>Lean</td>
<td>Lean AND gemba</td>
<td>874</td>
<td>504</td>
</tr>
<tr>
<td>Lean manufacturing/production</td>
<td>Lean manufacturing AND JIT goods receiving</td>
<td>502</td>
<td>419</td>
</tr>
<tr>
<td>Gemba</td>
<td>Lean manufacturing AND Kaizen goods receiving</td>
<td>153</td>
<td>97</td>
</tr>
<tr>
<td>Material flow</td>
<td>&quot;Lean philosophy&quot; AND &quot;Lean tools&quot;</td>
<td>423</td>
<td>319</td>
</tr>
<tr>
<td>Just In Time/JIT</td>
<td>&quot;Goods receiving&quot; AND &quot;Lean philosophy&quot;</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Goods receiving</td>
<td>Goods receiving AND Kaizen</td>
<td>441</td>
<td>305</td>
</tr>
<tr>
<td>Inbound logistics</td>
<td>&quot;Inbound logistics&quot; AND &quot;Lean manufacturing&quot;</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Kaizen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Often the number of hits is too many which made the authors use search techniques like phrase search to reduce the number of hits and maintain relevance of the search. With phrase search the search engine primo only shows hits with that exact word order which reduces the number of hits. Also, relevant topic filter was used to lower the hits and locate more accurate articles. The topic filters were used on every search term to locate the most relevant articles. Topics chosen to narrow the searches was topics similar to production management, manufacturing and lean manufacturing. Some articles were found by “snowball sampling”. This means that if a key point from an article is considered relevant to the study, the researcher then follows the citations and references provided with that keyword. The literature review was ongoing until enough relevant data to the study is collected (Dudovskiy, 2016). Table 1 provides information about which keywords and which combination of keywords were used. Also, the number of hits and the number of relevant peer reviewed hits is provided in the table.

2.6 Collection of Data

The study’s data was gathered with observations, interviews and document studies. Following headlines gives a more specific information about each data collection method and how they were performed.

2.6.1 Interviews

Interviews was chosen as data collection method to get a holistic view of the current situation and information of how the process is perceived by operators and managers. It was also selected due to the method is targeted and focus directly on the research questions and aim of the study (Yin, 2006). The weak spot with interviews as method is that it could acquire lapses in memory, poorly worded questions and distorted answers by the respondents (Yin, 2006). The authors way to handle these weak spots is to record the interviews and spend much time with forming the questions. Due to the recording of the interviews the interviewers could put all the focus on dialogue with the respondents and obtain the information needed. The downfall with recordings is according to Patel & Davidsson (2011) that the recordings needs to be transcribed which is time-consuming and that respondents might feel unsecure to answer some of the questions due to being recorded.

Interviews has been performed both individually with a value stream member and in groups with managers who have good knowledge about the supply chain. The respondents chosen are one operator at a value stream process within goods receiving that can provide knowledge about how processes actually work. The manager chosen to interview is the value stream manager that have knowledge about the holistic view and how processes interact. The interviews were semi-structured with wide and open character questions in the beginning and later ending up with more specific and narrow questions about the problem area. The open character structured
questions are according to Yin (2006) a great way to gather information about the actual situation and gives a possibility for the respondent to become an informant. If the interviewers manage to generate an informant out of a respondent, the possibility to a successful case study increase (Yin, 2006). In Table 2 the interviews performed is presented.

Table 2 Interviews

<table>
<thead>
<tr>
<th>Date</th>
<th>Purpose</th>
<th>Position</th>
<th>Method</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-04-08</td>
<td>Gain knowledge</td>
<td>Value Stream Manager</td>
<td>Semi-structured</td>
<td>60</td>
</tr>
<tr>
<td>2017-04-08</td>
<td>Gain knowledge</td>
<td>Logistics engineer</td>
<td>Semi-structured</td>
<td>60</td>
</tr>
<tr>
<td>2017-04-17</td>
<td>Gain knowledge</td>
<td>Operator</td>
<td>Semi-structured</td>
<td>60</td>
</tr>
</tbody>
</table>

2.6.2 Observations

According to (Yin, 2006) reliable case studies base their information on more than one information source. Observations were chosen as a data collection method to complement interviews and because observations describe events in real time (Yin, 2006). Observations was carried out after the first interviews was performed. This in form of a Gemba walk to gather information about the current situation at the work stations. This study contains structured observations which is motivated by that problem is specified to the content that it is certain which processes and situations that should be included in the observation (Patel & Davidsson, 2011). To ensure reliability on the empirical data gathered from observations both authors took notes during the Gemba walks.

The observations made it possible to follow the material flow through the factory and the information gathered by observations made the value stream mapping achievable which identifies the activities in goods receiving. All observations were conducted with both authors to increase the reliability of the study (Yin, 2006).

Table 3 Observations

<table>
<thead>
<tr>
<th>Date</th>
<th>Purpose</th>
<th>Method</th>
<th>Observers</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-04-10</td>
<td>Gain knowledge</td>
<td>Unstructured</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>2017-04-18</td>
<td>Gain knowledge</td>
<td>Unstructured</td>
<td>2</td>
<td>60</td>
</tr>
</tbody>
</table>

2.6.3 Document Studies

Yin (2006) states that written references in form of company documents is of great relevance for a case study to support data collected from other sources. The document of focus was the ones that provided historical data on previous production flow chart and current receiving frequency of containers and trucks that results in the current number of packages received. These documents were all given in Excel sheets which enabled the authors so filter and sort relevant data. Document studies in this case study was mainly used to strengthen empirical data collected by different methods.

2.7 Data Analysis

To analyze case data, the analyze process has base in the literature review. From the literature review a theoretical framework is composed to form a foundation for the analysis process. The case study collects primary data from interviews, observations and document studies which has been analyzed against the theoretical framework to get a result. Figure 4 shows the case study’s analysis process.
To answer the first research question, the authors have used the qualitative methods interviews and observations to locate activities within goods receiving. Literature reviewed became the theoretical framework and forms theories about lean and value stream mapping that are explored in the case study. These theories have lead to conceptualization of data gathered to compile individual thoughts into a communicable system of thoughts. This results in a theoretical pattern. Similarly, empirical data about goods receiving and its activities has been gathered through observations and interviews. This data has been compiled and resulted in an observed pattern. When this was done, empirical pattern was matched with the theoretical pattern to find similarities and differences. This way of analyzing data is according to Yin (2006) called pattern matching. The second research question was analyzed in the same way with pattern matching and with using qualitative methods.

To find these patterns the empirical data was matched against the theoretical framework continuously during the study to ensure an appropriate structure of the theoretical framework. Pattern matching, and analysis of data began when empirical data was collected and was continuously matched against the theoretical framework. The analysis contains a link of similarities and differences between theoretical and empirical data and after describing and explaining the relationship between the theoretical and empirical data the case study’s research questions can be answered and the purpose be achieved.

2.8 Quality of Research
Credibility is a way of measuring the quality of a research design in a case study. With help of the criteria’s validity and reliability, the quality of the research design and thereby also the overall quality of the research can be measured (Yin, 2006). To ensure quality of validity and reliability of the case study the authors have followed proven scientific methods as described below.

2.8.1 Validity
According to Maughan (2009) validity is the criteria that shows how well a tool is measuring what it is supposed to be measuring. She also states that validity is harder to measure than reliability because there are no formulas or scores to measure how well the validity is performed. It is also a hard concept to grasp due to even if the validity is high in one case study
it is not valid in another (Maughan, 2009). Validity can be divided into two kinds of validity called internal and external validity, this to make it easier to understand what validity is and how good validity is gained (Yin, 2006).

