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Implementing Lean Procurement

Opportunities, methods and hinders for
medium sized enterprises - a case study

Master's thesis within Business Administration

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Abstract

This thesis describes how lean procurement can be implemented in a medium sized enterprise, focusing on opportunities in the process, methods to achieve the opportunities, and hinders that need to be handled. A literature study has been conducted to identify these aspects, organized by six implied implementation stages of lean procurement. To challenge the findings, an empirical study was conducted at Isaberg Rapid, in order to confirm or discard identified important concepts.

In order to conduct a credible study, the choice of a qualitative method has been chosen to contribute to the studied area, with a main emphasis of providing an insider's view of the case company by semi- and unstructured interview questions. Further, an abductive research process can explain the work order, where an iterative approach has been used between theoretical and empirical studies to create an understanding of the studied area. Isaberg Rapid as a case company was chosen because of their successful lean work and their current aim of implementing lean procurement.

A starting point for the study was a theoretical review to decide how and what data that needed to be collected. This led to the choice of interviews, documents analysis and observations at the case company, where interviews were the main contributor with participants connected to lean and procurement. Collected data was interpreted and conceptualized, in order to function as a base for the analysis, together with the theoretical study.

The theoretical study describes the opportunities, methods and hinders of lean procurement in the implied implementation stages of Internal lean, Understanding the supply, Establish lean suppliers, Efficient inbound logistics, Joint improvements and development, and finally An extended enterprise. The analysis compares these findings with the empirical study, to depict main concepts of lean procurement, related to medium sized enterprises.

The study shows the importance of creating a lean culture that is manifested internally, that can support the development of the procurement function, and further motivate and influence suppliers to adapt the lean work. Main opportunities identified in the study are increased inventory turnover, capable suppliers and reduced waste in the supply chain. Important methods to enable the opportunities are assigned lean roles, education and training, kaizen events, kanbans, milk runs and knowledge sharing. Main hinders for the methods and opportunities are resistance, commitment and trust, resources, power circumstances, and distant suppliers.

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1 Introduction

This chapter starts by introducing the background and problem definition, followed by purpose, research question and a presentation of the case company.

1.1 Background

Lean has its origin in Toyota Motor Corporation and their Toyota Production System (Liker, 2004; Womack, Jones & Roos, 2007). The term lean was coined by John Krafcik in the late 80's (Lean Enterprise Institute, 2009), but the philosophy came to the Western world's attention already in the beginning of the 80's as the automobile industry's suffered by the competition from Japan with low prices and excellent quality (Liker, 2004). As a contrast to the mass production system (Womack et al., 2007), lean needed half the human effort, manufacturing space and capital investment (Lean Enterprise Institute, 2008), where strong partnerships with suppliers were essential (Liker, 2004). Instead of learning new practices, trade barriers and other impediments were set up before it was realized that Toyota and their production system was the new guideline to follow for improved quality, productivity and flexibility (Womack et al., 2007).

Along with Toyota's success and the increasing awareness of lean, a global transformation was triggered in almost every industry to lean manufacturing and supply chain philosophy methods (Liker, 2004). Lean has successfully been applied in other industries than the automobile, such as the service industry, healthcare and government, and continues to evolve and spread (Bowen & Youngdahl, 1998; Larsson, 2008). For instance Liker (2004) emphasizes that lean also efficiently can be applied in all business processes, including procurement. Additionally, supplier relationships are of high importance in lean for its success (Arnold & Chapman, 2004; Liker, 2004) and generally, the supplier plays a vital part in order to survive in the increasingly competitive market place (Bergdahl, 1996).

A study revealed that Swedish companies are worried about the increasing competition, especially from manufacturers in China that offer substantially lower prices and simultaneously increase their capabilities regarding quality, delivery and service (TT/E24, 2011-03-28). It is likely that Swedish companies have difficulties to compete with lower prices, and therefore need to be more efficient and productive. Lean can assumably enable this, but it may be hard for medium sized enterprises to relate to lean solutions of larger enterprises, considering their size and supplier environment.

1.2 Problem definition

Most linked to production is procurement, which plays an increasingly important role for an organization's profitability (Larsson, 2008). By an efficient procurement there is potential for substantial competitive advantages (Langley, Coyle, Gibson, Novack & Bardi, 2008) as the largest part of the cost of goods sold are in purchased raw materials, components, and services (van Weele, 2002). The procurement function is transforming and gets broader in its context (Virolainen, 1998) and it has recently been given more attention and is nowadays seen as a necessity in creating value stream excellence (Hines, 1996a). This puts a higher focus on the supplier network as the key to competitive advantage (Hines, 1996a), and to share the commitment and the risks involved (Virolai-

nen, 1998). It is assumable that lean can enable a more efficient procurement and extensive research has been conducted in the field of lean, where the work by Womack, Jones and Roos (1990) and Liker (2004) are salient. In the procurement area, a lot of research of lean is available as well (e.g. Hines, 1996), and also regarding supplier partnership (e.g. Lamming, 1993; Liker & Choi, 2006) and lean logistics (e.g. Baudin, 2004). Hines and Taylor (2000), Lee (2003) and Åhlström (1997) have presented guidelines or sequences regarding the implementation. What these authors have in common is that they focus on larger enterprises. However, it is just as vital for smaller firms as for bigger firms to gain benefits by more efficient processes (Wilson & Roy, 2009).

The question is how medium sized enterprises work with lean procurement? Bigger firms are in a situation where they have power to proactively work with suppliers (Cox, 2001) and thus able to exercise lean methods linked to larger actors like Toyota. Some benefits and criticism of lean procurement in the perspective of small- and medium sized enterprises have been discussed, for instance by Wilson & Roy (2009), where lean improves quality, delivery and costs but the lack of bargaining power with suppliers and technology questions its full use. Bonavia and Marin (2006) conclude in a study that lean is much less used in small enterprises but that medium and large enterprises work in a similar manner with lean. However, it is likely that there are differences between small, medium and large enterprises how they manner and experience opportunities and hinders. Thus is a more specified study of lean procurement in the perspective of medium sized enterprises interesting, and to further investigate what methods are applicable and what the opportunities and hinders might be in the implementation process.

1.3 Purpose

The purpose of this thesis is to understand and conceptualize lean procurement, focusing on the implementation process and from the perspective of a manufacturing medium sized enterprise.

1.4 Research question

The research question for this thesis is:

What are the main opportunities, methods, and hinders in the implementation process of lean procurement for manufacturing medium sized enterprises?

1.5 The case company

This thesis's empirical study is conducted as a case study at Isaberg Rapid at their head office and production site in Hestra, Sweden. In Hestra there are approximately 250 employees (Isaberg Holding, 2010) in the functions of production, research and development, human resources, IT, finance, sales and procurement.

The Isaberg Rapid Group is one of the world's leaders in the stapling industry and they develop, manufacture and market a wide range of products within the segment of office staplers and electric insert staplers for printers and copying machines (Isaberg Rapid, 2010). In focus is high quality, innovative products and user friendliness (Isaberg Rapid, 2006).

In March 2010, Esselte Corporation entered as the new owner of the Isaberg Rapid Group (Isaberg Holding, 2010; Isaberg Rapid, 2010). Esselte is a global office supplies manufacturer with its origin in Sweden (Esselte, n.d.a). Since 2002 the U.S.-based pri-

vate equity investment firm J.W. Childs owns Esselte who centered the growth strategy around Lean Management. The lean work aims to reduce waste in all areas of the business, which also leads to fewer burdens to the environment (Esselte, 2010b).

Isaberg Rapid started their lean journey in 2002. It developed within a couple of years to a structured work process with lean coordinators. Even though there has been set backs and problems with for instance commitment from the workers, lean is now a top priority and well supported by the top management in both Isaberg Rapid and Esselte.

Recently the procurement function became involved in the lean work and a main emphasis is currently to increase the inventory turnover.

2 Frame of reference

This chapter is a literature review of lean procurement and presents its related concepts structured out of six implied implementation stages. The implied stages go from Internal lean, that anchors the lean philosophy internally, to An extended lean enterprise, where suppliers are an extension of the buying firm, via Understand the supply, Establish lean suppliers, and Joint improvements and development. The literature study will be summarized by a model that visualizes the main opportunities, methods, and hinders of lean procurement in these stages.

2.1 Introduction to lean procurement

Lean is a philosophy with an integrated set of activities (Arnold & Chapman, 2004; Langley et al, 2008). Liker (2004) states that lean is based on tools and quality improvement methods but its most vital parts are kaizen (continuous improvements) and respect for people. Its essence is, according to Lean Enterprise Institute (2009), to maximize customer value while minimizing waste and can shortly be described as creating more value for customers with fewer resources. With its system-wide philosophical approach, organizations should be managed as a system and not as a set of incoherent activities (Arnold & Chapman, 2004). As a business system, lean organizes and manages product development, operations, and supplier and customer relations (Lean Enterprise Institute, 2008).

To precisely define lean is hard and it is likely that every company exercising lean will follow their own and unique course (Lewis, 2000). It is a term often confused with just-in-time (Arnold & Chapman, 2004), and also with its ultimate origin of Toyota production system. (Liker, 2004; Srinivasan, 2004; Womack et al., 2007). According to Arnold and Chapman (2004) there are actually two types of just-in-time that have been presented where the first type, called “little just-in-time”, mostly refers to the pull production scheduling system. The second type, called “big just-in-time”, is the overall philosophy and it is this concept that has evolved to the enterprise-wide perspective called lean. The “little just-in-time” is within lean just called just-in-time and it is one of lean’s main elements (Arnold & Chapman, 2004; Liker, 2004). From now on, when referring to just-in-time, it will represent the “little just-in-time”.

Liker (2004) describes lean by a 4P-model consisting of the following concepts:

- *Philosophy* - emphasizing the long-term philosophy in any decision.
- *Process* - focusing on eliminating waste but also the creation of flow, the pull system, leveling the workload, in-station quality, standardization, visual control and to use reliable and thoroughly tested technology.
- *People and partners* - respecting and challenging the employees and suppliers, with an essence of growing leaders who live the lean philosophy.
- *Problem solving* - focusing on continuous improvements and learning, where decisions are made slowly by consensus, but then rapidly implemented.

Procurement is a great determinant of revenues and costs, according to Langley et al., (2008) and van Weele (2002), and they state that an effective procurement can give competitive advantage. Procurement is 'all those activities to acquire goods and services consistent with user requirements.' (Langley et al., 2008, p. 510) More narrowly it could be described as the act of buying goods or services (Langley et al., 2008). Axelsson et al. (2005) explain that the function of purchasing has gone from buying via procurement to Supply Chain Management (SCM) and thus further increase its scope by including improved administrative routines and supplier development.

In Porter's value chain, procurement is one of the supporting activities where the purchased inputs could both be related to primary activities (inbound logistics, operations, outbound logistics, marketing and sales, service) and the other supporting activities (firm infrastructure, human resource management, technology development) (Porter, 1998; van Weele, 2002). The function of purchasing interacts, if it is carried out effectively, with all departments as inputs from marketing, engineering, manufacturing, etc. are needed in order to choose the right purchased product (Arnold & Chapman, 2004). Inbound logistics, which includes activities associated with receiving, storing and disseminating inputs, may be the primary activity with the strongest link to procurement (Porter, 1998).

According to van Weele (2002) the main difference between lean companies and other companies is how they manage the supply chain. He means that a lean company uses fewer suppliers and involves them in joint improvements and development. The targets are also very clear for suppliers regarding quality, delivery and costs which also enables a simple but efficient selection and performance measurement process. This also emphasizes the difference to the traditional approach's focus on price criteria only (Ansari and Modarress, 1988; van Weele, 2002). Waters-Fuller (1995) states that the difference between lean and the traditional way of purchasing is that the traditional approach is to use multiple sources and short terms contracts, instead of single sourcing and long term contracts which lean is associated to. Waters-Fuller (1995) and Liker (2004) also highlight geographically close suppliers as a characteristic for lean procurement. Further Liker and Choi (2006) mean that lean companies have more focus on increasing their suppliers' capabilities in order to reduce costs and improve quality. For instance are assigned lean roles and resources needed to improve and develop the business with suppliers (Lean Enterprise Institute, 2008). Further Ansari and Modarress (1988) emphasize the difference between the traditional purchasing and lean procurement with smaller batches, less quality inspection and administrative work, which is in line with lean's philosophy of doing more with less by reducing waste.

Further sections dealing with lean procurement are structured in six implied implementation stages there are influenced by the literature study. The linkages to Bicheno (2007) and Liker and Choi (2006), and their framework and steps are most evident as bases for structure.

2.2 Internal lean

This section describes the first implied implementation stage called Internal lean. Its focus is on how the organization's internal lean work supports the implementation of lean procurement and further describes important and permeating concepts for the entire lean procurement transformation, such as waste reduction and continuous improvements.

2.2.1 Implementation of lean

The best place to start the implementation of lean, and thus the first and natural step of going lean, is in the company's own factory where most of the internal value is created and no external suppliers or customers are involved (Hobbs, 2004). In a medium sized enterprise, procurement is usually the final function to be included in the implementation, according to Wilson and Roy (2009). Taylor and Martichenko (2006) also state that lean is initially implemented in manufacturing operations and that external activities comes in second hand, which is in line with Hines and Taylor (2000) and Lee (2003) that not involve the procurement function entirely until later stages.

A reason for not involving the procurement function earlier may be explained by Baudin (2004) who states that in order to be able to involve and motivate suppliers in the process, the buying company must be able to show credible results of their own lean work. Also, as Bicheno (2007) and Hancock and Zayko (1998) state, a number of concepts and details need to be mastered for the implementation, and thus emphasize the importance of education and training. This is in line with Hobbs (2004), that discusses the fact that it is easier to not include suppliers in the first stages of the lean transformation.

Often many companies lack the internal capabilities to facilitate education and training and thus often hire consultants to help in the process (Bicheno, 2007; Hancock & Zayko, 1998). Dedicated resources, used for instance to establish a lean promotion office, is an important enabler, and according to Bicheno (2007), a prerequisite for going lean as it cannot be done as a side project. As the implementation is a long term journey, including cultural change to embrace the lean principle through the whole value chain, the lean promotion office can direct and support the implementation (Bashin & Burcher, 2006). Clear responsibilities within lean can assure that the implementation allows time for the organizational culture to change and further promotes enthusiasm, which Hobbs (2004) emphasizes.

Achanga, Shehab, Roy and Nelde (2006) found four critical success factors when they studied the implementation of lean in small- and medium sized enterprises. The first factor, strong leadership and management, facilitates the integration of all infrastructure in the organization and good leadership fosters effective skills and knowledge among workers. The second factor, financial capabilities, is as in any project a key for success and is required for training and also needed for eventually hiring consultants. Skills and expertise is the third factor and is critical for the success as some technicalities and applications of lean requires skilled employees. The fourth is the organizational culture and is an essential platform for the implementation of lean where a culture of sustainable and proactive improvements is characteristic for high-performing companies. Most important is the leadership and management, which is the cornerstone of the implementation. A lack of an ideal management team inhibits aspects like workforce training and benefits of improvement in knowledge, skills and cultural awareness. Achanga et al. further mean that these factors are the elements for a supportive organizational culture that is needed for the implementation of lean, and thus also for the implementation of lean procurement.

Leadership and commitment from the management is crucial for the implementation according to Bashin and Burcher (2006), Bicheno (2007), Liker (2004) and Sohal and Egglestone (1994). Reasons for a less successful implementation of lean is, according to Le (2003) and Liker (2004), the lack of systems thinking, which is linked to Mason

(2007) as well, who states that lean is more than just a set of tools as it is about how you approach your job, customers, suppliers and processes. According to Liker (2004) the systems thinking refers to lean as a philosophy which needs to be fully understood, which is supported by Bhasin and Burcher (2006), as they state that many companies fail because they see lean as more of a process.

Resistance is also a problem in the implementation of lean, as in most change processes. A study by Sohal and Egglestone (1994) shows that resistance is represented in all functions of a company, including middle managers, senior managers and shop floor personnel. Axelsson et al. (2005) state that resistance from individuals is a familiar problem for purchasing managers which inhibits a change to lean in procurement. According to Axelsson et al. (2005), primary reasons for resistance is often a lack of clarity and uncertainty of the change, pressure, interference with interests, and the challenge to learn something new.

According to Bhasin and Burcher (2006), it is important for the implementation of lean to have a clear vision of what the organization will look like after the transformation with a strategy of change and clear set goals that are communicated to the staff. It seems that the major difficulties when applying lean are a lack of planning and project sequencing (Bhasin & Burcher, 2006; Åhlström, 1997). Knowledge of the tools and methods is often not the problem, according to Bhasin and Burcher (2006), but rather difficulties of coordinating the work and making people believe in them. However, as the culture takes hold, lean is spread by the people (Liker, 2004), which leads to commitment and cooperation to the lean work (Liker, 2004; Meland & Meland, 2006).

2.2.2 Elements of lean

The lean house in figure 2-1 gives a good overview of lean and its elements and has been presented by for instance Liker (2004). The house is used both internally and externally, to in a comprehensive way explain the working system of lean to give a common mindset.

Larsson (2008) and Liker (2004) state that lean is advantageously applied in all functions of the organization and that the principles, methods and tools are generally the same, but to some extent differing in emphasis and reflections. However, lean is just as important in administrative support processes, like procurement, as in the production because of the aim to permeate the whole organization.