To ensure this study have high internal validity the authors have applied Yin’s proposition pattern matching. This method relates different kinds of information units from a single case to theory hypotheses and thereby show if a pattern exists. If the pattern matches it shows that the study has high internal validity. Also, the interview questions and the observation objects were linked to the theoretical background which ensures the internal validity (Patel & Davidsson, 2011). Patel & Davidsson (2011) explains internal validity as:

“To know what we examine is about correspondence between what we say we are examines and what we actually are examining”

To ensure the internal validity the authors not only based the interview questions on the theoretical background. The authors also based interview questions on the first observation of the goods receiving to know that what is claimed being examined is examined. According to Yin (2006) internal validity means that conditions leads to other conditions, also known as a causal relationship between events. An example on how to obtain high internal validity is to try to evaluate if condition 1 leads to condition 2. It is important that condition 3 doesn’t have any effect on condition 2, which would be a threat against the case’s internal validity (Yin, 2006).

External validity is the generalizability of the study, which means that the outcome of the study should be applicable on a similar study object (Patel & Davidsson, 2011; Yin, 2006). Lean manufacturing has long been an activity that’s been a part of most company’s daily work which justifies the usage of techniques within lean manufacturing. This case study thereby receives a generalizability due to methods and theories that have been used are well proven to be applicable on similar organizations which provides external validity (Yin, 2006).

2.8.2 Reliability
A study’s reliability is its ability for another researcher to receive the same result and conclusions by using the exact same approach as the original research did (Yin, 2006). Maughan (2009) also talks about this in the article “Validity and Reliability, what do these terms mean?” where she states that when the reliability of a case study is to be ensured the results you get one day match the results of the second day. To increase a case study's reliability, the authors’ needs to have an exact documentation on how the study was performed so other researchers can with ease follow the same pattern and achieve same result. A case study’s reliability is crucial to be able to minimize flaws in the research (Yin, 2006).

Documentation on how this study is performed have been done narrowly which according to Yin (2006) increase the reliability. Yin (2006) also states that to increase reliability the case study should be done with as many operational steps as possible. The idea is to perform the study in such detail as if there was someone who regularly checked your work (Yin, 2006). This case study was controlled by a supervisor which increases the reliability.
3 Theoretical Framework

This chapter begins with the link between research questions and theory. The chapter continues with a theoretical foundation to the study and an explanatory approach to the purpose and research questions formulated.

3.1 Link Between Research Question & Theory

In order to have a theoretical motive behind the first research question “Which lean tools or methods could be applied on manufacturing company’s goods receiving?”, the lean theories value stream mapping and Gemba is chosen to be studied. This in order to evaluate which activities that are included in a goods receiving process. These theories are proven to be successful when locating activities and processes in the value stream (Aprutesei & State, 2013). These theories were essential throughout the report as they act like a framework to help answer the purpose. The second research question “How can lean-orientated goods receiving lead to improved value flow?”, is dependent on the answer to the first research question. From those understandings and with a holistic view it was possible to get an understanding on what a Lean philosophy in goods receiving might lead to. Figure 5 displays which theories are used to answer each research question and the connection between the research questions and the theories.

3.2 Lean Philosophy

During the middle of the 20th century Toyota manufacturing system was invented and developed by Sakishi Toyoda the founder of Toyota, his son Kiichiro Toyoda and engineer Taiichi Ohno (Bevilacqua, Ciarapica, & Paciarotti, 2015). This system is the foundation of lean manufacturing which is used to gain business excellence and competitiveness by being lean (Wong & Ignatius, 2012). Lean philosophy is a way of thinking to manage an organization, an approach to gain efficiency and a strategy to improve a company by increase value across value stream and satisfy the end customer (Ghosh, 2013). Lean philosophy aims to make the organization and its member adapt to the philosophy by encourage and motivate them to contribute to the overall company performance. According to Liker (2004) a comprehensive view of Lean is needed across the entire organization in order to gain from different Lean tools like JIT or 5S. This means that Lean must permeate the entire organization. This is achieved by involving and educating everyone in the organization in Lean to motivate them to participate in the Lean work and work with continuous improvements (Dombrowsky & Mielke, 2014). It is also important to make the philosophy and its tools transparent to make employees feel safe during changes (Martin & Osterling, 2014). The important concept in lean philosophy is as stated before continuous improvements, also called Kaizen. Kaizen enables changes to be carried out continuously with an improvement cycle that ensures quality (Imai, 1997). This cycle is called PDCA which are a set of activities performed to ensure quality when improving processes. The PDCA cycle aims to continuously make small systematics modifications in activities rather than radical changes in processes (Imai, 1997). The cycle is divided in to four activities which are Plan, Do, Check and Act (Petersson, Johansson, Broman, Blücher, &
These four steps are performed continuously to ensure quality through process improvement (Imai, 1997). The first step, plan, is about identify and analyze the problem. When moving to the next step it is important to identify essential parameters and plan a solution. The second step is to implement the solution and perform a stable process together with collection of measurements. After the implementation, it is important to check and evaluate if the changes were an improvement. If so, the fourth step comes naturally, and it is time to act and introduce the change as a new standard. If the changes were unsuccessful the cycle starts over once again with plan (Petersson, Johansson, Broman, Blücher, & Alsterman, 2009). The overall goal with the philosophy is to make the company thinner by eliminate waste. It is needed to evaluate which lean tools to apply to gain manufacturing improvement, process activities that adds value for the final customer. To do so processes are divided by value adding, non-value adding and necessary non-value adding activities (Bevilacqua, Ciarapica, & Paciarotti, 2015). The improvement consists of locating and trying to eliminate non-value adding activities, which are considered wastes or Muda in lean language, to gain value stream efficiency and increase the percentage of value adding time during production flow (Bevilacqua, Ciarapica, & Paciarotti, 2015; Stålberg & Fundin, 2016). There is a total of seven wastes included in Muda which Ghosh and Imai (2013; 1997) implies are:

- Muda of overproduction
- Muda of inventory
- Muda of repair/rejects
- Muda of motion
- Muda of processing
- Muda of waiting
- Muda of transport

Apreutesei and State (2013) suggests in accordance with Bevilacqua, Ciarapica and Paciarotti (2015) that to take full advantage of the potential of these lean improvement tools, it is needed to bundle the tools together in an approach with a holistic perspective, not handled individually. A result of a successful combination different lean tools will not only minimize and remove wastes, which makes the value stream sustainable efficient, but also make the value stream responsive and flexible (Apreutesei & State, 2013). To gain this responsiveness Bevilacqua, Ciarapica, & De Sanctis (2016) claims that the manufacturing system needs to minimized system variability and have reliable delivery in form of quality, time and quantity. They also state that the usage of lean tools increases the company performance by reducing lead times and inventories.

### 3.3 Likers 14 principles of Lean and 4P model

In Likers (2009) book “The Toyota Way” he identified 14 principles that he categorized according in the 4P model. The principles help creates a learning organization and encourage continuous improvements. The model consists four categories: Philosophy, Process, People and Partners and Problem solving. The model is visualized as a pyramid and are shown below in Figure 6.
Philosophy

**Principle 1.** Superior short-term decisions and build the business with a long-term mind for the company’s vision, goals and meanings (Liker J. K., 2009). Generate value for the customer and society is the general long-term goal and the company’s function should be evaluated against these (Liker J. K., 2004).

**Process**

**Principle 2.** Arrange the processes to create continuous value adding flow (Liker J. K., 2004). It is important to get rid of waiting and inactivity from the processes (Liker J. K., 2004). The flow for both material and information should be rapid and that processes and people should be interconnected because it provides a prerequisite for problems to come up to the surface (Liker J. K., 2004).

**Principle 3.** Base the process management on needs or demand and create a pulling system (Liker J. K., 2004). Reduce buffer and stock levels in downstream processes by create a JIT flow and see them as internal customers (Liker J. K., 2004).

**Principle 4.** Reduce overload of people and machines and eliminate irregularity in production schedule (Liker J. K., 2004). Main goal is to achieve as even production and work load as possible to avoid unnecessary wear and overproduction (Liker J. K., 2004).

**Principle 5.** Create a culture where deviations are rather seen as positive and can lead to progress instead of negative and inhibitory (Liker J. K., 2004). Build conditions for detecting deviations and stop processes to correct them so quality can be right from the start (Liker J. K., 2004).

**Principle 6.** Goal is to make the processes predicable by standardized, repeatable and recurring tasks and methods for continuous improvement, which are basis for a pulling system (Liker J. K., 2004).
Principle 7. Simple visual indicators should be used in order to facilitate decision making and determine if the process is different (Liker J. K., 2004). The indicators could be signs or lamps where the work is done, also instructions and reports should be visual and as short as possible (Liker J. K., 2004).

Principle 8. Purpose of technique is to facilitate and support people, not to replace them (Liker J. K., 2004). Seek for technical solutions to develop the process and use known technology to provide stability to processes (Liker J. K., 2004). New technology could be a threat to the standardized flow, therefore make sure to test new technology before implementation (Liker J. K., 2004).

People and Partners

Principle 9. Rather educate and develop leaders within the organization than purchase competence from external party (Liker J. K., 2004). A well-educated leader about the daily work in detail act as a good teacher of the company’s long-term thinking (Liker J. K., 2004).

Principle 10. Establish a culture of corporate values and work continuously to maintain corporate culture that last for a long time (Liker J. K., 2004). Workers need to be educated and developed so that good cooperation and good results can be achieved (Liker J. K., 2004).

Principle 11. See partners in the value chain as an extension of the business and respect them as well as challenge them to evolve by set high demands and help them achieve the requirements (Liker J. K., 2004).

Problem Solving

Principle 12. Create your own idea of the problem and how it should be solved rather than listen to what others are telling you, base data on what you have verified yourself (Liker J. K., 2004).

Principle 13. Although it could be time consuming, discuss problem and solution together with those involved to collect ideas and to determine a common way forward (Liker J. K., 2004). When carefully considered different options, implement quickly but carefully (Liker J. K., 2004).

Principle 14. When a steady process is established, look for the root causes of the waste by using methods for continuous improvement (Liker J. K., 2004). Design the process to need minimal buffer to challenge it and to highlight time and material loses, also document improvements and learn by standardize the best-known approach (Liker J. K., 2004).

3.4 Kaizen

Kaizen is a Japanese word that means continuous improvements. Imai (1997) explains Kaizen as a commonsense, problem solving, low-cost approach to improvement. The focus should lie on making small controlled steps rather than rely on drastic measures to reach improvement (Imai, 1997). These controlled steps are explained by Imai (1997) as the usage of commonsense tools, checklists and technology that doesn’t cost a lot of money. The commonsense is important in every work task and decision-making process and should permeate the organization (Imai, 1997). Along with commonsense a learning organization that includes everyone from top-management to operators needs to be established (Imai, 1997). Kaizen is for everyone beginning at the CEO and involves everyone to work together for success (Imai, 1997). Imai (1997) suggest that managers themselves should leave their offices and work at more close range with the operators to grasp what these people can bring to the table, quality issues or waste in or between processes.

Imai (1997) implies that western management often rely on the more dramatic way of improvement, innovation. According to Wittenberg (1994) a drastic innovation might be a large investment in new equipment or technology. The result is that with innovation there is often only one shot and it is hard to turn back (Imai, 1997). Kaizen on the other hand is based on common sense and low-cost approaches that guarantees stepwise progress which makes it
possible for managers to go back to the old way without suffering large costs (Imai, 1997). Kaizen promotes process-oriented thinking which means that before improved results can be obtained, the processes must be improved (Wittenberg, 1994). Kaizen mainly focuses on human effort (Imai, 1997). This means that Kaizen assumes that improvement in people’s efforts are more likely to improve the overall result than what a strict result-based thinking would do (Wittenberg, 1994).

Imai (1997) brings up seven major Kaizen concepts that companies need to adapt to realize kaizen strategy. The overall goals with the kaizen strategy is according to Imai (1997) maintaining and improving Quality, Cost and Delivery. Quality refers to both the quality of finished products but also quality of processes, cost refers to the overall cost of designing, manufacturing, selling and service the products and delivery means delivering the questioned quantity in time (Imai, 1997).

Kaizen and Management

According to Imai (1997) management within Kaizen has two functions: maintenance and improvement. Maintenance is the activities that maintain current standards like technological, managerial or operating standards and establish these with discipline and training (Imai, 1997). One activity could be to assure that everyone follows the same standard procedure when operating. Improvement activities refers to increase the current standards (Imai, 1997).

Process versus result

In the introduction of Kaizen strategies, a process-oriented approach like the PDCA cycle is needed (Imai, 1997). According to Imai (1997) the most essential element of a Kaizen process is the engagement and commitment of top management. This needs to be demonstrated constantly to assure success in the process.

Following the PDCA cycle

According to Imai (1997) the PDCA cycle described earlier is the first step in a Kaizen process to establish the different stages and assure the continuity of maintaining and improving the standards. Imai (1997) explains the PDCA concept as a revolving cycle which means that as soon as an improvement is made in an area the same area becomes target for further improvement. The key is to never get satisfied and continuously establish challenging goals (Imai, 1997).

Putting quality first

The goals with Kaizen is as stated earlier quality, cost and delivery. Of these three primary goals, it is the quality goal that is the most important and should have the highest priority (Imai, 1997). It doesn’t matter how appealing price or how inviting delivering terms that can be offered to the costumer if the company’s product or service lacks quality (Imai, 1997). This quality-first practice can be hard to follow. According to Imai (1997) the practice demands management commitment due to managers often face organizational goals to cut prices which makes it tempting to make compromises in delivery requirements or in quality.

Speak with data

As explained earlier, Kaizen is a way of solving problems. For a problem to be solved correctly it needs to be recognized and understood which means that relevant data needs to be gathered and analyzed (Imai, 1997). According to Imai (1997) the collection of data on the current status helps to understand where the current focus is and acts as a starting point for improvements.

The next process is the customer

There are two types of customers in Kaizen, internal (within the company) and external (out in the market) (Imai, 1997). The important realization is to never pass on defective parts or inaccurate pieces of information to the next process (Imai, 1997). If everyone in the organization practices this axiom, high quality product or service is assured for external or end customer (Imai, 1997).
3.4.1 Major activities in Kaizen

Imai (1997) claim that everyone in the company needs to follow three activities for practicing Kaizen strategy. Practicing these activities is the foundation of the house of Gemba which consist of learning together, teamwork, moral improvement, self-discipline and suggestions (Imai, 1997). Imai (1997) also implies that these three Kaizen activities are indispensable in practicing Lean. The ground rules for Kaizen are:

1. Housekeeping
2. Muda Elimination
3. Standardization

Housekeeping

Housekeeping or 5S as it is called in Lean terms are five steps that was developed as a part of TPS and was introduced as a methodology for realizing quality improvements in the organization (Randhawa & Ahuja, 2017). These steps enable organizations to achieve overall cleanliness and even a standardization at the workplace that is pleasing and motivating for everyone in the organization. Imai (1997) and Randhawa & Ahuja (2017) present the steps as:

- Seiri (sort)
- Seiton (Straighten/Set in order)
- Seiso (Scrub/Shine)
- Seiketsu (Standardize)
- Shitsuke (Sustain)

The first step is Seiri which means sort and is about keeping items at appropriate places (Randhawa & Ahuja, 2017). According to Imai (1997) items in the step sort can be divided into two categories, necessary and unnecessary and the goal is to remove the unnecessary ones. Imai (1997) implies that at the workplace in the organization is full of unused items like machines, tools, equipment, pallets and other items. He also suggests that things that won’t be used within 30 days should be removed. According to Randhawa & Ahuja (2017) the workplace should be effectively organized and thereby should unnecessary items eliminated to improve the flow of work.