Liker (2004) explains the symbolic of a house as it represent a system and just as for a real house it is strong only if the foundation, the pillars, and the roof is strong. A weak link weakens the system. The roof, as the goals, stands for quality, delivery and cost, which refers to the best quality, shortest lead times and lowest cost. Often safety and morale are included in the goals.

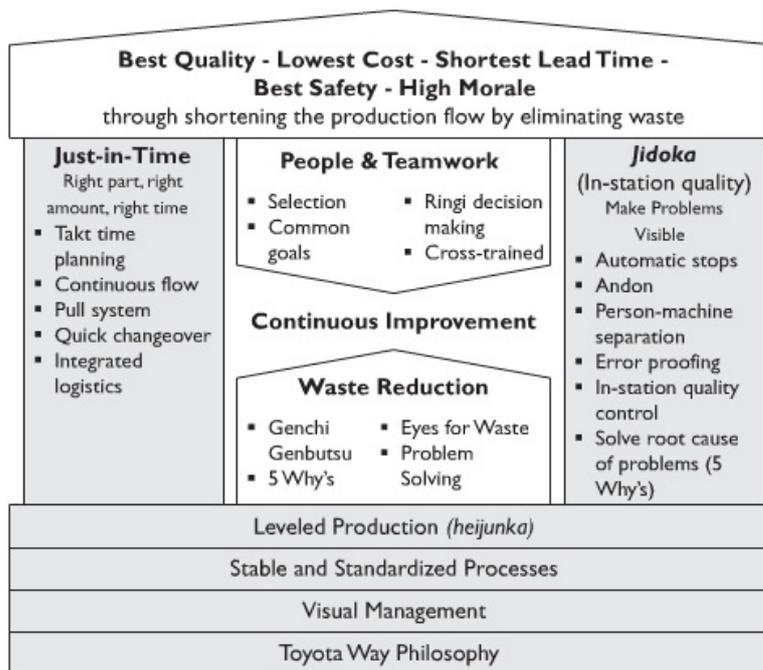


Figure 2-1. The lean house (Liker, 2004, p.33).

Just-in-time is the first pillar and can shortly be described by delivering right parts in right amounts at right time (Baudin, 2004; Liker, 2004; Womack et al., 2007). The pull system, takt time and continuous flow are the three operating elements of just-in-time (Lean Enterprise, 2008). The pull system, referring to only produce what is needed and when it is needed, is relying on the kanban system as a control system (Liker, 2004; Arnold & Chapman, 2004). Takt times represent customer demand and all processes should comply with these demands, where takt time is used to set the pace (Liker, 2004; Srinivasan, 2004). A flow oriented production (Olhager, 2000) and work cells to enable small batches (Arnold & Chapman, 2004) are often used to facilitate just-in-time.

Just-in-time is well linked to other aspects of lean, for instance the second pillar of jidoka (in-station quality), that refers to making problems visible by error proofing, automatic stops and solving the root cause of problems (Liker, 2004). Also heijunka (leveled production), is well linked to just-in-time as the leveling enables production to efficiently and without batching, meet customer demand (Lean Enterprise Institute, 2008).

The other foundations of lean are stable and standardized processes and visual management, referring to making processes simple, stable and visual and thus reinforcing the pillars (Liker, 2004). In the middle of the house is continuous improvements/kaizen, and also waste reduction and people and teamwork. These three concepts will be further discussed.

2.2.2.1 Waste reduction

The heart of lean can be seen as eliminating waste (Liker, 2004), and in order to understand waste, three types of activities are important to define (Hines & Taylor, 2000):

- *Value adding activities*, which are activities that create value for the final customer, simply defined as what the customer are willing to pay for.
- *Non value adding activities*, which are activities that do not create value for the final customer and is not necessary to exercise in any circumstance. These activities should be targeted for removal within a short time.

- *Necessary non value adding activities*, which are activities that do not create value for the final customer but necessary unless radical changes are made. These activities are harder to remove but should be targeted for removal but in a longer term or by a radical change.

Linked to the non value adding activities are the seven wastes which are overproduction, waiting, conveyance, processing, inventory, motion, and correction (Lean Enterprise Institute, 2008; Meland & Meland, 2006). Also unevenness or uneven work pace and overburdening/overload of equipment and workers are waste (Lean Enterprise Institute, 2008; Meland & Meland, 2006).

An easy method for waste reduction is the 5S method that is a series of five main activities that in a systematic way creates an effective work place by discipline, cleanness and well-order (Chapman, 2005; Liker, 2004). 5S is simply about removing unneeded items and establishing fixed and visible places for the needed items and then maintain the order by establishing routines to preserve it (Chapman, 2005). 5S is often a part of the organizational culture (Meland & Meland, 2006). It reduces for instance time spent for finding items, work orders and it also reduces obsolete products for instance (Chapman, 2005). Larsson (2008) and Liker (2004) mean that the 5S method is just as useful in the administrative support processes as at the shop floor, for instance in order to handle all documents and information. Larsson (2008) means that it is part of the organization's overall strategic intent of doing more with fewer resources, that requires an effective administration as well. This is in line with Keyte and Locher (2008), that state that waste in the administration may often be the reason for waste at the shop floor.

2.2.2.2 Continuous improvements / kaizen

Kaizen is a Japanese word that in English means continuous improvements (Manos, 2007; Bodek, 2002). Traditionally, the Western world has been more into rapid changes or traditional way of improvements, in contrast to the Japanese way of kaizen (Liker, 2004; Manos, 2007; Wittenberg, 1994).

Kaizen could be seen as a culture of sustained improvement aiming at eliminating waste in the entire organization and involves everyone in a common aim to improve work without huge capital investments (Bhuiyan & Baghel, 2005). Meland and Meland (2006) explain that the work is led in a top-down approach but it is run by a bottom-up approach where the driving force is the employees' opportunity to be a part of the whole workplace's development. Meland and Meland mean that the approach that engages and motivates employees is more likely to give result.

Originally kaizen has been referred to as small and gradual improvements over time but does now also include more efficient improvements in form of kaizen events (also known as kaizen blitzes, quick kaizen or rapid improvement projects) (Manos, 2007). The kaizen events put small teams together to improve processes aiming at bringing big changes to the work area (Bodek, 2002). Both kaizen and kaizen events produce results but in different ways as kaizen is a constant effort which results in smaller changes (Bodek, 2002; Manos, 2007). The kaizen events may last for some days (Manos, 2007), commonly five days (Lean Enterprise Institute, 2008).

The differences between kaizen, kaizen events and the traditional way of improvements are compiled in table 2-1 below.

Table 2-1. Kaizen, kaizen events and traditional improvements (Mason, 2007, p. 47).

Type of improvement	Kaizen	Kaizen events	Traditional improvements
Large or small scale improvements	Small, steady improvements over time.	Big, fast, simple improvements in three to five days.	Dramatic, one-time, complex, technologically based.
Who is affected	Individuals or groups.	Team based.	Top-down approach.
Costs	Low cost.	Low cost.	High cost usually.
Buy-in potential	Good because employee(s) came up with the ideas.	Good because employee(s) came up with the ideas.	More difficult because users weren't asked their opinion.
Intended benefits	Can be used for any benefit, including quality of work life.	Usually focused on reducing time or nonvalue added activities.	Meant to revolutionize an organization.

One essential feature of kaizen, according to Liker (2004), is a standardization that is created and then maintained and improved. The standards could be a set of policies, rules, directives and procedures that have been set as guidelines for employees to follow for a successful working climate with efficient results (Wittenberg, 1994). Liker (2004) explains the link by stating that you cannot improve if you do not do the same every time. Thus standardization is a foundation for continuous improvements and needed before continuous improvements can be achieved.

According to Mason (2007), the benefits of kaizen or kaizen events are several such as reduced costs, time savings, shorter travel distances, less people required, reduced lead time or cycle time, value etc. non-value added content, fewer steps in processes, reduced inventories, etc. Kaizen events have the advantage that they can be scheduled and thus assures they are performed. Further, the events require teamwork, which may be enjoyable for many and also promote departments to align their work, contributing to the lean culture. The kaizen events also give results immediately which give people visible proof that improvements have been achieved.

Kaizen is not bound to the shop floor as it spreads to all other functions of the business such as product development, production planning, purchasing and sales (Wittenberg, 1994). However, kaizen is dependent on a company's serious commitment to continuous improvement and requires a change in the way of thinking (Mason, 2007). It is important to look back and evaluate how to improve things in order to do it more efficient next time (Lean Enterprise Institute, 2008).

2.2.2.3 People and teamwork

Liker (2004) means that the understanding of people and human motivation and the ability to cultivate leadership, teams, and culture are important success factors for lean. According to Womack et al. (1990) a main feature is teamwork which makes it possible to react quickly to found problems and to understand the plant's overall situation. According to Womack et al., dynamic work teams enable education of the workers in a wide variety of skills, such as quality-checking, simple machine repair and materials-ordering. Liker (2004) also stresses the fact of creating work teams and upholding a culture within the company in order to get an efficient work group. Liker explains that the teams coordinate the work, motivate and learn each other and all systems should enforce

the teams that are actually doing the value-added work. With the right foundation and teamwork as a ground, individuals will give their hearts and souls to help the company to be successful (Womack et al., 1990).

One important idea in lean is, according to Liker (2004) to grow leaders that live and thoroughly have been taught in the lean culture in order to create a better learning organization. Liker emphasizes managers' role to promote and spread the culture by exercising *genchi genbutsu* and *gemba*, for instance by visiting the shop floor to understand the problem and then be able to report back. Linked to waste reduction, is that *gemba* creates eyes for waste and is just as important for the management as for the shop floor personnel (Liker, 2004).

Some important roles in lean, and linked to dedicated resources and clear responsibilities previously discussed, are according to Lean Enterprise Institute (2008) for instance the team leader, the value stream manager, and the lean promotion office.

The team leader leads five to eight workers and is the first line of support for workers and the heart of improvement activities. Their responsibilities are problem solving, quality assurance, basic preventive maintenance, kaizen activities and assuring that standardized work is followed. Usually team leaders have no fixed tasks as they instead give support with a broad knowledge of all the tasks connected to the team.

The value stream manager has a clear responsibility for the success of a specific value stream. This value stream could be defined by the product or business level (including product development) or by the plant or operations level (from raw materials to delivery). Their role is to identify value in the perspective of the customer and by that architecting the value stream and leading the effort of shortening the value-creating flow. The manager leads through influence, not by position, and provides resources to achieve the value stream vision.

The lean promotion office is an important resource team that assists the value stream managers by training employees in lean methods, conducting kaizen workshops and measuring progress. The lean promotion office is often formed from pre-existing industrial engineering, maintenance, facilities management and quality improvement groups.

2.2.3 Summary of Internal lean

The implied implementation stage, Internal lean, can be summarized by support of figure 2-2.

All methods can be linked to that they ultimately provide the opportunity to establish a lean organization that supports its procedures and culture (for instance the long term focus, waste reduction, kaizen, etc.), but also further development and eventually supporting the lean procurement. The supportive organizational culture gives the opportunity to influence and motivate suppliers. The methods that have been presented, and that enable the opportunities, can be categorized in education and training (in order to master the implementation and lean methods), assigned lean roles (e.g. dedicate resources for a lean promotion office and value stream managers), lean production tools (SMED, work cells, team work, 5S, etc.) and kaizen events. Hinders are categorized by resistance (including lack of commitment), leadership, resources, skills and expertise and systems thinking.

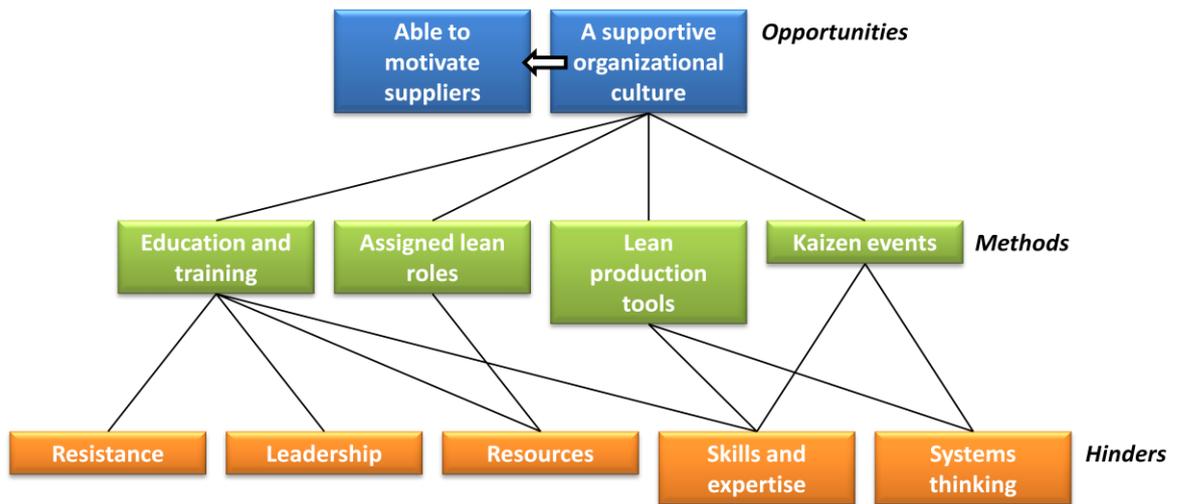


Figure 2-2. Opportunities, methods, and hinders for Internal lean.

2.3 Understand the supply

This section deals with the second implied implementation stage called Understand the supply, where it is important to understand the supply chain and how the suppliers work, in order to facilitate a successful involvement of the procurement function in the lean work. (Bicheno, 2007; Liker & Choi, 2006).

Bicheno (2007) emphasizes to define the supply chain and get a supply chain thinking, and refers to for instance a systems thinking, where it is the entire value chain's result that matters and not actors' local goals. Defining and having the supply chain thinking helps in order to plan the lean transformation for the procurement function, where Bicheno describes that it ultimately includes an entire chain that is pulling and creates joint advantages for the entire chain.

2.3.1 Supervision

Liker and Choi (2006) mean that understanding how suppliers work is the foundation for establishing partnerships and can only be created if the buyer knows just as much about their suppliers as they know about themselves. They state that the process can take some time but eventually be valuable for both parties. The mutual understanding comes to play for important matters like of setting targets for prices by understanding costs and prices, according to Liker and Choi. Also Baudin (2004) emphasizes that understanding the supplier's business, technology and people is a starting point for lean procurement so that programs are not pushed to suppliers that have no linkage to their environment.

Quality, delivery and costs are important supplier selection criterion and for control and assessment where the requirements are high (MacDuffie & Helper, 1997; Simpson & Power, 2005). Liker and Choi (2006) emphasize control of suppliers and state that the aim of mutual understanding and an equal win-win situation does not mean that suppliers can do whatever they want. Control is just as important as trust, they state, and it is important to set targets and to monitor suppliers' performances at all times. Further Liker and Choi also state that reports are advantageously sent to suppliers on how they are performing, focusing on quality and delivery.

2.3.2 Mapping and analyzing the supply chain

Many tools can be used to map and to analyze the processes and activities within the company and across the supply chain to identify areas for improvement. Most known for lean is the value stream mapping, which Bicheno (2007) describes is used to map the present state and the future state of a process. Both the material- and information flow is mapped where simple symbols of trucks, plants, kanban cards, etc., are used to describe the state. The essence is to map the entire process from customer order to delivery of raw material, manufacturing and delivery to the customer. Any process can be mapped, from the shop floor to administrative support processes (Larsson, 2008). Bicheno further explains that the value stream mapping is very useful to use for planning and implementation from the shop floor up to management level. The method, which can largely differ in detail, is used to understand and map the process in the perspective of what is value-adding and what is non value-adding (in other words; waste) in processes. Bicheno emphasizes that suppliers can be involved to a greater extent in order to make a wider value stream mapping.

Hines and Taylor (2000) suggest several tools that could be used when there is a need for a more detailed mapping than the value stream mapping, for instance to map and analyze processes in procurement and for quality, delivery and costs. For instance can mapping be used to identify duplications of inventories between a company and its suppliers, identify where defects are occurred and discovered in the chain and to examine scheduling, batch sizing and inventories.

2.3.3 Summary of Understand the supply

The second implied implementation stage, Understand the supply, can be summarized by support of figure 2-3.

The first opportunity is to understand suppliers and their processes and environments, which enables the further journey of lean procurement. The first opportunity gives the second opportunity, which is planning the transformation of lean procurement as the understanding of the supply and the present state is gained. The opportunities are enabled by the methods of supervision and mapping. Supervision mostly refers to supplier performance measurement focusing on quality, delivery and costs with frequent feedback to suppliers regarding their performance. Supervision also includes other ways to understand the supply like practicing gemba. Mapping refers for instance to value stream mapping but also other methods to map and analyze processes and quality, delivery and costs. However, a hinder for both methods is that they are time demanding. For supervision a hinder is also to balance control and trust where control is contradictive to lean as it is a waste but at the same time needed to monitor and assure quality, delivery and costs. It is also important in a early stages in order to understand the supply to be able to plan the transformation.

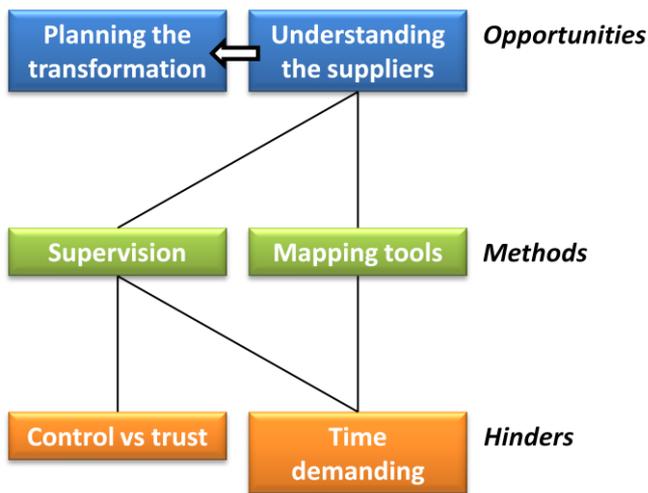


Figure 2-3. Opportunities, methods, and hindlers for Understand the supply.

2.4 Establish lean suppliers

This section describes the third implied implementation stage called Establish lean suppliers. It focuses on the aspects of the elaboration and rationalization of the supply to facilitate further lean work in the procurement function.

2.4.1 Sourcing, selection and classification

Supplier relations can be on very different levels of involvement and duration, according to Langley et al. (2008). They exemplify it by referring to parties in close relationships, who are willing to modify objectives and practices to achieve long-term goals and objectives, and the contrast of a much less integrative and collaborative relation that could be desirable for purchases of standards products. Thus are parameters like value, demand, importance, etc. of products essential when supplier relations are formed. For instances purchases of maintenance, repair and operating supplies may be repetitive and low in value, and of course not handled in the same manner as more expensive and important products for the company (van Weele, 2002). Considering that purchased products from suppliers stand for a significant part of a company's total costs, there is a great impact on customer satisfaction and profitability of how they are selected and managed (Bergman & Klefsjö, 2004).

An ABC-classification, described by for instance Arnold and Chapman (2005) and Bicheno (2007), is suitable to establish what kind of relation is suitable for the products or components, where A-products (a small share (~20%) of the products that stand for most (~80%) of the total value) is more suitable for a close relationship or partnership. C-products (a large share of the products that stand for a very small share of the total value) may have more of a relation that is at arm's length and B-products (somewhere in between A and C-products) somewhere in between. van Weele (2002) also refers to the 20-80 rule, which the ABC-classification is based on, and the finding that 20% of the suppliers or products represents 80% of the purchasing turnover. To identify these strategic suppliers or products is the first step in the method. van Weele also states that this step can be refined by Kraljic's matrix, where the suppliers and products are classified in four quadrants; routine, bottleneck, leverage and strategic, based on supply risk and impact on financial results. The Kraljic matrix can be used without using the 20-80 rule.

Considering mentioned methods, the main aim is to find the strategic or important suppliers in order to facilitate collaboration and improvements (Bergdahl, 1996; Bicheno, 2007; van Weele, 2002). It usually includes suppliers with large volumes or knowledge, or suppliers that stand for an extensive part of the product design (Bergdahl, 1996). However, it could be other criterions as well, like complexity in the chain and components or suppliers that supplies A or B-products (Bicheno, 2007), as mentioned. By establishing who the strategic suppliers are, it assures that supplier collaboration is done with the “right” partners as it is costly to collaborate this closely (Bergdahl, 1996). Linked to Kraljic’s matrix, partnerships are suitable with suppliers located in the strategic quadrant (van Weele, 2002). A group of strategic suppliers could then be further evaluated to find a supplier to work more intensively with (Bergdahl, 1996).

Another matter that Liker and Choi (2006) mention is how components or raw material should be sourced. Lean is much linked to single sourcing where local suppliers are preferred (Liker, 2004; Waters-Fuller, 1995). On the other hand, dual or multiple sourcing creates a healthy competition, and by using more than one supplier, the customer is not dependent on only one source (Liker & Choi, 2006). By single or dual sourcing, the supplier can achieve economies of scale and get help in for instance developing innovations (without bearing full investments costs) and then share the gains with the customers (MacDuffie & Helper, 1997). In the perspective of mediums sized companies, Wilson and Roy (2009) state that there in many cases are no other choices than to single source as the accounts are too small for more suppliers to be economically justified.

What needs to be emphasized is lean’s philosophy of supplier relationships that should be built on commitment and mutual trust, and assessed with a long term focus (Bhasin & Burcher, 2006). Further, the multiple selection criterions, focusing on quality, delivery and costs, are important aspects for the supplier selection and classification (Ansari & Modarress, 1988; Lamming, 1993; Water-Fuller, 1995).

2.4.2 Reducing suppliers and components

Considering the increasing competition, the interactions with suppliers have an increasing significance as well (Bergdahl, 1996). Many companies have responded by reducing the supplier base and increased attention and resources to the remaining suppliers (Krause, 1997). The lean practice is to work with few and reliable suppliers that offers a wide range of components, according to Bicheno (2007). Bicheno means that the aim is to reduce the numbers of suppliers where an example is to eliminate the tail of the Pareto curve, where 20% of the components are delivered by 80% of the suppliers.

However, rationalizing suppliers, establishing partnerships and working with supplier development is a waste if you have components that not even should be there, according to Bicheno (2007). Thus, rationalizing components is important and should be done early which also eases later efforts of improvements. Bicheno emphasizes the purchasing manager’s role in this, who should coordinate this work. But also the R&D-, quality-, and production function, etc., should also communicate with their corresponding counterpart.

2.4.3 Challenges

A challenge in the process of deciding and working with strategic suppliers is the power circumstances. Cox (2001) means that power plays an important role in a relationship where the power circumstances must be understood to find the appropriate way to man-

age the business situations. He states that in order to proactively work with suppliers, the relationship must be buyer dominant, buyer-supplier interdependent or a combination. The focus on proactive supplier development with joint development in a close and long collaborative relationship is only appropriate in these circumstances. In other circumstances he means that the buyer must rely on that suppliers innovate on their own, but he emphasizes that it does not mean that a long-term collaborative approach is not suitable as well. Stjernström and Bengtsson (2004) also state that the degrees of dependence make the collaboration difficult. In line with this, Wilson and Roy (2009) list the lack the bargaining power with larger suppliers for medium sized enterprises as one criticism for lean procurement.

MacDuffie and Helper (1997) discuss the challenge of deciding whether the company benefits most by switching to a more lean supplier or keeping existing suppliers. MacDuffie and Helper mean that a supplier that is already practicing lean could have some advantages towards other companies, as the adoption to lean may have severe impacts on for instance inventory levels and delivery performance. However, switching from an existing supplier to a more lean supplier does have its effects, they state, where for instance all the advantages from an existing relationship will be lost. Further, the trust, which is of high importance for success, can be jeopardized with other suppliers who observe the event. MacDuffie and Helper also consider that possible new lean suppliers, especially the best existing lean suppliers, may already have certain commitment with other customers, making them less responsive to a newcomer. Thus, switching to lean suppliers can lead to considerable costs (economic, political, and reputational) and considering this aspect, it could instead be a good idea to encourage existing suppliers to develop lean capabilities on their own, according to MacDuffie and Helper.

Creating lean supplier may often be easier with small firms, according to MacDuffie and Helper (1997), and refer for instance to build on their motivation and creating a strong dependence. Small firms might have less prior knowledge about lean but in the long run they tend to be more responsive to suggestions and expectations. In order to help the small suppliers, the customer must accept some short term disrupts in performance to achieve highly skilled suppliers, and understand that a main initial focus must be to acquire new skills (MacDuffie & Helper, 1997).

Waters-Fuller (1995) discusses some studies that have described difficulties of implementing lean with long-term contracts, sole sourcing, data exchange and leveled schedules, despite embracing the philosophy. Waters-Fuller states that mainly the lack of supplier cooperation creates difficulties as the shift of responsibilities, especially regarding inventories, can give tension. Further a lack of communication and the resistance are obstacles for success.

Finally, as the implementation of lean likely gives substantial technological and organizational changes, involving reduced batches and lead times, pull systems, multi-skilled workers, high degree of continuous improvements and high demands on quality and innovations, it is likely that the suppliers will have difficulties to meet these expectations unless they also adopt lean (MacDuffie & Helper, 1997).

2.4.4 Summary of Establish lean suppliers

The third implied implementation stage, Establish lean suppliers, can be summarized by the support of figure 2-4.

The opportunity of this stage can simply be categorized as achieving rationalized supply. It refers to reduced suppliers and components and identified strategic suppliers that are suitable for further lean work. A base for this is to conduct a supplier classification. Hinders in this stage are linked to rationalizing suppliers and components where switching costs and possibilities of sourcing give limitations. Also power circumstances, including issues of dependency, come into play as they have a big impact on supplier relations and thus the future lean work. Tension can arise between parties as changes in relations and responsibilities arise due to the new conditions.

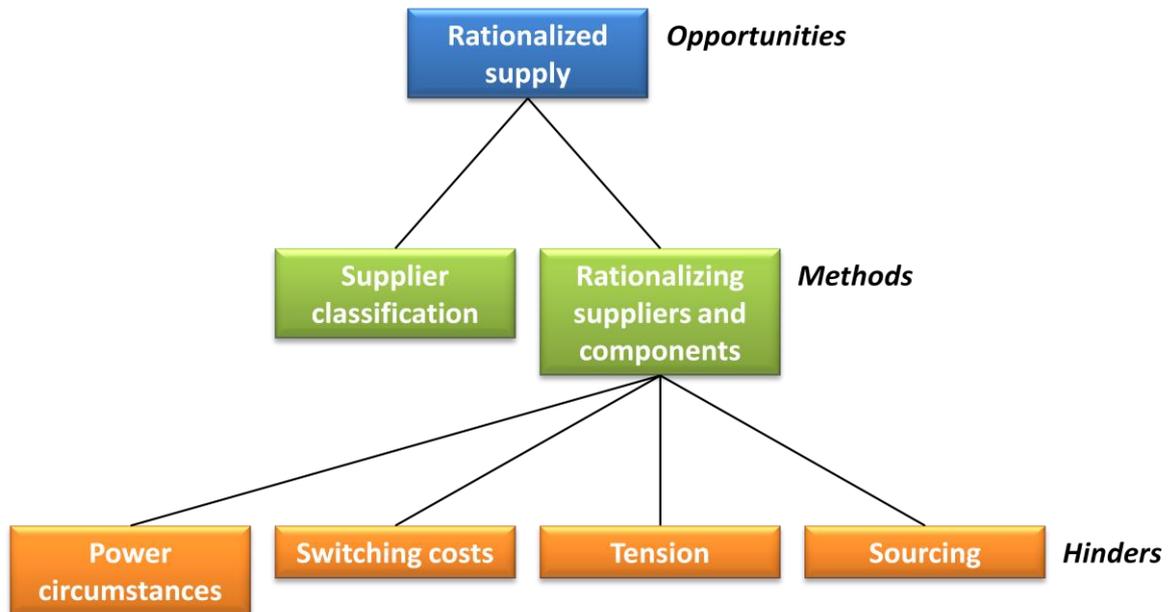


Figure 2-4. Opportunities, methods, and hinders for Establish lean suppliers.

2.5 Efficient inbound logistics

This section describes the fourth implied implementation stage called Efficient inbound logistics. It focuses on methods that enable an efficient inbound logistics and the suppliers' roles in the stage and the outcomes of it.

2.5.1 The objective

Baudin (2004) states that the objective of lean logistics is to, in an efficient way, deliver the right materials to the right place in the right quantities. Lean inbound logistics is thus to get parts from suppliers with the same objective. According to Bicheno (2007), the aim of lean linked to logistics is to facilitate a chain that responds rapidly, makes to order and has low inventory levels. Linked to these aims, Bicheno further explains that the ultimate lean supply chain is pulling from very beginning to the very end based on actual consumption. Thus is an efficient inbound logistics one part of achieving it.

Lean transports are made in small quantities between and within plants with short and predictable lead times (Baudin, 2004). By only producing and receiving when it is needed, inventories can be minimized which further also highlights problems (Olhager, 2000). The shorter the lead times the better it is for lean in the supply chain which put demands on short setup times and flexibility in the manufacturing processes, for instance by quick changeovers and a flexible workforce with multi-skilled personnel (Liker, 2004; Olhager, 2000).

Linkages to kaizen are apparent as there is a continual need to reduce lead times, setup times and batch sizes to enable a better flow (Liker, 2004). However, suppliers may be concerned by the shifted responsibilities from the buyer to themselves (Wilson & Roy, 2009). To ease the tension and to facilitate kaizen and an efficient inbound logistics, suppliers can be given exclusivity agreements, knowledge transfer, and support from the buying firm to achieve process innovation and improvements (Drolet, Gélinas and Jacob, 1996).

2.5.2 Inventory management

Extensive information sharing is a characteristic for lean and is important for the inventory management (Ansari & Modarress, 1988; Baudin, 2004). Often MRP is used to generate forecasts, EDI and kanbans used to issue orders and auto-ID to maintain inventory accuracy (Baudin, 2004).

Batching for incoming material can be optimized by several methods, where the economic order quantity is perhaps the most famous and suitable as a base to determine batches for lean inbound logistics, where one-piece flow is practically impossible (van Weele, 2002; Wilson & Roy, 2009).

Central in lean are kanbans in order to minimize inventories and move and produce items only when it is needed (Baudin, 2004). Consignment inventories are also a common feature in lean to support short lead times (Lamming, 1993).

2.5.2.1 Kanban

Kanban is a visual pull system that means roughly sign, single, card or ticket (Arnold & Chapman, 2004; Srinivasan, 2004). It is used to control the flow and inventories (Srinivasan, 2004; Vijaya Ramnath, Elanchezhian & Kesavan, 2009) and it enables small batches and a pull environment (Olhager, 2000). The idea of kanban is to refill the stock automatically without planning and forecasting by calling to the upstream process for new material when it is needed (Bergman & Klefsjö, 2007). The upstream process could be internal or external (e.g. a supplier) (Baudin, 2004). Kanbans promotes an orderly flow through the whole chain of supply, production, and distribution processes (Srinivasan, 2004). It is usually a printed card (Srinivasan, 2004), but could simply be just a transport bin with a standardized size (Bergman & Klefsjö, 2007).

A supplier kanban works just the same way as an internal kanban and authorizes supplier to deliver parts (Vijaya Ramnath, Elanchezhian & Kesavan, 2009). Figure 2-5 shows how material and information is transferred with the use of kanbans, exemplifying that there is no difference in concepts when involving suppliers, for instance compared to the loop between the internal processes of assembly and stores.

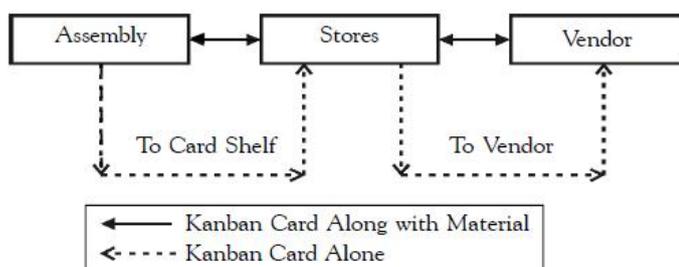


Figure 2-5. An example of a kanban system (Khanna, 2007, in Vijaya Ramnath et al., 2009, p. 59).

The function of the kanban system is that it transfers information, prevents overproduction and excessive transport, serves as a work order, reveals problems and maintains the inventory level (Vijaya Ramnath et al., 2009). According to Cork (2006) the essence of kanban is the visibility that it creates, which also can be connected to lean and its focus on visual management that Liker (2004) described as one of the foundations of the lean house. However, some conditions must be met for the kanban system. First of all, the demand must be relatively repetitive and the lead times relatively short (Srinivasan, 2004). The quality aspect is also of importance as defective items are not allowed to be transported to the next station (Olhager, 2000).

Bicheno (2007) suggests that when lead times are long, a system like MRP or a forecast based system, would be more favorable, and C-products should generally be controlled by a simple method, like for instance the most simple case of the kanban system. Depending on how the kanban system is set up, the irregular demand can be met by a safety factor.

Kanban can easily be achieved without computer assistance (Langley et al, 2008). However, when companies use physical cards to authorize movements and replenishment there are risks that these get lost and thereby cause stock-outs (Drickhamer, 2005). Electronic kanbans is one way to solve this problem and works just as the original system but with the additional benefit of a faster transfer time (Cullen, 2002). Cullen (2002) states that electronic kanbans requires limited infrastructure beyond internet access. EDI can also be used as a tool for electronic kanbans and used as a communication tool and the transfer of kanban signals (Cullen, 2002). By integrating technology into to the kanban system it can lead to further benefits as for instance assurance of accurate quantities (Vernyi & Vinas, 2005), and improved lead times (McLoone, 2009). A cheap and easy way of applying a kanban system with suppliers is to use faxes to call for material, and just as with the use of EDI, it eliminates lost cards and gives faster transfer time (Landry, Duguay, Chausse & Themens, 1997).

Using kanbans is possible even though the suppliers are not using them, according to Baudin (2004). He states that is especially relevant to consider for smaller companies who have less resources to teach suppliers how to handle it. For instance the company can circulate kanbans internally and when it is time to trigger replenishment from suppliers, orders are sent by EDI, fax, or what the company prefers to use, that exactly match the conditions specified on the kanbans. The supplier may not even know that the orders are triggered by kanbans, but just noticing the steady flow of small orders.