Seiton or set in order is the second step of 5S. When all unnecessary items are removed and only the necessary ones are left it is time to place these items in efficient ways close to the workstation (Imai, 1997). The items could be classified by terms of use and arranging them accordingly to achieve control and efficient operations (Randhawa & Ahuja, 2017). According to Randhawa & Ahuja (2017) the location of the items should be clear, so anyone can find them at any time which lead to rapid processing, reduction of errors and discipline.

Seiso means scrub or shine in English and the step is about cleaning the workstation, its machines and equipment as well as the floor and walls (Imai, 1997). Randhawa & Ahuja (2017) claims that there are three activities within Seiso: getting the workstation clean, maintaining its appearance and using preventive measure to keep it clean. This can help an operator find flaws in the workstation, e.g. oil leakages will be easier to spot if the workstation is clean (Imai, 1997). With help of continuously cleaning the workstation equipment failure can be reduced, product quality can be improved, and a cheerful working environment can be gained (Randhawa & Ahuja, 2017).

The fourth step is Seiketsu which translates to standardize in English. Seiketsu considers maintaining the workplace so it is productive and comfortable by repeating the first three steps (Randhawa & Ahuja, 2017). The step tries to standardize the best practice in the workstation by repeating Seiri, Seiton and Seiso every day or else the way of work will soon be back where it started (Imai, 1997). According to Imai (1997) management need to deploy systems to ensure that assures the continuity of the first three steps. This could be with visual management such as appropriate labels on equipment and machines or a planning schedule when and how often Seiri, Seiton and Seiso should take place (Imai, 1997; Randhawa & Ahuja, 2017).
The last step is Shitsuke which means sustain. Shitsuke stands for sustaining all the S mentioned with self-discipline (Randhawa & Ahuja, 2017). This step is crucial to understand and implement at all organizational levels due to the requirement in changing the behavior of employees (Randhawa & Ahuja, 2017). According to Imai (1997) self-discipline of employees consists of following established rules and standards at each step of 5S every day without managers needing to remind them. Imai (1997) also suggests that these standards should include ways of evaluating processes at each stage.

**Muda Elimination**

Muda elimination consist of finding the non-value adding activities and eliminating them (Apreutesei & State, 2013). To find out where Muda is located it is needed to visit the real workplace where action takes place and investigate if the Muda’s are occurring (Imai, 1997). Imai (1997) explains that it is common in manufacturing companies that operators needs to walk long distances during their working day which doesn’t add value to the product or customer. There is according to Imai (1997) a connection with Muda elimination and the 5S of housekeeping. In factories where Muda has been eliminated there are also signs of high level of 5S (Imai, 1997).

**Standardization**

Imai (1997) explains standards as a way of daily management that handles organizational resources like manpower, equipment and materials. When managers discover problems or errors they must investigate and revise current standards or implement new standards to prevent problems or errors to reoccur (Imai, 1997).

### 3.5 Gemba

In Japanese Gemba means real place, the place where actual action takes place or where a product or service is made (Imai, 1997). It is where a company adds customer satisfaction value to their product or service and needs to be managed with support from the managers (Imai, 1997). According to Imai (1997) there are two different ways of practicing Gemba, either with Gemba at the top with managers supporting the Gemba or Gemba at the bottom with managers above ruling over Gemba. These relationships explain the different scenarios on where improvement and implementation suggestions emerge from (Imai, 1997). Dombrowsky and Mielke (2014) refers to this as the different Lean leadership approaches with five fundamental principle of lean leadership. These principles are striving for perfection, lean leaders are role models, long term development of employees, work place management and customer focus. Imai' translates this in to two different Gemba relationship that are presented in Figure 7.

Both Imai (1997) and Dombrowsky and Mielke (2014) suggest that managers visit Gemba to get a correct and accurate view over the workplace, called performing a Gemba walk. A Gemba walk is a physical actual walk through the value stream to gather information on the current state in the manufacturing flow. According to Rahani & al-Ashraf (2012) the Gemba walk could be described as the “check” activity in the PDCA cycle. By performing the walk waste and issues are identified. By physically observing these issues and waste it becomes possible to find the root causes why they occur and find possible solution for elimination. By being in the actual manufacturing flow interviews and questions can be asked to operators to clarify process activity’s and bottlenecks. The walk also provides the knowledge on the connection between processes and which processes that are dependent on each other.
3.6 Just-In-Time

Just-In-Time (JIT) is one of the two pillars within Lean philosophy and a strategy to make production more efficient. The fundamental ambition with JIT is to eliminate waste in the supply chain by producing the right products to the right place at the right time and as a result lowers the logistic costs (Claycomb, Germain, & Dröge, 1999). Zhu & Meredith (1995) define JIT as an approach to continuously eliminate waste by constantly improve and standardize processes. Standardized processes make the value stream more predictable which removes some uncertainties and variations and makes the value stream optimizable (Petersson, Johansson, Broman, Blücher, & Alsterman, 2009) The idea with JIT is that items needed for a certain process activity is delivered just-in-time through a pull system to satisfy the process demand which leads to optimized inventory levels (Claycomb, Germain, & Dröge, 1999). The concept when optimizing the inventory is to keep the inventory levels as close to the actual demand as possible (Bowersox, Carter, & Monczka, 1993). Bowersox, Carter & Monczka (1993) thereby calls the JIT approach for “Zero inventory” which would be the result if a JIT approach was carried out at a 100 percent rate, which isn’t possible to achieve.

The main reason companies choose to implement JIT to their production plants is to standardize the manufacturing flow which enables improvements throughout the value stream which is beneficial for company performance (Zhu & Meredith, 1995). The result of successful implementation of JIT is lead time reduction, reduced inventories, reduction of work-in-process products and effectively increased inventory turnover (Claycomb, Germain, & Dröge, 1999; Zhu & Meredith, 1995). In addition to those effects JIT is effective to reduce storage space (Wu, 2003).

One objective in JIT is smaller lot sizes and more frequent deliveries that potentially could be a difficult part to manage with JIT is the more frequent deliveries the method requires to the user’s locations (Bowersox, Carter, & Monczka, 1993). The buyer and seller are required to handle the communication more closely with more precise information about quantities, lead time and location (Bowersox, Carter, & Monczka, 1993).

3.7 Value Stream Mapping

VSM is an important tool in the lean manufacturing philosophy which help enable company improvements (Martin & Osterling, 2014). VSM map activities a company performed to produce a finished product for the end customer (Lamia & Fredj-Ben, 2016). Martin & Osterling (2014) explains it as a visual storyboard of how work and customer order progresses from request to fulfillment of that request. The value stream mapping enables the processes to be visualized and analyzed from a holistic point of view. It helps cut lead times, reduce redundant inventory to increase quality of manufacturing and achieve better possibilities for on time deliveries and process performance (Lamia & Fredj-Ben, 2016). According to (Tyagia, Choudharyd, Caic, & Yang, 2015; Seth & Gupta, 2007) processes are measured by key indexes like cycle time, takt time, dependency, inventory buffers and involved resources.