2.5.2.2 Consignment inventories

Suppliers are required in lean to maintain stocks of their components at the buyer's facility, near the buyer (for instance warehouses close by) or holding inventories at their own facility (Lamming, 1993; Srinivasan, 2004). According to Srinivasan (2004), consignment inventories are used to reduce lead times from suppliers where the suppliers place inventories on consignment but are not delivered until they are consumed, which benefits the buyer who does not need to pay until it is actually used in production. The supplier benefits as well, which Srinivasan explains by stating that it gives better visibility and eases their production planning.

If consignment inventories are applied correctly, they are efficient to reduce Bullwhip effects, according to Bicheno (2007), and further important for consistent quality, shorter lead times and enhanced visibility (Pohlen & Goldsby, 2003). Instead of sending or-

ders, the customer sends information of the inventory to the supplier where the actual level is compared to the order point, which has been established to ensure that the materials supply is sufficient. When the actual inventory level is below the order point, the supplier delivers the difference to the agreed Order-Up-To-Point. This method could be well applied at all levels in the supply chain where a combination with milk runs is efficient.

As the inventory ownership is handled on a consignment basis, it places the excess inventory at the supplier, which encourages a lean environment (Pohlen & Goldsby, 2003). However, its implementation can give resistance from the parties and requires a collaborative relationship where trust is vital (Srinivasan, 2004). Vaaland and Heide (2007) state that types of vendor managed inventories are anticipated to grow in importance. However, they conclude that it seems like medium sized enterprises have far less interest of these inventories compared to larger enterprises.

2.5.3 Transportation

There are some challenges regarding transportation in lean. For instance distant suppliers and especially international freight create difficulties for lean due to their often long lead times (Wilson & Roy, 2009). Further, due to the small batches in lean and the reduction of inventories, transportation is often affected by frequent shipments (Taylor & Martichenko, 2006). Distant suppliers mean higher levels of inventory and less frequent shipments (Levy, 1997). Frequent shipments and long distances make it hard to keep the costs down, and lead to a higher burden for the environment (Gubbin, 2007). However, partnerships or closer relations with carriers and logistics providers are common to promote efficient deliveries and pick-ups (Gubbins, 2007; Srinivasan, 2004).

One popular method used to promote predictable lead times, small batches and reduction of inventories are milk runs (Baudin, 2004; Lamming, 1993; Srinivasan, 2004). A milk run speeds up the flow of material between facilities, for instance between a company and its suppliers (Lean Enterprise Institute, 2008). The concept is well applied in lean logistics to enable small-lot replenishments between facilities along the value stream by frequent less-than-truck-load quantities (Lean Enterprise Institute, 2008; Srinivasan, 2004). A vehicle is used to make multiple pick-ups and drop-offs at the connected facilities instead of waiting to accumulate a truckload for direct shipments between two facilities (Lean Enterprise Institute, 2008). Milk runs give predictable lead times, reduced inventories and improved supplier communication and trust (Baudin, 2004; Bicheno, 2007). They also give shorter response time along the value stream (Lean Enterprise Institute, 2008), creating flexibility in changing demands (Srinivasan, 2004), and ultimately eliminate waste and enable fast improvements (Bicheno, 2007). The milk runs can thus be used to enable the kanban system with suppliers or the consignment inventory.

Baudin (2004) discusses some shortcomings of milk runs, mostly referring to that they are not advantageously used with suppliers that are distant, for items that are only sporadically requested or in small quantities and for items that are requested in multiple truckloads every day. However, for remote suppliers some approaches can be used, according to Baudin. One approach is to establish a warehouse near the local suppliers and then include it in the milk run. A second approach is to set up another milk run if there is a cluster of suppliers further away from the local suppliers. A crossdock could be set up if there are sub-clusters of suppliers and thus be working as a consolidating point for two or more milk runs.

2.5.4 Summary of Efficient inbound logistics

The fourth implied implementation stage, Efficient inbound logistics, can be summarized by support of figure 2-6.

Creating an efficient inbound logistics gives several opportunities; responsiveness, low inventory levels, short lead times, small batches and visibility. The opportunities have also linkages in between where for instance short lead times and small batches give low inventory levels. The opportunities are facilitated by methods such as kanban, consignment inventories, milk runs, forecast sharing and EDI. EDI enables an efficient sharing of forecast and call-offs. Hinders for an efficient inbound logistics are tensions and distant suppliers. Tension refers to the shifted responsibilities to suppliers due to the use of kanban and consignment inventories but also due to the requirements of shorter lead times and smaller batches. Distant suppliers are often connected to longer lead times, which create difficulties for milk runs and also for kanban.

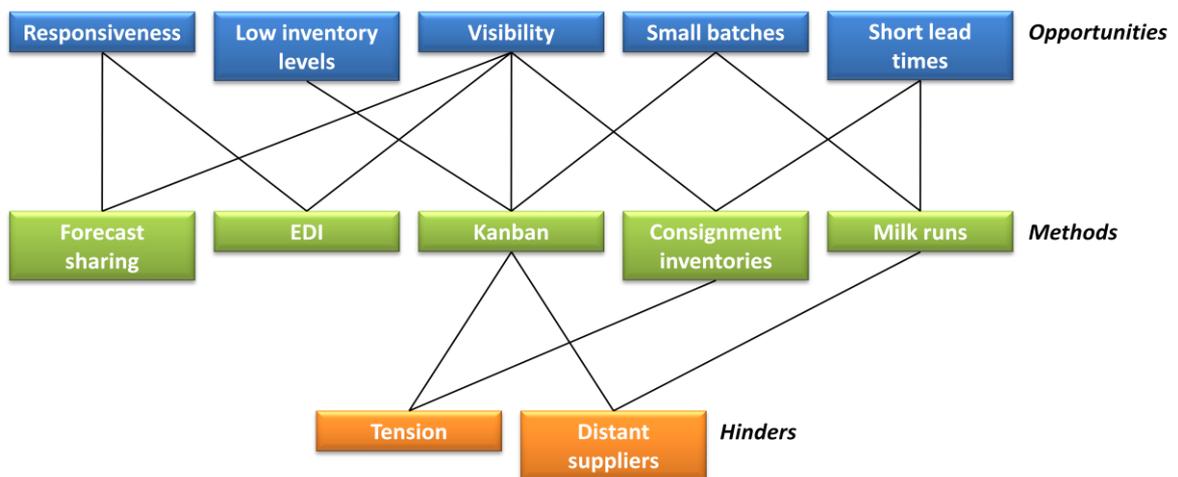


Figure 2-6. Opportunities, methods, and hinders for Efficient inbound logistics.

2.6 Joint improvement and development

This section describes the fifth implied implementation stage called Joint improvement and development. It focuses on the interaction between the customer and its suppliers for joint activities.

2.6.1 Knowledge sharing

In order to improve processes in the supply chain there is a need for serious investments in order to create a culture of continuous improvements and joint learning and a network for disseminating knowledge (Bicheno, 2007; Liker & Choi, 2006). However, it is usual that the customer gets most of the benefits, which according to Bergdahl (1996) and Krause (1997) should be shared in order to be even more successful in the long run. Liker and Choi (2006) emphasize that it is not about maximizing profit on the suppliers' expense and Bicheno (2007) explains that the aim is to create a win-win situation where the buyer eventually benefits by price reduction and the supplier gets cost savings.

In focus is to improve quality, delivery and costs between the customer and the supplier where information is essential to facilitate the joint improvement and development (Hines, 1996b). Joint efforts to reduce costs and rationalizing the value-adding processes can be made as soon as the information sharing is working (Lamming, 1993).

Liker and Choi (2006) also state that communication and sharing information with suppliers is important, but they also emphasize that it must be done selectively and in a structured way where clear agendas in meetings and rigid formats for information sharing are essential features for every supplier. Sharing a lot of information with everyone will not help anyone to have the right information when it is needed.

Transferring tacit production knowledge improves the skills of the supplier which benefits the buyer that gains a more capable supplier where also cost structure and future plans enables the partnership to run more efficiently, detecting opportunities for improvements and aligning objectives (Modi & Mabert, 2007). By sharing best practices, instead of just presenting tacit knowledge, difficulties to replicate are overcome (Sako, 2004). In order to facilitate the transferring knowledge, suppliers must be shown the commitment from the customer for improvements, to develop the incentives that are needed for opening up their own facilities (Modi & Mabert, 2007).

Assigned roles for the support, like a supplier support group, is preferable in joint improvements and development, and should be staffed internally where they include key contributors to the company's lean work (Baudin, 2004). Supplier development is an important way to influence and to support suppliers and their work towards lean (MacDuffie & Helper, 1997; Simpson & Power, 2005). Supplier development and support ultimately aims to get capable suppliers and to create improvements in the supply chain (Baudin, 2004). Supplier development can be defined as 'any activity undertaken by a buying firm to improve either supplier performance, supplier capabilities, or both, and to meet the buying firm's short- and/or long-term supply needs.' (Krause, Scannel & Calantone, 2000, p. 34)

The scope of the supplier development gradually evolves as the interdependence in organizational capabilities grows stronger over time (Sako, 2004). According to Baudin (2004), the support in lean involves the entire business of the supplier, but often with quality in main focus. The foundation is, according to Modi and Mabert (2007), evaluation and certification to ensure that the supplier has the minimum capabilities to make further investments worthy and to also detect areas for improvements. Krause and El-Iram (1997) state that the activities in supplier development vary significantly, ranging from limited efforts, like informal supplier evaluations and requests for improved performance, to extensive efforts, like training and investments in suppliers' personnel and operations. Baudin (2004) gives further examples where the suppliers can for instance be invited to visit the buyer's plants, be trained through the supplier association, attend supplier conferences, and maintain communication with the buyer's purchasing department to achieve a number of improvements. Krause et al. (2000) add that a direct support that gives significant performance improvements is to send engineers to the supplier to improve its efficiency. Further tactics, or successful aspects, in supplier development are the long term focus, the determination of cost ownership, setting goals and the executive commitment priority (Handfield, Krause, Scannel & Monczka, 2000). It is a big difference between a relationship where the buyer just is a good source for best practices and a relationship where the buyer actually teaches the know-how and enhances the supplier's capability (Sako, 2004).

Eventually the supplier development also leads to innovative suppliers where their ability to develop products is increased, according to Liker and Choi (2006). If this is efficiently done, long-term suppliers can develop components independently. In lean the parties work closely in the product development process where the suppliers develop

their capabilities to meet the high requirements and become a valuable resource. Liker and Choi mean that suppliers thus have developed capabilities that more than weigh up low costs sourcing.

2.6.2 The supplier association

According to Baudin (2004), supplier support is most efficient with a few key suppliers, and Liker (2004) further suggests those that are part of the supplier association. The supplier association is an important mechanism when it comes to lean procurement, according to Hines (1996a), who explains that it is a gathering of a company's most important suppliers that is brought together on a regular basis to develop cooperative attitudes, coordinate activities, share business strategies, engineering and cost information in order to create collaborative forces. Bicheno (2007) emphasizes that the members in the supplier association are not necessarily the biggest suppliers as they, with own resources, may have less to profit and to gain.

According to Hines (1996a), the supplier association is the primary mechanism that leading companies have used to integrate their supplier networks and is important in order to assist all the members that can benefit from methods such as just-in-time, kaizen, and kanban usage. It has been valuable when strategies have been shared and when common approaches to problem analysis, solution development, etc., have been developed. Hines explains that a supplier association is achieved by an extensive number of meetings at virtually all personnel levels to achieve the desired information exchange.

Features of the supplier association are common projects, assistance in areas of expertise, developing common standards, education, exchange of employees, hiring consultants and educators, and visits to sites within the association or to other companies (Bicheno, 2007). Best practices are also discussed, engineered and experimented, according to Hines (1996a), who also states that recreational activities are common, such as inter-firm baseball or golf tournaments.

Hines (1996b) states that a further purpose is to coordinate the flow of information within the association. Initially this is usually done by spreading information from the customer to the suppliers but as the collaboration matures, the flow of information is increasingly shared from suppliers to customers and later even between suppliers. According to Hines, trust and commitment is enforced among the companies by the supplier association and helps suppliers to understand the requirements of their customer and foremost the end consumers.

2.6.3 Kaizen events with suppliers

A kaizen event conducted with a supplier is a method in lean regarding supplier development and support and arranged by the supplier support group (Baudin, 2004). Most kaizen events are done with key suppliers but some companies focus on doing it with its small suppliers (Handfield et al., 2000). Baudin emphasizes that it is more than just facilitating the kaizen events in order it to be effective. The supplier support group must have sufficient knowledge and skills to meet all the different challenges the suppliers can face. Many small kaizen events can give significant benefits without major resources (Handfield et al., 2000). According to Liker and Choi (2006) the kaizen events at suppliers' facilities enable open communication channels and improve the relationship and to reduce costs.

Two pitfalls with kaizen events with the supplier can be (Baudin, 2004):

- *Falling back on a process compliance checklist:* The supplier assessment often consists of a huge checklist used to award the supplier points for having lean features, to eventually be given a certificate as a lean supplier. This misleads the supplier to think that lean is process compliance rather than a business strategy. Lean is about to win the game, not just making all possible moves.
- *Limited recommendations:* Making rushed conclusions and recommendations, for instance to implement 5S due to an obvious cluttered dirty and poorly marked plant, is easy. However, the same recommendations may not be done when a genuine analysis is made of the supplier's business, technology and work force. Important to remember, and to consider, is that implementation is difficult and several failed attempts are known.

Handfield et al. (2000) suggest that the first kaizen event preferable are rather simple to foster the supplier's commitment. They further state that the kaizen event is not planned until the supplier fully commits to the relationship where some written agreement could be one way to clear it out. Liker and Choi (2006) state that the kaizen events are also used as baselines for new contracts and the reduced costs that the suppliers achieve must be shared with the customer as well.

2.6.4 Challenges

Supplier development and related activities require to commit financial, capital and personnel resources and to share timely and sensitive information, making it a challenging effort where the buyer must be convinced that the risk is worth taking (Simpson & Power, 2005). Because of the requirements of resources and commitment it creates high establishment costs which shows the risk of choosing the wrong partner (Bicheno, 2007). Also the supplier must be convinced that the supplier development is in their best interest (Simpsons & Power, 2005). A challenge is thus to motivate suppliers, with years of experience, to want to be developed by for instance a supplier support group (Baudin, 2004). A supplier support group must be able to show the suppliers the results of their lean work in order to make the support credible (Baudin, 2004). To accept that the buyer intervenes in internal investments decisions is another challenge which may require a certain mode of corporate governance (Sako, 2004). A common pitfall in supplier development is unsupportive managers (Handfield et al., 2000), which requires determination and perseverance in management from both sides to overcome (Baudin, 2004).

An issue for the supplier, regarding joint improvement and development is, according to MacDuffie and Helper (1997), if the skills and benefits are applicable to other customers or if they are specific to one customer only. In the latter case, the supplier must make sure that the customer can assure the return-on-investment in both learning and profit. Baudin (2004) mentions a possible problem for the supplier if it has several customers that want to develop and support them. Baudin states that it may be possible to listen to all customers but it probably requires separate production or assembly lines for the customers. However, Baudin emphasizes that all good ideas from the supplier's customers should be possible to use, allowing cross-fertilization from all sides. MacDuffie and Helper (1997) emphasize that a supplier must ensure to grow in a solid way by themselves and thus not only trusting one customer's success.

Collaboration facilitated by supplier development and especially kaizen events, enables the parties to increase the total payoff but still to compete for their share. (Baudin,

2004). Co-opetition is a concept to describe collaboration where the parties cooperate to create value but compete when the benefits should be divided (Brandenburger, Nalebuff & Ljungman, 1996). According to Stjernström and Bengtsson (2004), high demands for price reduction do hinder suppliers that are smaller to catch up on technological developments and also hinder mutual learning. Stjernström and Bengtsson also state that lack of interests in the collaboration and unequal dependency hinder mutual learning.

Trust may be a key word for joint improvements and development, and facilitated by a long-term relationship, according to Liker and Choi (2006). Hines (1996b) states that trust is the foundation and especially to enable the supplier association. MacDuffie and Helper (1997) also emphasize the importance of trust where suppliers need to know if the customer can achieve what they promise (competence trust), if they will fulfill their agreements (contractual trust) and if they will take initiatives for mutual benefits (goodwill trust). Problems that aggravate joint improvements and development, just as the lack of trust, is poor alignment of organizational culture where minimizing legal involvement and adoption to the local conditions could ease the problems (Baudin, 2004).

2.6.5 Summary of Joint improvements and development

The fifth implied implementation stage, Joint improvements and development, can be summarized by the support of figure 2-7.

There are many opportunities in joint improvement and developments, which is enabled mostly by different forms of supplier development and support where it can be emphasized the importance for the procurement function to inspire and support suppliers in their lean work. Joint learning is enabled by sharing knowledge which can be done in several ways, such as education, conferences, etc. but also a supplier association facilitates joint learning in the network. Knowledge sharing also assures that suppliers have the right capabilities, which is the core of supplier development, and supplier association enables improved relations with for instance increased trust as a result. Kaizen events give the opportunity for improvements for both the buyer and its supplier and thus mutual benefits. However, a hinder for kaizen events and the mutual benefits are how they are divided. In order to disseminate knowledge serious investments are needed, which is a hinder and especially for a medium sized enterprise. It is not only investments that are needed, but also trust and commitment to enable the methods.