A company’s value stream is the processes and activities that produces a product to the customer. The value stream mapping is the mapping of customer value through these activities across the value stream. The procedure of a successful implementation of value stream mapping starts with creating a holistic view over the current state and map how the current processes operates in current time (Lamia & Fredj-Ben, 2016). To achieve a correct current state map Martin & Osterling (2014) suggest that value stream walks, also referred to as “going to Gemba”. This help with observing the workers in their environment and see the flow first hand and thereby help grasp the situation more correctly (Martin & Osterling, 2014). With a current state analyzed it is possible to know which improvement procedures to perform and locate which processes that are more suitable to improve. One way to achieve an overview and a current state map is to perform a Gemba walk through the value stream and perform interviews with value stream managers or operators. When a complete overview is achieved, the identification of value added, and non-value-added activities will begin and hopefully find possibilities to eliminate wastage in any of the Muda previously mentioned. A future state map is created to be able to locate underlying causes of wastes which through process improvement could be made more efficient and give a good financial and efficiency impact to the process and the value stream (Rahani & al-Ashraf, 2012).
4 Empirical Data

This chapter provides an overview of the activities performed at the case company. Furthermore, empirical data collected is presented to give answer to the study’s research questions.

4.1 Company Description

The case study has been conducted at one of the largest heavy truck manufacturing companies in the world with a history of manufacturing trucks for 90 years. Their vehicles are sold and serviced in more than 140 countries all over the world with 95 percent of their production capacity in Sweden, Belgium, Brazil and in the USA. Throughout the company, the focus is on their core values; Safety, Quality and Care of the environment. This results in the fact that the company are branch leader in manufacturing safe and innovative high-quality products with an environmental awareness for their customers.

The case study has been conducted at the plant located in Bangkok, Thailand. This plant manufacture two types of brands. One brand is manufactured by assembling knock down (KD) kits received from other plants. KD are kits that’s manufactured at another plant and then shipped to the facility to be assembled to finished products. For the other brand the company have complete manufacturing which means that they manufacture the trucks by themselves. They also manufacture KD parts of this brand to be assembled at another plant in southeast Asia. Due to the manufacturing of two brands the plant handles approximately 5300 different part numbers. The takt time at the plant is 12 trucks a day which means that the company in an average must receive 50 trucks and 8 containers a day with components to satisfy the production lines. Trucks are made to customer order which means that customers have a great opportunity to customize the truck to own preferences regarding look, performance, quality and features.

The case company is currently working with Lean philosophy, mainly in its manufacturing processes. From interview with logistics manager it surfaced that there are currently problems with supplying the assembly lines with correct components and materials. The manager said:

“Most of the time we have the materials we need to manufacture a truck in the plant. But sometimes there is a lack of products in our inventories before the assembly lines. This is often because the materials get stuck between activities in the goods receiving process. The assembly line is directly affected by this and it can sometimes lead to a total stop in manufacturing. In this case we need to go to goods receiving and search for the right materials to continue the manufacturing process.”

According to the manager the assembly line was functioning well as long as there are materials in stock but unfortunately the lack of materials happens quit frequently which results in manufacturing stops.

4.2 Current State Goods Receiving

The company’s goods receiving process handles incoming goods received by truck or container from both local and oversea suppliers. The goods receiving process is divided into eight different activities which handles goods from point of arriving to plant until component storage in either a super market or in high rack storage. Each of these activities are seen as either value-adding, non-value-adding or necessary non-value-adding activities that the company needs to perform to manufacture products or in this case to get the components to storage.

When a customer places an order at the case company the company translates the ordered truck in to components and electronically order the needed components from each supplier. The components are then sent as overseas freight with boat, local delivery by truck or by air freight if quick delivery is needed. The goods receiving process starts when the shipment arrives at one of the unloading locations at the plant and ends when the materials have been moved to storage. The received trucks and containers pushes the material in to the plant in a “push flow”. The activities in goods receiving aren’t functioning with a pull system due to the irregularity of shipments and trucks. The activities are therefore sometimes operating at full capacity with
materials waiting on handling between activities and sometimes standing still due to no materials being received during that time.

Although the case company have a Lean philosophy adapted to their manufacturing processes, they haven’t implemented it at goods receiving. When interviewing an operator at goods receiving he states that they don’t work with Lean which was noticeable when observing the operators performing work tasks. Operators performing the same task completes it differently and uses different tools and equipment. From the interview with the logistics manager it surfaced that the goods receiving process isn’t prioritized to be improved:

“We mainly focus on the manufacturing procedures and improving them. As long as the Goods Receiving is functioning and being able to support JIT manufacturing we are happy”

4.2.1 Suppliers

The case company have suppliers located all over the world. Some are located in Europe and are a part of the focal firm as subsidiaries, like the case company, and provides the case company with organizational branded components like doors, huts, and chassis which is delivered by oversea containers. The organization also have other manufacturing plants in Asia which acts as KD suppliers provides the factory in Bangkok with finished modules, which are ready to be assembled in to finished trucks at the Bangkok plant. The local suppliers are not part of the organization and mostly provides raw materials, screws, nuts, door panels, roof panels and much more.

Shipment times overseas vary several months due to uncertain ocean condition and thereby force the case company to keep these items in stock. The Asian and Bangkok local suppliers on the other hand can deliver ordered component from a couple of weeks to under a week’s time depending on shipment distance.

4.2.2 Packaging

The case company receives materials and components in many different packaging types with different kinds materials and dimensions. The organization have standard packaging which is used when shipping between different manufacturing plants within the organization, called V-emb. These have different dimensions and are labeled with letter K, L, F, G or H depending on which dimension the packaging has. V-emb is made of wood and metal pieces that protects the components during shipments. Upon completed shipment these packaging’s are reused within the organization to save costs and to reduce the environmental impact of shipping. V-emb is also used as storing packages due to their strengths and standardized size. This is something that the logistic engineer pointed out during the interview:

“The durance and quality of the V-emb packaging makes it great to use as storage packaging. It helps us save space and reduce the number damaged products at the same time as it improves the flow through the receiving process due to not needing to be unpacked and repacked.”

Suppliers outside the organization mostly ship components by carton packaging. These can vary in dimension and in material strength which makes them less efficient to work with compared to V-emb that are made of stronger material and has standardized sizes. To cope with handling different type of packaging materials the case company currently repack the components received by carton packaging to their own standard packaging V-emb to keep in storage. During the interview with the logistics engineer he said:

“The cartons received by truck from the local suppliers are often damaged or contains the wrong items. This forces us to unpack, inspect and repack the shipments which is frustrating”

4.2.3 Goods receiving

The case company receive goods from its six unloading docks located at the incoming goods section of the company. The different docks handle different kind of packaging and materials. For example, one of the docks is strictly used for unloading chassis due to their size. Received
packages is unloaded at the unloading docks and are then checked and controlled by operators. Depending on what type of packaging that is unloaded, some will be repacked in V-emb to fit storage dimensions and some that already is packed in V-emb is moved directly to storage. The identified activities in goods receiving are presented in Figure 8.

![Figure 8 Activities in goods receiving](image)

**Activity 1**  
*Unloading* is the first step of goods receiving. The unloading process is carried out by receiving trucks and containers at one of the plants six goods receiving locations. There are in average 8 containers and 50 trucks being received and unloaded every day at the plant. Three locations are used to unload packages from trucks and the other three for containers. One problem with the unloading activity is that often the same unloading area is used as shipping area. One interviewed operator claimed:

*“Some hours a day the unloading floor and docks are used as shipping docks. This makes the space limited, it gets crowded and it take longer to unload. It also means that some trucks must wait to be unloaded and forklifts are often occupied by other stations”*

There are four people employed and the equipment resources is four forklifts at the unloading activity. Two employees unload trucks and the other two unload containers with help of the forklifts.

**Activity 2**  
The next step after unloading is *Check Package*. There is one employee working at this activity which involves comparing the invoice with the number of received packages to control that the right amount is delivered to the plant. Also, the condition on the packaging is checked to make sure that the components received haven’t been damaged. When observing the activity over two days it was noted that the same packages was still waiting to be processed. According to the operator this was because other activities needed back-up.

**Activity 3**  
The third step of goods receiving is *Admin Arrange document*. In this activity one operator inserts the package information obtained from the unloading and check package oversea activity in to company internal excel files.

**Activity 4**  
*Unpacking and Repackage* is the fourth step and consists of two stations. One station handles overseas incoming goods while the other handles local incoming goods. These two stations begin with unpacking goods delivered with “one-way-packaging”. These packages are made of carton and are repacked to the case company’s own standard packaging. From interviews with operators it surfaced that the correct standardized packing V-emb was missing and needed to be collected at other parts at the plants. One operator said:

*“When V-emb is missing, I need to try to either find a forklift to get it myself or ask a free forklift operator to collect some for me”*

Three employees are working with oversea packages and two employees work with the local packages. Each station is equipped with one forklift and one stacker.

**Activity 5**  
*Admin GR* is activity five in the goods receiving process. There are four people working at this station and the work consists of insert package information in to the internal data base with help of excel files from previous activity *admin arrange document*. This is done to support the next activity so that the component and package information can form a correct label.
Activity 6
*Label scan* is the sixth activity and consists of two stations, *Label scan local & Label scan overseas*. These two stations have one employee each with help of one PDA to scan labels printed by previous process.

Activity 7
Next step in the goods receiving process is *Attach internal label & repack* which is the seventh step. In this sub-process, there is one employee working with attaching new labels printed from the internal computer system. Some of the incoming goods is also repacked and organized to fit storage standards and ease the withdrawal of components to the assembly line.

Activity 8
The last step in goods receiving is *Move to storage* and there are 8 employees working at this process activity. This activity consists of moving package with attached and scanned label to either hi-rack storage or deep stow storage. Around 90 percent of the component packages are stored at hi-rack storage above the supermarket which supplies the assembly lines with picking locations for components. When the supermarket needs refilling, operators withdraws the component packaging from hi-racks and inserts the components to the supermarket so that the assembly line can be supplied. This activity has 8 forklifts, 5 PDA’s and 3 CPU’s as equipment. The operators claim that it is always a stressful working environment at activity 8. According to one operator the forklift workers are often burdened with other types of work which delays and interrupts their work assignments. He stated:

“There are often components missing in the supermarket which should be there. It is us who must search in the other goods receiving activities where the components are.”
5 Analysis

The chapter answers the case study’s research questions by matching collected empirical data with the theoretical framework.

5.1 Which lean tools or methods could be applied on a manufacturing company’s goods receiving?

The first research question will be answered by identified lean tools and methods will be matched against the case company’s good receiving to evaluate which tools or methods are suitable to apply on a manufacturing company’s goods receiving. To get a clear structure of the analysis each paragraph will begin with the lean tool analyzed.

5.1.1 Application of Lean tools or methods in goods receiving

A Lean philosophy needs to permeate the entire organization to be successful (Liker J. K., 2004). Liker (2004) also states that the organization needs to have a comprehensive view of Lean to benefit from the implementation of different Lean tools and methods. The case company is working with Lean in its manufacturing processes and on manager level but not in goods receiving which indicates that the Lean philosophy does not permeate the entire organization. Rogers (2009) and Imai (1997) claims that improvements made without a holistic view could lead to sub-optimizations.

Likers 14 principles. Liker (2004) identified 14 principles and created the 4P model for these. The 14 principles were used to characterize Lean production. Two key principles in the model was continuous improvement together with respect for people (Liker J. K., 2004). The case company’s managers were aware of the 14 principles but have never really used them or did not know how to. According to Liker (2004) these principles were advantageous to keep in mind in most business decision to become competitive and forward thinking. By following these principles, it is achievable to create a more effective and better working goods receiving where employees are more involved in improvements and decisions. Although creating a pull flow in a goods receiving is difficult or might even be impossible due to the inconsistency of incoming shipments, all other principles are feasible.

Kaizen. Managers at the case company has already implemented Kaizen at the manufacturing processes with help of the PDCA-cycle to assure safe and continuous improvements. According to Imai (1997) Kaizen in for everyone in the organization, from top management to operators at floor level which means every worker at every process. Kaizen is therefore suitable to apply in goods receiving to involve everyone in the organization. According to Imai (1997) a Kaizen approach ensures low costs compared to innovation, higher quality and better delivery as long as the company is working with the seven Kaizen concepts presented in the theoretical framework. These concepts are related to managerial approaches to change mindsets of employees within the organization towards commonsense problem solving and priorities (Imai, 1997). By following these concepts, it is possible to implement the Kaizen strategy in manufacturing processes as well as in goods receiving.

5S. The five steps of housekeeping in Kaizen and Lean philosophy consist of cleaning the Gemba and maintaining the cleanliness and the standardized way of working (Imai, 1997). The workstations at the case company was functioning decently but it was clear that improvement or cleaning was necessary. Sometimes the operators couldn’t find the right tools or had to wait for the equipment to be free. Some work stations even shared tools and equipment with each other which resulted in items that was ready to be processed had to wait. Randhawa & Ahuja (2017) suggest that to gain process improvement the tools and equipment used should be organized. According to Rogers (2009) it is important that goods receiving runs smoothly without interruption or miscommunication which prevents harsh consequences for downstream processes. By implementing the 5S of housekeeping the company can reduce the number of errors and improve quality in goods receiving (Randhawa & Ahuja, 2017). According to Imai (1997) the implementation of 5S is applicable over the entire organization and especially at floor workstations which makes it suitable to apply in goods receiving.
Gemba. As stated in the theoretical framework Gemba refers to the workplace where action takes place. According to Imai (1997) the Gemba need to be managed with support from management to have the best improvement effect. Managers in the case company do use Gemba but only in the assembly line. They are practicing Gemba with a management of Control perspective presented in Figure 7, which Imai (1997) implies could have a negative effect on improvements. Managers in the case company would according to Imai (1997) benefit more with management as support. By performing a Gemba walk and follow the value flow waste and issues in processes can be identified (Imai, 1997).

Just-In-Time. JIT is one of the two pillars within Lean philosophy and a strategy to make production more efficient (Claycomb, Germain, & Dröge, 1999). The fundamental ambition with JIT is to eliminate waste in the supply chain by producing the right products to the right place at the right time and as a result lower the logistic costs (Claycomb, Germain, & Dröge, 1999). It is an approach to continuously eliminate waste by constantly improve and standardize processes (Zhu & Meredith, 1995). It also requires a pulling system (Claycomb, Germain, & Dröge, 1999). The managers at the case company were well aware of JIT and the idea of it. However, blue collar workers were not aware of JIT and did not know how an implementation of JIT in production would affect daily work. Consider the requirement of a pulling system it is not advisable to implement a JIT flow at a goods receiving. Even so, it is beneficial to improve and standardize processes.

Value Stream Mapping. The lean tool VSM helps according to Martin & Osterling (2014) a company to pursue process and value stream improvement. It acts as a visual storyboard on how orders from customer is processed to finished product (Martin & Osterling, 2014). Lamia & Fredj-Ben (2016) explains that the VSM should have a holistic perspective and include every process the making of the product passes through. This makes it an important tool to include in goods receiving as well as in the rest of the value stream. If not, there are risk of sub-optimization when improving processes (Imai, 1997). Rogers (2009) implies that wrong procedures or improvements in goods receiving could have a ripple effect on the rest of the value stream. Logistic managers provided value stream maps over the value stream from order received to finished truck but in goods receiving the data was incomplete. If process improvement is to be done at goods receiving it could lead to sub-optimization due to working with incorrect data and lack of knowledge for downstream operations and processes (Imai, 1997). This makes it a valuable tool to include in goods receiving.

5.2 How can lean-orientated goods receiving lead to improved value flow?
The second research question is answered by analyzing how the implementation of the appropriate lean tools and methods in goods receiving effects the overall value stream. The different tools and method all have different contributions and effects on the organization and its value stream. According to Bevilacqua, Ciaraipca & De Sanctis (2016) Lean tools and methods functions better if bundled together with a holistic view. This means that the applicable Lean tools and methods in this study are more likely to affect the value flow if bundled. Therefor they are analyzed together as a functioning bundle to show the effects on the value stream. The bundle of Lean tools and methods will be analyzed against and applied on the empirical data to answer the second research question.