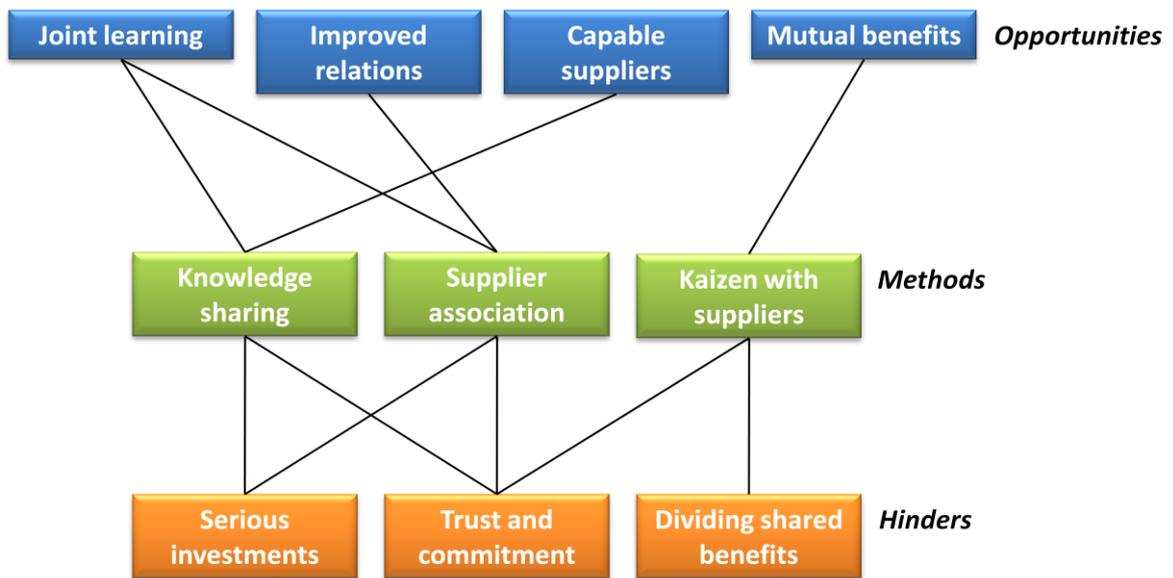


Figure 2-7. Opportunities, methods, and hinders in Joint improvements and development.

2.7 An extended lean enterprise

This section describes the sixth and final implied implementation stage called An extended lean enterprise. It focuses on aspects of integrating suppliers, establishing partnerships and minimizing waste in the supply chain.

2.7.1 Supply chain integration and partnerships

A true lean enterprise is successfully aligning its philosophies and systems with its most important suppliers, according to Liker and Choi (2006). Procurement plays an important role, according to Bicheno (2007), as the link to suppliers and the wider value network where all members of the value chain must contribute to the value creation and to eliminate waste. Ultimately it is the supply chain that competes on the market and not the single company. Bicheno means that the entire chain should be pulling material from the very beginning to the very end and systems thinking suggest that it is the total supply chain costs and results that matters and not local goals.

In order to achieve it, lean requires close relationships or partnerships with suppliers in order to reduce waste and costs in the supply chain and to achieve higher quality products and to increase productivity (Bicheno, 2007; Gilbert, Young & O'Neal, 1994). For the extended lean enterprise to be successful there is a need of leadership, a culture of continuous improvements and joint learning among the partners in the network to disseminate knowledge (Bicheno, 2007; Liker & Choi, 2006). Improved communication links, for instance by EDI, enable a better partnerships (Bicheno, 2007).

Partnership is a collaborative relation where the parties work together for mutual benefits (Langley et al., 2008). Stuart (1993) compares it to the traditional approach where instead of just focusing on price, partnership includes multiple criteria, longer term contracts instead of short-term, and fewer suppliers. Further Stuart states that the benefits are equitably shared, and continuous improvements are sought with the help of joint problem solving, information sharing, etc.

Mudambi and Schründer (1996) conclude in their research that the sourcing methods, including partnerships in larger companies, have been absorbed by medium sized enter-

prises. Their study showed that the size did not matter in many dimensions but larger enterprises did however make more supplier site visits and used more long term contracts. Thus are the relations not exclusively beneficial for larger firms and by encouraging partnerships along the supply chain, benefits can be enjoyed in the entire chain, Muddambi and Schünder conclude.

Close relations reduce short-termism, according to Bergdahl (1996) as it is not profitable due to high switching costs of replacing suppliers, which facilitates lean's long term philosophy. According to Liker (2004), the heart of lean and its partnerships with suppliers is to work towards common goals, and Larsson (2008) states that if the suppliers share the philosophy and its aim towards continuous improvement, a lot of waste can be eliminated and a common focus on the final customer and its need and demand can be achieved.

Increased collaboration helps to reduce uncertainty, improve the communication, and create loyalty and a common vision that ultimately leads to an enhanced performance (Langley et al., 2008). Linked to the benefits above, suppliers of important components, subsystems and systems must be involved in early stages of the product development as they are the specialists on their products, and thus best on identifying improvements (Bergman & Klefsjö, 1996). MacDuffie and Helper (1997) state that the advantages of closer cooperation are operation improvements, development of better transfer of knowledge, and strengthened relations.

Moving towards a more collaborative relationship is difficult because it requires a conscious effort from both parties (Baudin, 2004). However, some factors foster success in the creating, developing and maintaining of the relationship, like trust, senior management support, ability to meet performance expectations, clear goals and partner compatibility (Whipple & Frankel, 2000). Further, regular information exchange, constructive management of conflict and flexibility in management is important (Gulati, 1998). The supplier relationship can play an important role for the firm's long term success but requires considerable joint interactions and information sharing (Stuart, 1993). For a close relationship to be successful it demands serious commitment, which in turn increases switching costs to other suppliers, and thus increases the dependency (Langley et al., 2008).

Fawcett and Magnan (2002) however state that few companies really are engaged in an extensive supply chain integration. For medium sized enterprises the reason may be, according to Vaaland and Heidi (2007), that they lack behind in technology and system adoption. Vaaland and Heidi mean that these companies are less focused on integration and also EDI and e-based solutions in the supply chain. Hines (1996a) states that in order for the procurement function to be able to integrate and develop supplier relationships that are needed, it must move away from being an operational or tactical function to a more strategic process. Operational tasks, such as order placing, expediting, receiving, and invoice checking, must be eliminated, systematized and removed, for instance by using EDI to minimize human involvement, reposition kanban call-offs to shop floor and shift more responsibilities to suppliers.

2.7.2 Waste reduction in the supply chain

In order to improve the supply chain, eliminating waste in the single company is not sufficient. All waste should be eliminated in the supply chain and according to Hines and Taylor (2000) it can be categorized in two types of waste:

- *Supply chain coordination*, regards to a high extent to find inefficiencies and wastes between companies. Coordination activities to reduce waste consider working to common quality standards, same paperwork system, shared transport and inter-company communication (e.g. EDI).
- *Supply chain development*, regards to a high extent inefficiencies inside a company within a supply chain. Work to facilitate the development includes the dissemination of customer strategies that for instance enables suppliers to plan their processes more effectively. Further, the dissemination includes firms to offer specific assistance to other firms, like factory layout, set-up time reduction and implementing kanban systems.

In a partnership the focus is also to eliminate waste where procurement has several wastes linked to it, like a large number of quotes, order confirmations, invoices, repackaging, checks, returns, expediting, and of course inventories (Bicheno, 2007). Better supplier collaboration reduces unnecessary activities and waste like duplication of work (a typical example is final inspection at the supplier and then an inspection again at the customer when the goods arrive) and also misunderstanding due to bad communication, according to Bergdahl (1996).

2.7.3 Summary of An extended lean enterprise

The sixth implied implementation stage, An extended lean enterprise, can be summarized by the support of figure 2-8.

An extended enterprise refers to suppliers as extensions of the company where integration can give the opportunity of enforcing the different parties' systems, regarding culture and the information- and material flow. Partnership is a method, and not only suitable for larger enterprises, which enables the alignment but also the opportunity to enhance performances. A third method is supply chain waste reduction that refers to reducing waste both internally and externally in the supply chain. Supply chain waste reduction does not only give enhanced performance, it also releases resources that enable a more strategic procurement function and thus enhanced performance. A hinder for the integration, and also for supply chain waste reduction, is the lack of systems thinking which refers to that few enterprises are engaged in an extensive supply chain integration and especially not smaller enterprises. A reason may be a lack of technology adoption, which is a hinder for integration a successful partnership. Commitment is also vital to facilitate a partnership.

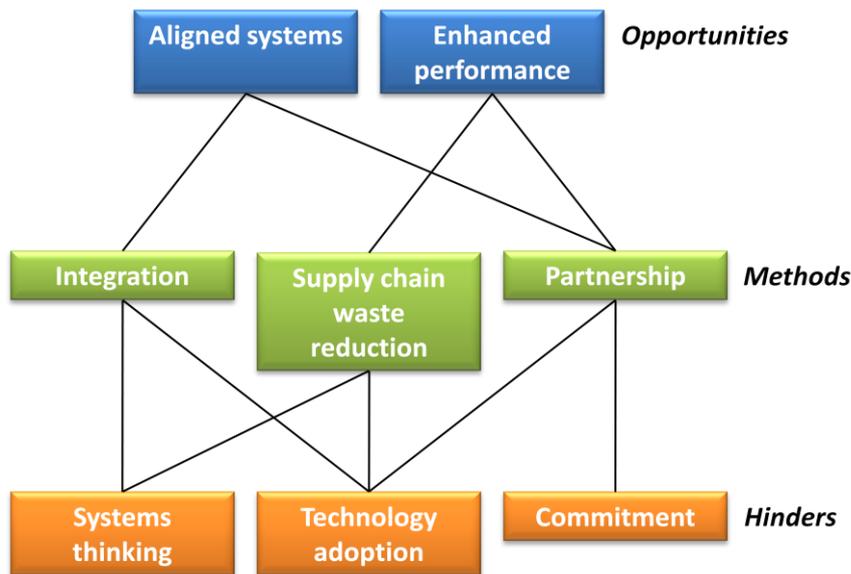


Figure 2-8. Opportunities, methods, and hindlers in An extended lean enterprise.

2.8 Summary – literature study

Lean procurement has the philosophical foundation of a long term focus and the essence of waste reduction and continuous improvements. Suppliers play important roles to facilitate improvements and reduce waste. Some characteristics for lean procurement is close collaboration with few suppliers where geographically close suppliers are preferable. Lean procurement has further characteristics of small batches and short lead times.

A main focus in this thesis is the opportunities, methods and hindlers in lean procurement. These aspects have been presented and discussed in six implied stages of the implementation process (see figure 2-9). The first stage is to establish the lean culture and procedures internally, mostly related to the production, as it eases and supports the lean transformation in procurement. The second stage is more linked to procurement and refers to understanding the supply which gives results that will help in the planning of the lean procurement transformation. As the transformation is initiated, the third stage refers to establishing lean suppliers that are suitable for further lean work. The stage also includes reducing suppliers and components in line with the lean philosophy. For a medium sized enterprise, one hinder is that they often lack the power to influence the suppliers, which is needed in later stages.

The fourth stage is dedicated to inbound logistics and is an important stage to reduce waste, by involving suppliers and to further practice lean methods linked to the process. One hinder worth mentioning is that tension may arise due to shifts of responsibilities to suppliers. The fifth stage is about further enabling waste reduction and continuous improvements by joint improvements and development. In this stage, knowledge transfer is the key. One hinder is the serious investments needed to disseminate knowledge. The sixth and final stage is that the buyer and its most important suppliers are an extended enterprise where the lean philosophy is shared. In this stage, partnerships are preferable in order to minimize waste in the supply chain where the strategic focus also helps to enhance performance. However, few companies are engaged in extensive supply chain integration due to lack of systems thinking and technology adoption.

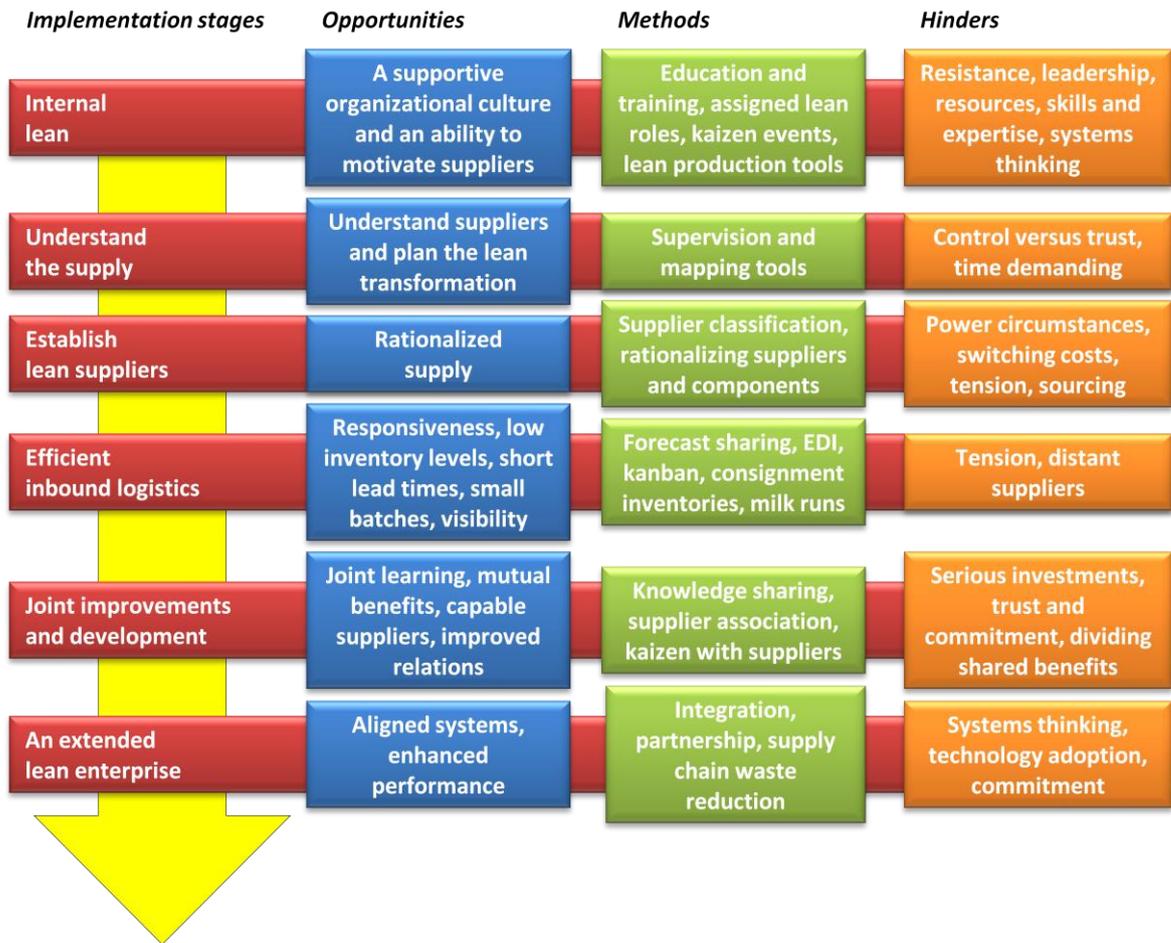


Figure 2-9. Opportunities, methods and hinders in lean procurement.

3 Methodology

This chapter presents the methodology used in this thesis, by describing the choice of method, research approach, the case study design and data collection and analysis. It further describes the research limitations and the validity of the study.

3.1 Choice of method

The study consists of a literature study and an empirical study, see figure 3-1. The empirical study was conducted as a case study at Isaberg Rapid's production site in Hestra, Sweden, which enabled the authors to study the implementation of lean procurement in an environment of a medium sized enterprise. The literature and the empirical study were conducted simultaneously, which enabled practices, knowledge and experiences from Isaberg Rapid to be exploited and to organize and point out important aspects of theory. The literature study supported the empirical study, for instance in order to decide which data that needed to be gathered. The literature study is compiled in chapter 2 and the empirical study in chapter 4, which in combination are subjected for analysis in chapter 5. The conclusions in chapter 6 are a result of the analysis.

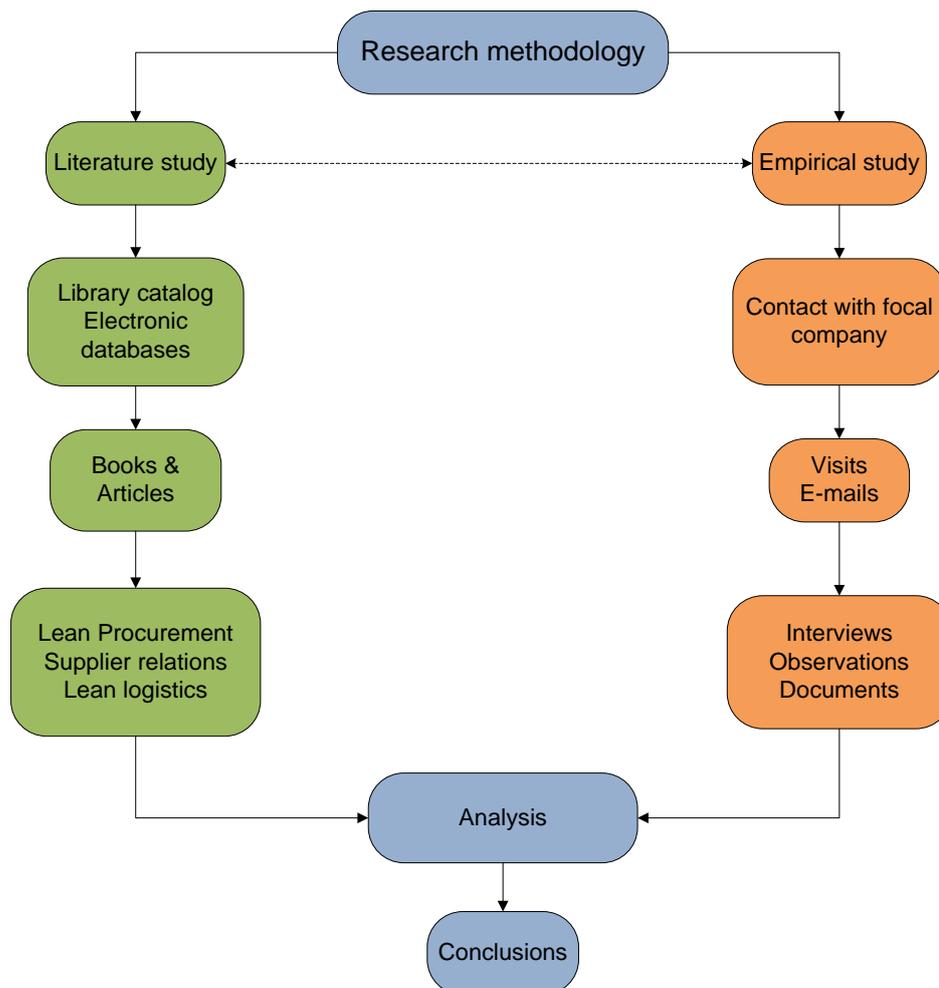


Figure 3-1. The research methodology.

The research that has been conducted has been qualitative. In line with Welman, Kruger and Mitchell (2005), the thesis's qualitative study contributes to the studied area and a deeper understanding of it. As a qualitative study enables exploration and to change data progressively for the understanding (Welman et al. 2005), the benefits of it has been evident as the data in theory and in a real life context were allowed to be explored and reflected. By a qualitative study, an insider's view of the studied area could be given as the involvement of people with first-hand experience and subjective view were gained (Welman et al., 2005). By meeting several individuals at Isaberg Rapid related to the studied area, and the use of both semi- and unstructured questions, the subjective view was maintained by multiple inputs.

Considering the thesis's purpose, the choice of a qualitative study was in our case logical. By literature studies in the field of lean procurement and a case study at Isaberg Rapid that is currently in the transformation of lean procurement, the authors believe that the study gives theoretical contribution.

3.2 Research approach

There are mainly two contrasting theories when it comes to the methodology of building theory and knowledge – namely inductive versus deductive research (Crowther & Lancaster, 2009). There is however a third approach which is more suitable for describing this study, which according to Spens and Kovacs (2005), is an abductive research process. This approach explains how new theory or framework is applied to an already existing phenomenon. Previous theoretical knowledge plays an important role, even though it does not completely explain the problem area. Therefore it is up to the author to work iteratively with different frameworks, in this thesis the theory and the empirical study, to explain a problem.

The abductive approach describes this thesis's process as the study iteratively moved between the theory and the empirical to understand the phenomenon. This approach helped to make sense of both parts as it showed both clear and less clear links between theory and practice. Thus it became a natural and suitable approach to the study. An understanding and conceptualization of lean procurement was developed by the theory and additional understanding and conceptualization was developed by the empirical study. However, the parts were developed in parallel and influenced each other due to the abductive approach. The parts could eventually be integrated by the analysis and ultimately developing and achieving the purpose of the thesis to understand and conceptualize lean procurement by support of both parts and the analysis.

As questions are exposed of how and why, a case study is according to Yin (2003a) suitable, which is why a case study was chosen to study lean procurement in medium sized enterprises. The case study could, as Bryman (2002) states, analyze in detail the organization and in this case their implementation of lean procurement. In line with Simons (2009), the primary reason for the case was to study and explore its uniqueness that enabled an in-depth study with multiple perspectives from involved individuals. A strength of the case study, as Simon also state, was that it was not constrained to a certain method, which enabled to include the most suitable methods for this study, which foremost became interviews.

The case study at Isaberg Rapid was thus well suited for this thesis in order to study lean procurement and the change process towards it. It complemented and reinforced the theory and constituted to a good base for analysis and conclusions. Isaberg Rapid

was useful as a case company as they are currently implementing lean procurement, hence, giving meaningful insights. Isaberg Rapid has been working with lean for some years and recently gained a boost in its practices and recently initiated lean projects in the procurement function. The challenge for the procurement function was that they did not know that much of lean's practices in the procurement field. They focused on the aspects of creating an efficient inbound logistics but they were interested in other aspects and the linkages of lean and procurement, for instance opportunities, methods and hinders. The benefits for this study were evident as it allowed to discuss relevant and current issues in the problem area, and at the same time allowed to explore approaches suitable for Isaberg Rapid.

The case study is best described as being a descriptive case study. The descriptive case study gives, in its context, a complete picture of a phenomenon (Yin, 2003a), and requires the investigator to begin with a descriptive theory with a possibility of facing the problem during the project (Tellis, 1997), which describes this thesis approach by studying theory and conducting a case study at Isaberg Rapid to face the problem.

According to Simons (2009), the problem or activity for the case study needs to be refined, which can be done by a literature review or be identified by someone else or your own thinking. In this thesis the problem was identified by a combination of a literature review and Isaberg Rapid's input. The area of lean is certainly not new as a research area as it has been extensively studied, but when discussing with Isaberg Rapid it was clear that lean in procurement was more diffuse. Opportunities, methods and hinders were not that evident as it was in the production, which inspired to create an understanding and conceptualization of lean procurement.

3.3 Case study design

Simons (2009) emphasizes that the case design is an important starting point to plan the case study in contrast to an approach of just starting to observe or interview which rarely is an efficient strategy. In this case, a first meeting was set to establish an open relationship where it was important to emphasize that the study would be beneficial for all parties, which is in line with Simons aim of the first visit. The first meeting was dedicated to discussing the case study and set some dates for initial interviews. For Isaberg Rapid the choice of the topic seemed natural as their new owners emphasized that the procurement function needed to be included in the lean work, but without a clear view about the concept of lean procurement. For the authors' purpose of the study, the choice of topic was also natural because of the relevance of the problem and the company's commitment to the studied area.

The case study can be divided into three parts where the first aimed to understand and explore Isaberg Rapid and their lean work. The second part was focused to Isaberg Rapid's procurement function and their lean work. The third was more a detailed discussion of opportunities, methods and hinders in lean procurement that Isaberg Rapid used or perceived.

Figure 3-2 summarizes the main activities in the case study, where the literature study served as the starting point in order to decide what data needed to be collected and to set the questions for discussions with Isaberg Rapid. The data that needed to be collected influenced the choice of participants where employees not only within the procurement function were involved in order to get the understanding. The data collection in the case study was dominated by interviews with chosen participators but observations and doc-

uments were also used. The data was interpreted and presented in chapter 4, to function as a contribution to the analysis.

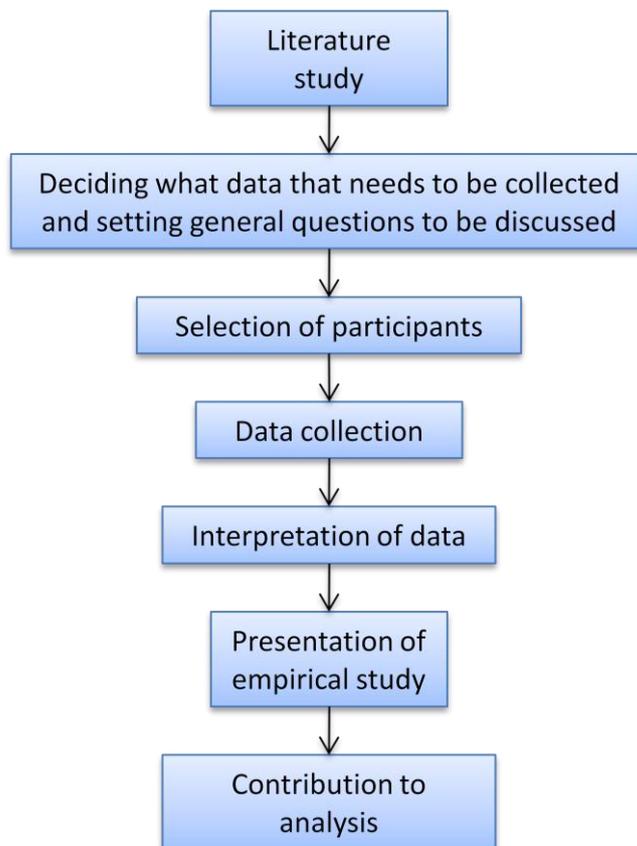


Figure 3-2. The main activities in the empirical study.

3.4 Data collection

The data collection for the thesis is categorized by the two main parts of literature study and empirical study.

3.4.1 The literature study

‘A research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners.’ (Fink, 2010, p. 3) The literature study was useful to find out what knowledge existed in lean procurement and was further used as the foundation for the study. The literature study was in focus in the beginning of this study as its findings were useful and influenced the case study, for instance by contributing to discussion and to determine what data that needed to be gathered.

As Bryman (2002) and Fink (2010) state, databases via Internet or online searches were useful to find the work of reference in the initial stage of the literature study. An extensive search for literature was made in this study where Jönköping University’s catalogue was mainly used to find books in the studied area. When the search results were insufficient, the search was extended to LIBRIS (the national union catalogue). Google scholar was the main tool used to find published material, such as articles in scientific journals. However, other databases, such as ABI/Inform, were used to explore the research area.

Most used journals in this study were within purchasing, supply chain management, operations and material management. The areas that were studied can shortly be summarized in lean, procurement, supplier relations and lean logistics but many other related aspects needed to be studied, such as the implementation, organizational culture, kaizen, kanban, and especially their applicability in procurement and for medium sized enterprises. Much of this reveals the search words used to find literature in the work of reference, but the direct findings also gave hints of additional relevant articles and books by their frame of reference.

The collected data for the literature study was refined during the whole study as it would only include what was important for the study, which became more apparent in the course of time as the study continued to take form.

3.4.2 The empirical study

The data collection for the case study was made through several visits to Isaberg Rapid during January - April, 2011, but more focused to March - April, 2011. A compilation of the visits is shown in table 3-1.

An initial meeting with Isaberg Rapid's sourcing director was made in late 2010 to discuss their contribution to the study. As they planned to implement lean procurement and to increase the involvement of suppliers in 2011, they were matching partners for the study and were also interested in participating.

The authors were given a presentation of the company and a tour of the plant in January, 2011, with the possibility of initial observations of the culture and working methods.

In early February, 2011, a first interview with the main participators was made to discuss the study. The aim of the first meeting was to get an overview of Isaberg Rapid's work with lean under informal circumstances. Further interviews were set and scheduled for the coming month and also possible participating employees were discussed and set. The participating employees became foremost the kaizen promotion officer and the procurement function represented in this case by the sourcing director, a strategic purchaser and a project employee. Also one value stream manager and the logistics managers were participating. These individuals were suitable as they played important roles in the procurement and/or the lean work. Several useful inputs were received during the study, including several interviewees, observations at the site along with documents that were analyzed.

Before the interviews in March and April, 2011, the literature study had advanced, which enabled and contributed to discussion with the interviewees.

Table 3-1. A compilation of visits at Isaberg Rapid.

Date	Participants	Duration	Description
19 th November, 2010	Sourcing director	1 hours	An initial meeting to discuss the project
18 th January, 2011	Logistics manager	3 hours	Company presentation and tour of the plant
3 rd February, 2011	Sourcing director Strategic purchaser Kaizen promotion officer	2 hours	Start-up meeting, mostly discussing the case study but also a discussion of the company and its lean work
1 st March, 2011	Kaizen promotion officer	2 hours	Discussion of Isaberg Rapid's lean work
1 st March, 2011	Value stream manager	1.5 hours	Discussion of Isaberg Rapid's general lean work and the procurement function
10 th March, 2011	Sourcing director Strategic purchaser	2 hours	Discussion of Isaberg Rapid's procurement function and lean work
30 th March, 2011	Logistics manager	1 hour	Complementary data collection regarding Isaberg Rapid's lean work
7 th April, 2011	Sourcing director Strategic purchaser	2 hours	Discussion of Isaberg Rapid's procurement function and lean work
7 th April, 2011	Project employee	1 hour	Discussion of Isaberg Rapid's procurement function and lean work
13 th April, 2011	Kaizen promotion officer	1 hour	Discussion of Isaberg Rapid's lean work in procurement
13 th April, 2011	Value stream manager	1 hour	Discussion of Isaberg Rapid's lean work in procurement

3.4.2.1 Observations, interviews and document analysis

Interviews, observation and observations were the methods used in the case study, which Simons (2009) describes as the most usual qualitative methods to facilitate in-depth analysis and understanding.

In line with Stake (1995), the observations helped to gain a better understanding, especially as it enabled to relate concepts and methods in theory to the reality. For instance were the results of the kaizen events shown and also the work with kanbans, 5S and

work cells. The observation gave a great understanding and a comprehensive picture of the site that would be hard to obtain by just talking to people, which Simons (2009) also states.

As Stake (1995) states, description and interpretation by others are two vital inputs in a case study, especially as own observations may not be sufficient. The main tool for this is the interview, which like no other method enables to get to the core as quickly as possible and in a greater depth (Simons, 2009; Stake, 1995). In line with Stake (1995), the interviews were planned as too informative interviews are hard to steer to ask the right questions and to get the right answers. The interviewees were beforehand given the list of questions with a short explanation of the purpose. This enabled the interviewees to be prepared and to understand the agenda, as Stake (1995) emphasizes. In line with Bryman (2002) and Stake (1995) and their emphasis of documenting the interviews, they were recorded and transcripts were written shortly afterwards. As Bryman (2002) and Stake (1995) explain, the recordings helped to focus on what the interviewees meant and not the exact words. Further, as the study was qualitative, and in line with Bryman (2002) and Simons (2009), the importance of the interviews structure was less important than it would have been if the study was quantitative. Further the importance in the interviews was to gain the understanding what the interviewees considered important, which is in line Bryman's (2002) and Simon's (2009) discussions. Thus were both semi- and unstructured questions used and follow-up questions were important depending on the answers that were given. As Bryman (2002) and Simons (2009) emphasis, flexibility were thus important to be able to gathered the needed data.

Interviews were useful to capture how Isaberg Rapid worked with lean and in order to gain a dynamic understanding on methods used and what they perceived as opportunities and hinders. By involving several participators, the insights were broader and showed angles from those who worked with procurement and those who were more indirectly involved.

Examining documents is important in almost every study where the thinking is the same as for the observation and the interview (Stake, 1995). However, documents are less used and exploited than observations and interviews, according to Simons (2009), who further explains that documents could be formal policies, rules, vision statements, annual reports, internal documents, etc. In line with Stake (1995), different documents were used to substitute for activities that cannot be observed or were more useful than interviews and observations. For instance was document analysis an efficient method in order to get a detailed description of for instance the design of kaizen events in the company, which was important as it is a big part of the lean work in the company. Also documents that were used to describe lean for suppliers eased the understanding. Some documents and lists were shown and discussed during the interviews, for instance some guidelines regarding quality, delivery and costs, the list of strategic suppliers and time plans for some lean projects. Also general information about the company was efficiently retrieved through mainly internet sources.

Together, these three qualitative methods contributed to a wide picture of Isaberg Rapid and the problem area. Interviews were essential to the study where observations and documents mainly can be seen as important complements.

3.5 Data analysis

According to Crowther and Lancaster (2009), the data in a qualitative study can be quantified but with a more informal approach. One procedure is to quantify on how frequently something is occurring. It can be used to determine whether something normally happens or if it is a recurring event. If a phenomenon occurs more frequently, the method can also be used to omit insignificant data. Another simple approach, according to Crowther and Lancaster is called scaling where the method is about labeling data as “important” or “not important”. The authors quantified the data to a certain extent, for instance when it came to describe certain behaviors or the overall culture at Isaberg Rapid, where the focus was on the general opinions that were received from the employees. If data was more frequently occurring or emphasized, the data was considered being more important. This was an efficient and a simple way to analyze what was important and based on interpretation of the recordings and consideration the theory.

As an overall strategy to the study, the authors aimed to develop an understanding and a conceptualization of lean procurement, first based on the theory and then additionally by the case study. By analyzing and comparing the theoretical study with the empirical, and understanding and conceptualization could be created. The summarizing model of opportunities, methods and hinders of the literature study was the basis for the analysis where it was challenged by the findings in the empirical study. Considering this, the study has its foundation in previous research and is further explored by a case study.