Likers 14 principles. The 14 principles suggested by Liker (2004) help companies become learning organizations and to encourage organizations to work with continuous improvements within their supply chain and throughout their whole organization. Liker (2004) suggested in the 14 principles to create a pulling system and through that reduce buffer and stock levels with help of JIT. As well as the flow need to be standardized and without irregularity, educated and developed leaders to emphasize to the company’s culture is essential to the company’s long-term thinking (Liker J. K., 2004). Likers 14 principles encourage employees to challenge each other and to become problem solving by creating an own vision of the problem and gather data to solve situations, instead of listening to what others tell you.

The 14 principles written down together with the pyramid to visualize the model and create an understanding of the principles from employees and leaders within the goods receiving would
benefit the value flow. A culture where continuous improvements, elimination of waste and focus on long-term thinking will be ground pillars. By creating a learning organization that encourage continuous improvements as this would generate an employee who is engaged in finding feasible improvements in the goods receiving. This culture and the 14 principles would therefore continuously improve the goods receiving process at the same time as creating a standard to lean towards.

Kaizen. Kaizen mainly focuses on human effort and making small controllable steps to improvement based on commonsense (Imai, 1997). One of the objectives with Kaizen is to implement a learning organization starting with the CEO and managers to operators (Imai, 1997). In the learning organization Imai (1997) suggest managers to visit the work place frequently which helps them realize the actual problems and grasp what operators could bring to the table. The operators at the case company only met managers at meetings once a week and only got directives on company goals and information about incoming goods. The operator never got the chance or understood why it was necessary to give feedback and have a dialogue with managers. Imai (1997) implies that when working with Kaizen the effort of people is more likely to be improved which results in that it is also more likely that the overall value flow is improved.

The overall goal with Kaizen is to maintain and improve quality, cost and delivery (Wittenberg, 1994). To assure that the improvements is done continuously and are controllable Imai (1997) claims that it is fundamental to use the PDCA cycle and to adapt the seven Kaizen concepts. By following the seven concepts and using the PDCA cycle for improvement in goods receiving the value flow would benefit from understanding where improvement should be done and why. Imai (1997) explains that it is important to put quality first and speak with data for problems to be solved correctly. Otherwise the root cause might not be identified, and the problem reoccur. This is something frequently experienced in the case company. Operators doesn’t have the time or knowledge to investigate why the activity isn’t functioning as usual or as hoped. Instead they come up with small fixes to keep on working. One example is when V-emb is missing at activity 4 “Unpack & repack”, operators leaves their activity to search and collect V-emb. This is non-value adding time to the final product and should be eliminated (Apreutesei & State, 2013). A key activity in Kaizen is according to Imai (1997) standardization. When solving problems like this current standards needs to be revised to prevent the problem from reoccurring (Imai, 1997). The new standard should assure that activity 4 never runs out of V-emb which means that the activity doesn’t need to stop. With the new standard quality, cost and delivery is increased due to that the worker doesn’t need to search for V-emb. The new standard has removed waste in form of Muda of motion (Ghosh, 2013). This is according to Imai (1997) going to affect the value flow in reduced lead times, more accurate deliveries which lowers cost and increases customer satisfaction.

Kaizen and commonsense problem-solving in goods receiving assures that quality, cost and delivery is maintained and improved (Imai, 1997). This would result in that manufacturing processes in the assembly line would suffer less manufacturing stops due to lack of components in storage. With the learning organization, the operators will be able to gain knowledge and provide managers with relevant information to improve the goods receiving in the right way. By implementing standards in goods receiving it is easier to understand abnormalities and to find the root cause. This means that goods receiving will continuously improve and assure quality when doing so.

5S. When visiting Gemba it was clear that the case company’s goods receiving was not structured or standardized in an efficient way. It was also dirty and messy. Randhawa & Ahuja (2017) explains that 5S is a methodology that ensures overall organizational cleanliness and a motivating workplace for everybody. The methodology cleans the workplace in sorting, straightening, scrubbing the working environment and implement standards to sustain the steps. There are several activities in the case company’s goods receiving that doesn’t function efficiently due to sharing of tools and work space, mainly activity 1, 3 and 6. For example, activity 1 unloading, shares the dock space with shipping which results in waiting time to receive trucks and wait for forklifts to use. Imai (1997) implies that these activities need to be sorted and straightened to gain control and efficiency. Randhawa & Ahuja (2017) states that it is easier to find root causes to flaws and improve workstations when they are cleaned which have been
observed at the case company. Both operators and managers didn’t know how to improve goods receiving and often had a hard time on finding the root cause.

With 5S implemented the overall cleanliness of the organization would increase and thereby it will be easier to improve processes and activities. 5S would also eliminate Muda when sorting and straightening workstations. This would make goods receiving activities more efficient and have more quality and secure deliveries which reduces cost (Imai, 1997). Ultimately the lead time will be reduced due to eliminating non-value adding time in goods receiving activities. Randhawa & Ahuja (2017) implies that 5S as a tool is not just for cleanup at processes and workstations. It also brings improvement in employee involvement, organizational communication and inventory management which means that it supports Kaizen (Randhawa & Ahuja, 2017).

**Gemba.** Gemba can be practiced in two ways according to Imai (1997). The case company practice Gemba as management of control instead of management of support. This means that managers rule over decisions in Gemba without taking the operators thoughts and information in consideration (Imai, 1997). Rahani & al-Asraf (2012) suggest managers to perform regular Gemba walks to understand operators and support instead of ruling over them. With Gemba walks it becomes possible to find root causes and understand flaws in processes and workstations (Rahani & al-Asraf, 2012). With management as support as the new was of practicing Gemba in the case company an understanding about root causes to flaws the goods receiving activities can be gained. This means that activities can be improved so that root causes disappear. This will lead to new standards being implemented and increased value flow.

**Value stream mapping.** The case company was eager to implement new improvements across the value stream at regular basis. Some improvement could lead to sub-optimizations which Rogers (2009) implies could have a ripple effect on value stream if occurring in goods receiving. A value stream map reveals hidden and obvious wastes with its holistic perspective and could therefore prevent sub-optimizations (Imai, 1997). The goods receiving would benefit using a value stream map before implementing Lean tools and methods. A current state map could according to Martin and Osterling (2014) help managers grasp the situation more correctly. This makes it possible to get an understanding on which processes or activities that are more suitable to improve, and which improvement methods should be used (Martin & Osterling, 2014).

From the analysis of applicable Lean tool and methods the bundle is created with Likers 14 principles, Kaizen, 5S, Gemba and VSM. Managers at the case company had value stream charts that included the entire procedure from order received to finished truck. In goods receiving though, the maps were incomplete with some data missing. Logistic manager hinted that they mainly focused on timing the manufacturing processes not the goods receiving. This because the main focus lies on producing products, not stocking materials in front of the assembly line with manufacturing processes.
6 Discussion & Conclusions

This chapter provides a summary of this study’s result. Further on the study’s implications and delimitations are described. Also, the study’s conclusion and recommendations will be presented together with suggestions of further studies.

6.1 Discussion of results

The purpose of the study is:

Explore how a lean philosophy affect the value flow of a manufacturing company's goods receiving.

Below the result is discussed which answers the purpose of the study.

First off, from the analysis it is clear that a Lean philosophy is appropriate to implement in a company's goods receiving as well as in the rest of the organization. Although the philosophy is appropriate to implement in goods receiving some Lean tools and methods are not. The analysis show that the JIT practice isn’t appropriate to implement. JIT aims to create a pull system with zero inventory between processes. Goods receiving is functioning as a push system triggered when a truck or container is received at the company and components and materials needs are pushed in to inventory or manufacturing processes as soon as possible.