3.6 Research limitations

Limitations of the study are connected to the delimitations of the study itself. When focusing on merely one company, there is always a reason to question whether the study is applicable in other companies in the same or similar situation. However, the results of this study have not been developed merely with the inputs from Isaberg Rapid, but more aimed to complement and make practical sense of the literature. The case study has a function to be able to challenge the opportunities, methods and hinders for lean procurement based on the findings in the literature study.

Further, limits or weaknesses in a case study can be the mass of data accumulated, making it hard to process (Simons, 2009). This was handled by using both semi- and unstructured interviews where mainly the semi- structured questions could guide the interviewees into giving relevant information. As the interviewees emphasized certain aspects of lean more than others, it was possible to weigh the material as important or less important. Further, as these interviews have been the main qualitative method used in the study, limitations are linked to how the questions were constructed, and reflexivity as the interviewee may have given what he or she thinks that the authors wanted (Yin, 2003b). Further limitation of the case study is the document analysis, where documents can be hard to retrieve and access (Yin, 2003b), which is true for this case study where few documents and other material were available. This was mainly because of the organizational culture of communicating orally, instead of spending time to construct and share documents about specific problems and methods.

3.7 Validity

When assessing data, there are several complex dimensions or criteria of quality, according to Crowther and Lancaster (2009). They state that this problem is often described by researchers with the help of validity. Crowther and Lancaster explain that va-

Validity refers to the extent to which the research method describes or measures what it is supposed to. Another definition they mention is that validity is the absence of self contradiction and that it is crucial to data quality. Crowther and Lancaster emphasize that if a research does not measure or describe what it is supposed to it is at best meaningless but as worst misleading. However, the concept is complex they state, but it is still important that the researchers assess the extent to which the current approach to the collection of data will produce data that is valid.

The authors were fully aware of the problem of validity before and during the study. This due to the awareness of that lean is a well studied research area and that only one company was involved. Since the aim has been to understand and conceptualize lean procurement it has been important to actually collect information that is relevant to the purpose of the study. However, it is a comprehensive work area, but focusing on the perspective of a medium sized enterprise helped as it made it more concrete and specified. The authors also believed that a broader view needed to be taken regarding Isaberg Rapid than just talking to the purchasers. Thus were several people in the organization involved to catch a wider picture.

The results of the study is believed to be valid in other manufacturing medium sized enterprises as it is supported by theory and has been subjected by practice consideration by Isaberg Rapid. It is likely though that companies perceive different opportunities and hinders in the implementation of lean procurement and also perform it differently. Thus would an involvement of other companies likely give some differences. Generally, however, the study does give an understanding of possible opportunities and hinders in the process and what methods that are applicable and thus helpful for medium sized enterprises before and during the implementation.

The implied implementation stages have not been subjected to be determined in this study as they have been implied in order to structure and depict opportunities, methods and hinders in possible phases of the implementation. However, as the implied stages are constructed by literature and they follow Isaberg Rapid's implementation processes, the stages are assumably valid to other medium sized enterprises.

4 Empirical study

This chapter presents the case study at Isaberg Rapid and their lean work, focusing on the procurement function. The structure is based on the same implied implementation stages of lean procurement as in the frame of reference.

4.1 Internal lean

This section describes Isaberg Rapid's lean organization, which functions as a foundation for the lean work in the procurement.

4.1.1 The lean organization

The commitment to lean from the site manager in Hestra is clear. She has developed the organization to fit the lean program where central roles are the kaizen promotion officer and the value stream managers.

The kaizen promotion officer is responsible for managing and coordinating the lean program and the related administrative work in the company. He is in charge of the kaizen events and plays a vital part in educating employees in lean. The kaizen promotion officer reports to the site manager, who sets the overall goals and further functions as a leader and motivator in the lean project. As assistance, there are three junior kaizen promotion officers, with more operational tasks as collecting data for measurement and to give support in the company's kaizen events. The kaizen promotion officer and the junior kaizen promotion officers constitute the kaizen promotion office (compare to lean promotion office) at Isaberg Rapid.

There are three value stream managers at Isaberg Rapid; one for the nickel flow, one for inside solutions, and one for other products with a common stream. When the process of adopting lean is done, these managers will have responsibility for the entire flow, from procurement to distribution. A main responsibility is to promote their current flow and to provide and assure resources to achieve a successful result. Other important tasks are to for instance ensure standardized work procedures and to plan kaizen events. A main aim for these managers is to focus on the more long term and strategic work, while production managers focus on problem solving and development of the operative work. These in turn, have team leaders as assistance for day to day planning and problem solving at the shop floor.

Esselte's kaizen director in Europe visits Isaberg Rapid several times a year for consultancy and to assist in kaizen events. He has also the responsibility of coordinating and standardizing different kaizen promotion officers work in the corporate group, with joint meetings twice a year. Apart from this, Esselte provides globally recognized consultants from the Japanese company Shingijutsu, to be a part of kaizen events in the company and to motivate and to encourage lean work. Employees at Isaberg Rapid have also been provided with trips, for instance to Japan and "best practice"-factories to be educated in lean.

4.1.2 Implementation of lean

The purchasers discuss the fact that they could have started with some practices earlier than they did, but say that lean has a bigger effect if it is first implemented in the production. By understanding the own organization, it is easier to show suppliers how to work and also how the own company should work with lean. They emphasize the importance of the support and commitment from the organization in order to fully be able to focus on lean in procurement. This is something that is supported by the value stream manager that underlines the fact that it is hard to ask of something from the suppliers if you do not have it yourself.

The kaizen promotion officer mentions the fact that there has to be dedicated resources and clear responsibilities when working with lean. He describes that these aspects have made it possible to work in a committed and structured approach with necessary tools. An environment has been created where the goals are clear and where the priorities are set.

The main challenge for the company has been the resistance in early phases of the implementation, according to the kaizen promotion officer and the value stream manager. However, the attitudes are gradually changing, which is a direct effect of clear leadership and persistent work, they describe.

4.1.3 Elements of lean

Isaberg Rapid is practicing several lean tools with a main connection to the production, where tools and methods include setting takt times, creating work cells with one-piece flow, kanban, 5S, SMED and multi-skilled employees. A lot of work remains, where for instance production lacks visualization and suffers from difficulties of establishing standardization. Currently a lot of efforts are dedicated to implement just-in-time and pull in the production.

Central in the pull implementation is to set up kanbans, which is a time demanding effort as many kanban loops need to be dimensioned where many parameters need to be considered, like shared machines and sudden peaks, according to the logistics manager. Kanban is implemented as a part of only producing based consumption where the actual customer demand controls the flow. The logistics manager says that implementation has so far run smoothly, and that kanbans probably will result in a more efficient flow. However, she emphasizes that it is not that easy as it seems in theory. The project employee states that setting up supplier kanbans is eased by the experience and support of the internal implementation.

A reoccurring phrase at Isaberg Rapid is the shortening of lead times together with high quality. This is what kaizen events often focus on and to gather specific teams that work with for instance SMED-projects. The drastic shortening of lead times is described as most important to be able to be more lean and to order smaller batches, both internally and externally. Another important emphasis from the kaizen promotion officer is to never give up. Isaberg Rapid has had multiple SMED-projects that have been disasters, with resistance from the employees as a result and low commitment. But the company kept on trying and now the attitudes and results are described as successful instead.

The lean work at Isaberg Rapid is heavily relying on kaizen events and has proved to be an important factor in Isaberg Rapid's lean strategy. Main goals of the events have been to reduce waste and to create more efficient flows with less effort and better quality.

The Kaizen promotion officer exemplifies how efficient the events have been where one production line was transformed so that 60% less area was needed, and productivity was increased with 33%. Another successful example is an event regarding SMED, where the set up time for a machine was reduced from 90 minutes to less than 1 minute.

The kaizen events are perceived to spread the lean culture at Isaberg Rapid where currently 50% of the employees have participated in an event and some several times. Thus the kaizen events are not only important as an improvement tool but efficient to educate and to spread the lean culture to all functions of the company. Especially the kaizen promotion officer points out kaizen events as one of the most important tools for achieving lean and to motivate employees.

Lean has an increasing influence on the culture at Isaberg Rapid as the program continues to evolve. Esselte has a big commitment to lean, both in their general strategy and specifically towards Isaberg Rapid. The structure is described by the value stream manager as a culture of lean that is coming all the way from the top and down into detail in the processes of Isaberg Rapid. Esselte has a very clear approach to how lean should be applied in the corporate group but they do not interfere on how different sites construct solutions, as long as it is in line with given guidelines. The value stream manager further states that she has not experienced such a structured approach before, and says that it is important when coping with resistance among workers. Due to persistent work, she describes a new situation of employees that suggests areas for improvements. The discussion about the processes has come to a new level according to the kaizen promotion officer, and he states that workers at the shop floor give mature suggestions and that they in some aspects are more into lean than production engineers.

So far the lean work at Isaberg Rapid has more or less just focused on the production processes, according to the kaizen promotion officer and the purchasers. However, the kaizen promotion officer states that kaizen events will probably in the near future be applied in administrative support processes as well, which also have been proved successful in Esselte. Methods like 5S in the office have been tried but failed to give any significant results as many of the employees have not seen the point of it.

4.2 Understand the supply

Isaberg Rapid has established measurements in order to control and improve areas regarding quality, delivery, and costs. The reports are currently not sent to suppliers though, instead discussed with them if indicators show unsatisfying results. The reason for not sending reports or continuous feedback is lack of resources and time. The purchasers state that it would be useful if the opportunity existed and they have discussed to have some form of supplier performance sheets.

Isaberg Rapid has some understanding of the suppliers' environment but do not know their processes like their own processes. Some visits to the suppliers are performed in order to increase the understanding and to know the suppliers better. This is something that can be directly connected to gemba, which can be further applicable in the organization as the purchasers underline the importance of it and to go out and watch and learn. It is more important than you might expect, they mean. Also the value stream manager emphasizes that it is important to know both your own organization and the suppliers' and that it supports the continuation of lean procurement.

The purchasers point out that it is important to educate suppliers and to start early. It may not be as extensive as in later stages but it can function as an important base for further development. The kaizen promotion officer explains that Esselte uses kaizen events early in the process to get to know their suppliers better. He means that the education process can start early and that it is important to practice gemba at suppliers. He discusses further that understanding the supply is in some cases critical. Esselte have had some cases where they have pushed their suppliers too hard, eventually leading them to the edge of bankruptcy, which in turn have put them in a situation where they must find new capable suppliers. This is an evident example of what can go wrong if the understanding of the supply has failed.

4.2.1 Mapping and analyzing the supply chain

Mapping tools have been used at Isaberg Rapid, but only internally by for instance value stream mapping to identify waste and to focus on value-adding activities. To get a picture over the supply, the company focuses more on measurements of quality, delivery and costs. Quality checks are also performed on some incoming deliveries and show that the quality is not flawless. It is a waste that both the supplier and Isaberg Rapid do quality checks, but it is currently necessary in some cases, and exemplifies the difficulties of balancing trust and control. The purchasers state that the optimal would of course be that no quality checks have to be done and that they could totally rely on the suppliers to fulfill the requirements.

By developed key performance indicators, Isaberg Rapid follows costs developments. They measure stock levels, both for individual products and for suppliers. Analysis of the data is not done frequently but when the need arise. A main conclusion that these measurements have shown, according to the purchasers and the logistics manager, is that the inventory turnover has to be improved. Therefore, the suppliers must be able to provide deliveries more frequently and in smaller quantities. This is also something that the purchasers explain as their main aim in the lean transformation.

4.3 Establish lean suppliers

As the procurement function becomes more involved in the lean work, a main starting point was to identify a group of strategic suppliers. Isaberg Rapid has about 200-300 suppliers, however not all are related to the production or active suppliers. About 25-30 suppliers stand for 90% of the purchased value account where half of them are local suppliers. The main criteria of why suppliers were chosen as strategic were their effect on bound capital in inventories, which lead to a list of about 35 suppliers. The plan of what solutions and with which suppliers is continuously revised. An important remark pointed out by the kaizen promotion officer was the advantage of local suppliers. It is not by coincidence that so many of the strategic suppliers are local, because it gives substantial benefits for communication and transportation and further enables more efficient problem solving, shorter lead times and organization of transports.

The purchasers explain that many of the suppliers are experiencing long set up times. This is a problem, according to the purchasers, as they are dependent on the suppliers due to investments in tools, that are not easy transferable to other suppliers. Because of the investments in tools, Isaberg Rapid single source, which they do with most of the components except for band steel where they dual source to create competition. The band steel suppliers are giant players in the market and thus harder to influence. Further,

the kaizen promotion officer describes a long history with several suppliers, especially those located in the proximity.

Methods such as pareto analysis and reduction of components and suppliers have not been extensively used at Isaberg Rapid. They believe that their way of classifying suppliers is initially enough because it captures the most important parameter of bound capital. The value stream manager points out that the articles that have most effect on the bound capital, often are the most complex ones as well. Suppliers of these components are the most important to the company and are probably similar to those that would be shown if a pareto analysis would be made.

Isaberg Rapid has decreased their supplier base but only marginally. For instance the value stream manager points out the difficulty of reducing suppliers and components, and that it requires substantial resources and commitment. But it is believed to be a good idea. Also the kaizen promotion officer explains that it would be useful to reduce components where some suppliers have explained that Isaberg Rapid is the customer with most article numbers. In some cases, according to the kaizen promotion officer, workers at Isaberg Rapid do not know what articles they have, which therefore is needed to be explained by suppliers, which leads to wastes such as unnecessary work and waiting. He concludes that a lot can be done, and it would be beneficial to do it. However, at the moment it is not a main priority as it does not have a major effect on bound capital, along with the complexity of the task itself and the need for close collaboration with relevant suppliers.

The value stream manager discusses whether it is better to work with suppliers with lean experience or not, and states that it is often preferable to focus on already existing relations, and in later stages focus on supplier development and spreading best practices of lean. However, it is not a disadvantage if suppliers have pre-knowledge of lean and some experience, she emphasizes, but switching suppliers just because of a lack of lean knowledge is not preferred because of the complexity and time required to replace suppliers.

Linked to existing suppliers and conceivable replacements of suppliers, is the important aspect of power circumstances where Isaberg Rapid wants suppliers who they can influence to fit their lean aspirations, according to the purchasers. An example of a problematic relation is the one with the band steel suppliers where the relations are supplier dominant which makes it more complex to establish solutions that are customized for Isaberg Rapid. The band steel suppliers stand for a major part of the purchased value and there is a need to find solutions because of their substantial effect on Isaberg Rapid's costs. Some of the giants in the market have however, according to the value stream manager, taken steps for improvements themselves, which Isaberg Rapid can benefit of.

A challenge is to motivate the suppliers. The purchasers believe that some suppliers will be more reluctant to the lean work because they will need to build up inventories in the beginning. But their motivation is based on the fact that Isaberg Rapid does not force them to build these inventories, but instead encourage them to become more efficient in their processes in order to meet the requirements without building unnecessary inventories. Motivation is also given as there is a possibility that Isaberg Rapid will give support to suppliers to reduce inventories and lead times, according to the purchasers, kaizen promotion officer and the value stream manager.

4.4 Efficient inbound logistics

The purchasers explain that the aim of their work regarding inbound logistics is to improve the inventory turnover where the solutions and systems should be responsive. The most important task that needs to be handled is, according to the purchasers, to reduce lead times. As the aim is to only produce based on consumption and customer order, the lead times from suppliers must be short to be able to reduce inventories and to be able to practice solutions like kanban. If chosen lean suppliers cannot make-to-order with short lead times, they have to make-to-stock in order to produce short lead times. The purchasers do not say that suppliers must hold inventories, as they can be more flexible instead, and perhaps as mentioned, Isaberg Rapid can support them to achieve it. However, the purchasers state and are honest with the fact that inventories are pushed backwards in the chain where the suppliers must take the burden instead of Isaberg Rapid, which they are aware can result in tension. The purchasers emphasize that in cases where the suppliers must hold inventories, they may agree of taking for instance some responsibility of the ownership for obsolete products, etc. However, most important according to the value stream manager is to “sell” the idea of lean to the suppliers. Suppliers will need to make the same lean journey in order to get a balanced and successful relationship. In some cases she explains that it will not be a big challenge, because of their already existing knowledge in lean.

An essential feature in the inbound logistics is according to the project employee forecast sharing. For the kanban system, the forecasts are especially important in order to revise the number of kanban cards. For the consignment inventories, they are one part of enabling the visibility for both parties. However, there is a big difference regarding how detailed and how often the forecasts need to be sent to the suppliers.

4.4.1 Kanban

The purchasers explain that prior the implementation of kanban systems with suppliers, a supplier day was dedicated for their strategic suppliers where Isaberg Rapid’s lean work and kaizen events were presented. The main point was to inform that Isaberg Rapid would implement kanban systems and how the kanban systems were planned to be designed.

The strategic purchaser explains that a kaizen event was conducted to prepare the first implementation with a supplier. The choice of this supplier was based on that it was a local supplier (making the communication easy) and with an already relatively short lead time. The structure of the event was the same as the usual kaizen events performed at Isaberg Rapid, including same set-up and documentation. It worked well to understand how the kanban system would be working and guidelines were further created of how the implementation would be done with other suppliers.