The empirical data collected showed that managers had talked about lean in all the processes like it was well adopted across the case company. The observations at goods receiving showed that lean was not that well adopted at floor level where most of the work place was unstructured and not standardized. This is a sign that the case company has the “Top down” Gemba practice that Imai (1997) explains is managers ruling over Lean and Gemba without including the employees in decision making. As a result, the employees don’t take part of the Lean practice and doesn’t understand what the managers are ruling over and implementing at the work place. This way of Lean leadership might therefore result in that Lean practice in goods receiving probably won’t reach the five pillars presented by Dombrowsky and Mielke (2014) as key to reach in order to have a sustainable lean practice and implementation.

The importance of competent lean leadership is shown during the observations where four different employees performed a work task with different tools, in different ways and took different amount of time. Liker J.K (2004) claims in his principle 6 that the goal is to make processes standardized and predictable which this process clearly lacks. This will lead to a more stable value flow and with standardized and repeatable processes continuous improvements is much more achievable (Liker J. K., 2009).

From literature Likers 14 principles, Kaizen, 5S, Gemba and VSM was identified as appropriate to implement in a company's goods receiving. They all have different approaches to ensure secure and controlled improvements but they all are dependent on good leadership to be successful. Likers 14 principles and Kaizen both aim to create a leadership that educates and creates a learning organization that involves everyone. This wasn’t the case in goods receiving where managers with knowledge ruled over operators instead of educating them. It was identified that Kaizen, 5S, Gemba and VSM were known by managers used successfully by the case company in their assembly line. According to literature a company benefits from making small controllable steps towards improvement which could be achieved if using the managers at the assembly line to educate goods receiving employees in Lean to find root causes and gain expertise from operators.

As analyzed in the previous chapter a Lean philosophy with appropriate tools and methods in goods receiving secure safe and continuous improvements which ultimately leads to security of delivery, improved quality and improved cost across the value stream. Kaizen and Gemba also ensures that higher quality is gained when improving goods receiving due to finding root causes and basing improving decisions on accurate and current data. 5S is cleaning the goods receiving and eliminating waste in form of non-value adding activities and implement a structure and a standard to the way of work. This also result in improved quality due to the standardization. To ensure that the Lean philosophy and improvements are made in the right direction the VSM
Appendix

provides a holistic view over the value stream and show connections between processes which makes sub-optimizations and waste visible to managers.

6.2 Discussion of methods

To ensure scientific quality the authors chose a case study approach in accordance with Yin (2006) and Patel & Davidsson (2011). The choice of performing a single case study and literature studies with observations, interviews and document study as empirical data collection methods will be discussed and critiqued individually below.

6.2.1 Case study

To gather empirical data a case study was chosen to be conducted. The empirical data could later be compared with the literature review which enabled the authors to use pattern matching. This means that the case study was crucial in order to gain data to analyze against the theoretical framework and finally reach a result. This means that the case study was of importance to many parts of the study although some parts could have been answered completely with study of theory. Due to time limit a single case study approach was chosen which lowers the reliability of the study. If a multiple case study was performed the reliability would have been increased. To cope with this, the case study chosen is a global manufacturer of trucks and the result can therefore be seen as a representative case applicable on similar companies.

6.2.2 Literature review

The literature review was carried out at the early stages of the study to have a foundation to base methods on. To increase the level of reliability and validity of interviews the authors chose to only include peer review articles in the study. This meant that the results of the study are more likely to be the same if someone else performs the same study. To secure that literature was valid and accurate the authors chose to only perform literature searches on known data bases.

6.2.3 Interviews

As explained above, interview questions were based on the literature review to ensure the validity and reliability of the study. To gain valid information only managers with insight in goods receiving and employees at the work stations was selected as interview respondents. A key point with interviews is to get the respondent verbal and free speaking. Managers spoke freely about the questions asked and provided much needed insight at the case company. This proved to be difficult at floor level at goods receiving when interviewing workers at the work stations. Due to language barriers interview questions and responses was repeated several times to get an understanding but the results were of importance for the study result as it showed differences between managers and workers. The validity and reliability of interviews could have been increased if the authors had used an interpreter during interviews with workers at floor level. This would have reduced the language barrier and maybe contributed to more accurate and true answers.

The reduce misunderstanding and wrong interpretations the authors took notes and recorder the interviews which helped ensure the reliability of interviews. The interviews were carried out with each respondent individually and the authors ensured that the respondents knew that they were anonymous during the interviews. This meant that respondents could speak freely about their perspective and not being interrupted or afraid of a manager at a higher position which increased the validity.

6.2.4 Observations

Two observations were chosen to be performed to collect empirical data. The first one to get a current state view at the case company and the goods receiving process and the second one to validate interview answers. The second observation also strengthened data collected from the first observation and interviews. Observations showed differences and similarities between empirical data and the literature review which ultimately lead to the study result. To gain a high level of reliability and validity the observations was carried out by both authors and at two times during the case study. This meant that results were repetitive and increased the reliability and
that when one author missed something, the other one noticed it which increased the validity. The validity and reliability could have been higher if the work was videotaped. This was not possible due to restrictions at the case company and it might have contributed to workers changing their working habits.

6.2.5 Document studies

Document studies was mainly used to strengthen the empirical data collected with the case study. This meant that data in form of Excel-charts over goods receiving activates was analyzed to help base interview questions and get an accurate current state view which resulted in strengthened the validity of the study.

6.3 Conclusion and recommendations

As the study’s result argues, these Lean tools and methods all have different functions and contribute to overall process improvement. The individual contributions are presented and analyzed in section 5.2. Although these contributions individually contribute with improved value flow in form of improved delivery, quality and cost the authors come up with the first conclusion which in accordance with literature is:

*To take full advantage of Lean tools and methods in goods receiving, these are best to be bundled together to an approach that is in accordance with the Lean philosophy at the organization.*

From the discussion of result, it can be noted that although these Lean tools and methods are affecting the goods receiving and value stream in various ways. They need to be controlled and managed by good and competent leadership that leads the way and educates the organization towards a Lean philosophy that covers the entire organization. All of the tools analyzed in the study is highly dependent on good leadership to be implemented successfully. Without consistent leadership that evaluates, educates, ensures continuous improvements and guides the goods receiving the organization will likely fall back to old standards and stop improving. This leads to the second conclusion of the study:

*Good and competent leadership in the Lean philosophy is crucial to ensure continuous improvements in the organization which makes an improved value flow possible.*

As the discussion of result argues, a successful Lean philosophy in goods receiving is beneficial for the overall value stream in many ways. With continues improvements the goods receiving can be optimized and be more efficient by removing the seven mudas of Lean. This will lead to a clean workplace and the overall goal with Kaizen which is to ensure quality, cost and delivery. With a Lean philosophy adapted in goods receiving the value stream becomes more repetitive and processes more predictable which leads to the third and final conclusion:

*A Lean philosophy adapted in goods receiving is likely to ensure stability and reliability across the value stream which makes improvements possible and might lead to improved value stream performance.*

6.4 Further research

The study explores a new area in which the authors did not find theory specialized towards lean practice oriented towards goods receiving. Further research is therefore recommended to deeper investigate the impact of lean practice in goods receiving by including several case companies located in various regions. During the case study the authors identified that the flow of incoming goods was uneven which caused daily constraint and problems at goods receiving. This also meant that JIT was not implementable at goods receiving activities. The authors therefore suggest that further research should investigate how a JIT supply relationship with vendors could affect the value stream and flow of materials.

The authors only explored how Lean orientated affects a company’s value flow from a qualitative measure. Therefore, a quantitative research with accurate calculation and testing is recommended to strengthen the reliability of the case study.
7 References


Appendix