This first kanban system with one supplier is now running for some articles and more articles will be added. Except from the first supplier, more suppliers are currently in the implementation phase and about 20 suppliers will have it before the end of 2011. About 75% of the articles delivered by a supplier are likely to be included in the kanban systems where the less frequent articles may have a solution more similar to an order point system instead, but where kanban cards still are used for visualization.

The purchasers believe that the mentioned solution will function approximately in the same way for all kanban suppliers, but customized to some extent. The main difference

is the number of cards depending on distance and number of deliveries from the supplier. Also some articles are handled more manually depending on the characteristics of the articles. But still there will be kanban cards sent to the suppliers. Ironically, the kanbans have initially given the opposite effect of reducing inventories, the project employee explains. She says it is easy to over-dimension the systems as large safety factors are used in the initial phase to minimize problems that for instance a stock out would cause.

A further challenge is the transport solutions, where for the local suppliers the milk run is already set up, but more challenging is the longer distances where the kanban system will need more frequent deliveries. Thus there might be a breakpoint where forecasts may rule instead of consumption, or the solution of a consignment inventory.

Further, the purchasers state that a lot of time must be dedicated to negotiations regarding order quantities where the old agreements are not suitable for the more frequent deliveries and the new batch sizes. The purchasers state that one solution is to standardize contracts for the lean suppliers in order to save time and administration.

4.4.2 Consignment Inventories

The purchasers say that another option for shortening lead times is to set up consignment inventories, which Isaberg Rapid has, and probably will set up more of in the future. They are mainly efficient when the suppliers need to make-to-order, but have problems to fulfill short lead times, they state. Further the solution is suitable when no efficient transport solutions are available to provide short lead times. However, the purchasers see a problem with these inventories as they demand space and thus hinder Isaberg Rapid to grow in Hestra. The kaizen promotion officer states that these inventories are something of a last resort when no other possibilities are evident.

Isaberg Rapid has currently one consignment inventory located near their site in Hestra and handled by a third party logistics provider. The supplier owns the inventory, and Isaberg Rapid makes the call-offs to the third party logistics provider. This consignment inventory is included in the milk run as well and will also be controlled by kanbans.

A possible supplier that is currently reviewed for consignment inventories is a band steel supplier in Germany. As mentioned earlier, Isaberg Rapid is a very small player compared to the supplier, and by offering free space at Isaberg Rapid's site, both parties benefit; Isaberg Rapid by short lead times, the band steel supplier by free inventory area. The inventories are placed at Isaberg Rapid's site but are owned by the supplier. The supplier is forced to hold inventories but may be compensated by free inventory area. These are however issues to be solved, as Isaberg Rapid may not accept higher prices just because the supplier holds and manages inventories at Isaberg Rapid's site, as they offer the area for free. A further challenge regards the control and visibility of the consignment inventories where the refilling needs to be controlled and based on consumption. They emphasize the need for control and clear stated agreements.

4.4.3 Milk runs

Isaberg Rapid has set up milk runs with local suppliers, enabling mostly the kanban system but also consignment inventories. The milk run contributes to the short lead times and is an efficient transport solution as it consolidates deliveries from suppliers. The solution has been used for a long time to consolidate deliveries from local suppliers. It was set up to reduce transportation costs and now, with implementation of kanban systems,

its usefulness increases even more as it is a great enabler of frequent deliveries from a cluster of suppliers. Isaberg Rapid has a big advantage that many suppliers are local and all of them are included in the milk run. The milk run arrives every week on Monday, Wednesday and Friday and sometimes twice these days. As more suppliers get kanban systems, there are opportunities for the milk run to run every day. Isaberg Rapid has no other clusters of suppliers and thus are no additional milk runs planned or likely in the near future.

4.5 Joint improvements and development

The kaizen promotion officer underlines the importance of resources in order to facilitate joint improvements and development. He explains that the roles of the purchasers must be different in order to further be able to work with joint improvements and supplier development. Call-offs must be made at the shop floor, so that the purchasers can focus more on these strategic tasks and on supplier development.

The purchasers explain that the purchasing department is moving towards a more of strategic position. It is up to the purchaser to assist in the implementation phase of kanban etc., but it will later be pushed to the logisticians' responsibility to preserve and develop it. Thus, as the lean journey continues and the organization's efficiency increases, resources can be released for more collaborative relations with suppliers. The purchasers describe that they have developed some type of visibility with suppliers, referring to a good information exchange regarding sharing of forecasts for instance. However, working with open books with common goals is not yet relevant.

One of the main responsibilities for the purchasers is supplier development and especially in order to create and maintain capable suppliers. The kaizen promotion officer explains that the hiring of the project employee, who is currently working with the implementation of kanban with suppliers, may be a first step towards a more dedicated work with supplier development and support, similar to a supplier support group. However, the purchasers emphasize that Isaberg Rapid is not there yet. If resources are available in the future, it would be reasonable that this role develops towards more of a supplier developer and supporter, as the kaizen promotion officer describes.

The purchasers and the kaizen promotion officer discuss kaizen events as an important start towards developing the suppliers' abilities and capabilities. The kaizen director at Esselte has also expressed an interest of conducting kaizen events at suppliers' facilities so that benefits for both parties can be achieved, says the kaizen promotion officer. This would lead to benefits such as shorter lead times, which is most important according to the purchasers, and would initially be the focus for suppliers' development. These kinds of benefits are initially more interesting for the purchasers than eventual discounts, they say. Suppliers that would be likely to start the joint improvements projects with would be the ones with most problems of achieving short lead times and thus having difficulties with high inventories to enable the kanban systems, according to the purchasers. The kaizen promotion officer states that eventually, as Isaberg Rapid would dedicate a lot of resources on this, they expect that it results in price reduction in order to assure Isaberg Rapid benefits as well.

The kaizen promotion officer discusses the advantage that geographically close suppliers have and that these suppliers would be likely to start with, if efforts would be directed regarding joint improvements and development. The reason is the geographical proximity which eases communication and collaboration. The power circumstances with

these suppliers do also make the relations suitable for joint improvements and development. Kaizen events could be a possible starting point to achieve better collaboration.

Currently, Isaberg Rapid invites suppliers to their site in order to influence their development towards lean where they can learn how to conduct kaizen events or implement lean methods. This is something they state could be more used in order to inspire suppliers and share and transfer knowledge. Currently the commitment from Isaberg Rapid and the suppliers is not there to facilitate more joint improvements and development. The focus is more about finding improvements for the focal company. An example of other possible improvements by the sourcing director is to continue to revise suppliers, and to practice more dual sourcing to gain cost savings by competition.

The project employee discusses the extensive amount of resources that it takes to motivate suppliers and the purchasers further explain that there are completely different opportunities for larger enterprises to work with this than in a smaller company. The initial focus is however to have functioning kanban solutions, and in the future being able to direct efforts of supplier development to improve the systems.

Both the value stream manager and the kaizen promotion officer explain that there are opportunities for joint developments and not only regarding logistics solutions but also in the product development, where there are already cases where the suppliers to some extent develop products or support the product development process.

4.6 An extended lean enterprise

The logistics manager and the value stream manager explain that Isaberg Rapid aims to have the organization pulling from the very beginning to the very end based on actual consumption and customer order. In line with this, kanbans will control the flow and suppliers will be even more involved to facilitate pull in the beginning of the chain.

A main challenge discussed by the purchasing department is the systems thinking in the supply chain. Currently Isaberg Rapid is experiencing positive effects and signs of accomplishment of internal culture of lean but there is a long way before the entire chain is lean. The aim is cost efficiencies for the focal company, and the purchasers state, this limited focus is shared by suppliers where the actors focus on their own benefits and do not see what is best for the entire chain and the final customer. Thus is the systems thinking a hinder for further development where it should be the entire chain that matters and a common focus at the final customer. The purchasers describe that common goals and visions for the supply chain is distant and that there is a long way to go before achieving it.

When discussing tools for the extended lean enterprise it is clear that the company finds most of the current systems sufficient. Esselte encourages the use of fax as communication tool for call-offs and it is unlikely that this will change in the near future. The project employee describes the fax as a functioning tool, and something concrete that does not get lost. However, if there were resources for technologies like EDI, she believes that it would be important for the lean development. However, the purchasers state that it is a waste to implement such solutions if suppliers are not able to be integrated.

A challenge for the value stream manager is the information systems that currently are several and not currently giving visibility of the chain, despite the fact that she should have responsibility of the entire flow. She states that creating the visibility is hard and if

suppliers would be included it would be even harder to facilitate visibility and a successful integration.

4.6.1 Partnership

The value stream manager states that the best suitable relation for the lean work is establishing partnerships with suppliers to enforce trust. However, to establish partnerships with small suppliers, like family owned firms, could be dangerous as it is hard to predict their future, according to the value stream manager. Thus the dependency a partnership creates could give some problems if the supplier has problems.

The kaizen promotion officer states that it is of most importance to have the same vision in a partnership, which would be important for their lean work with external actors. The key for a successful partnership is clear goals and to assure that the partners go in the same direction. Further, the kaizen promotion officer expresses the fact that along the journey, certain aspects of lean get easier, regarding for instance commitment and trust. As mentioned before, even at the shop floor, new ways of thinking is evolving and everyone is encouraged to see waste and come up with ideas for improvement. For instance, Isaberg Rapid enlightened a supplier with the help of a video from one of the corporate group's plants, about how SMED could make significant improvements for their set ups. The kaizen promotion officer explains that the supplier was amazed that improvements like these can be achieved at all.

4.6.2 Waste in the supply chain

Waste between companies is something that is reduced by already mentioned methods, like kanban, consignment inventories, and milk runs, as it minimizes inventories and makes the processes more efficient by for instance minimal human input with more automated call-offs. However, there will be substantial opportunities to improve the systems in the future.

Linked to the procurement function and its administration is the flow of and the number of quotes, order confirmations, invoices, etc. Invoices are for instance sent for every call-off, creating a large number of invoices that need to be administered for the suppliers and Isaberg Rapid. This has been discussed with some suppliers, as the strategic purchaser explains, and especially as the call-offs will increase due to the implementation of kanbans. It would be good to have invoices for all call-offs on one invoice for a certain period to reduce waste. However, the challenge is that the suppliers do not want to get paid any later.

As the lean work continues at Isaberg Rapid and their suppliers, they will continue their efforts with for instance kaizen events, and more waste in the supply chain will be reduced.

5 Analysis

The aim of the analysis is to identify opportunities, methods, and hinders related to the implied implementation stages of lean procurement. This will be done by analyzing and comparing the literature study with the empirical study. The results will be summarized and conceptualized in a model in the end of the chapter.

5.1 Internal lean

In this section will the opportunities, methods and hinders in the first implied implementation stage be analyzed.

5.1.1 Opportunities

Internal lean, as an important foundation towards becoming lean in the procurement, has shown the same vital opportunities both in the literature study and the empirical study. These opportunities have in this thesis been summarized as achieving a supportive organizational culture with an ability to motivate suppliers.

The reason why a supportive organizational culture is found as one of the most important opportunities is because of Achanga et al. (2006) and Liker (2004) emphasis of the lean culture as the foundation for a successful lean journey. This is also supported by the empirical study and the descriptions by the kaizen promotion officer as a new way of thinking; a thinking that everyone should help to spot waste and find areas for improvement. If this supportive organizational culture is achieved, it might function as an important starting point for further lean work. This base can beneficially be created by starting the implementation in the production, which is also supported by Achanga et al. (2006). The empirical study showed that internal lean creates motivation and support from the organization, by committed leaders and personnel, which further was explained by the purchasers as a necessity for the coming lean work in procurement. This is also reason why a supportive organizational culture is found as one of the most important opportunities for this stage of implementation.

The second main opportunity found in the stage of internal lean is to be able to motivate suppliers. It is a result of the supportive organizational culture and that helps to spread lean to other actors in the chain by showing a successful implementation of lean. The value stream manager summarized the importance of being able to motivate suppliers: How can you ask something from your suppliers if you do not have it yourself? An interesting remark that shows what internal lean can give before moving on to further developments within lean procurement.

5.1.2 Methods

The methods found in the literature study did not differ from the ones found in the empirical study. It seems like education and training is efficient to be able to gain the commitment from the employees. At Isaberg Rapid, the kaizen promotion officer has a big responsibility in this, but also the consultants from Japan have the function to educate and support. The empirical study has shown that lean is something that should permeate the organization, and education and training is therefore vital, which is also supported by Bicheno (2007) and Hancock and Zayko (1998). It is further clear that

kaizen events can support the work of education and training and give fast and visual results for the organization. This is definitely supported by the empirical study, where all interviewees named kaizen event as one of the most important methods in their lean work.

The assigned roles of lean have a big influence to enforce the organization as well. This is especially something that the empirical study has shown with motivated leaders that strive for continuous improvements, and the purchasers talked about the process being much harder, if these lean leaders are not present. This is also supported by for instance Lean Enterprise Institute (2008). These roles are important to divide responsibility in the company, and to find individuals that are persistent in strive towards becoming lean. Even if some projects are not a success from the beginning, assigned leaders will have the responsibility of trying again until the goals are achieved.

Finally, lean production tools are a major part of internal lean. For instance the value stream manager talks about the efficiencies achieved by using these production tools. They can be seen as generally applicable in the stage of internal lean, and further enforces the practices of lean and enforces the supportive organizational culture, because of their positive effects on processes.

5.1.3 Hinders

Hinders in the stage of internal lean actually differed in the literature study and the empirical study. The supported concept by the empirical study was resistance. Further, the purchasers brought forward the concept of commitment. Concepts that were not supported as essential by the empirical study in this stage were resources, skills and expertise, and lack of systems thinking.

Commitment can of course be connected to the concept of resistance. When for instance the kaizen promotion officer described the difficulty of creating commitment, resistance was explained as the underlying problem. Resistance can therefore be identified as the overall identified problem, based on for instance by Sohal and Egglestone (1994) and Axelsson et al. (2005). But if the resistance can be handled, it is also likely that commitment from the workers can be created.

It is interesting that Isaberg Rapid did not discuss the challenges of resources, skills and expertise, and lack of systems thinking, which the literature emphasized as challenges in this stage. Achanga et al. (2006) described for instance the difficulty of fostering skills and knowledge as a major difficulty. The reason might be the support that Isaberg Rapid has received from their new owners Esselte. This has made it possible for Isaberg Rapid to build their internal lean organization, with help of external resources in forms of consultancy and knowledge to foster the organization from the shop floor, thus making mentioned concepts less of a problem in their case. However, without the support of Esselte, it is likely that the challenges of resources, skills and expertise, and lack of systems thinking would be evident in this stage for Isaberg Rapid as well.

Linked to mentioned challenges is poor leadership, which is critical for lean's success (Achanga et al., 2006; Bicheno, 2007; Liker, 2004; Shoal & Egglestone, 1994). The purchasers did not see this as a major problem. This is due to the fact that the challenge has been handled efficiently with the help of assigned lean roles with committed individuals. The kaizen promotion officer described the fact of how important it is to have persistent leaders that work with lean. It is easy for individuals in the organisation to

give up if they do not get result, but with assigned lean leaders, this problem will be handled.

5.2 Understand the supply

In this section will the opportunities, methods and hinders in the second implied implementation stage be analyzed.

5.2.1 Opportunities

The opportunities that come out of understanding the supply have been found to be the same in the literature study as in the empirical study. The first main opportunity is the understanding of suppliers and that in turn gives the second main opportunity to plan the lean procurement transformation (Bicheno, 2007; Liker & Choi, 2006). The reason that these opportunities are the major opportunities in this stage might be traced to Hobbs's (2004) statement that lean procurement is dependent on suppliers' processes and abilities. Further, these opportunities are important so that resources are not wasted in later stages, and that closer relationships are not formed with wrong suppliers (Baudin, 2004). These aspects were also supported by the purchasers as the understanding can give many insights on what to focus on. In Isaberg Rapid case their conclusion was to increase the inventory turnover and reduce the bound capital in stocks. The purchasing function seems to be dependent on these opportunities for the further development of the lean work, for instance in order to determine which suppliers are to be first included in the work.

5.2.2 Methods

The main identified concepts in the literature study were supervision and mapping tools, which also were supported by the empirical study as important methods in this stage. The empirical study also highlighted gemba and to educate suppliers as main concepts.

Ansari and Modarress (1988), Liker (2004), MacDuffie and Helper (1997), Simpson and Power (2005) and van Weele (2002) emphasize that quality, delivery and costs are central in lean, and linked to supervision as well. This is definitely supported by the purchasers which focus their measurements on these factors as well. However, opportunities for improvements exist, where for instance reports are not being sent to suppliers and where all data is not being analyzed to its fullest extent.

Mapping tools have so far just been used internally and thus can no practical examples be given to support the involvement of suppliers in this. But as described by the value stream manager, they were efficiently used internally, and she saw no problem to use these tools externally as well. Bicheno (2007) described mapping tools as functioning tools to get an overview over both material- and information flow. At Isaberg Rapid, mapping tools could be used to for instance get an overview about the procurement process or for instance a specific value flow between a supplier and Isaberg Rapid. This in turn would lead to an increased understanding of the supply and an ability to spot waste.

Even though gemba has been discussed in the literature as a concept used to understand suppliers (Liker & Choi, 2006), it was not believed and identified as a major concept. However, the purchasers and the kaizen promotion officer did enforce this term in order to get more knowledge about the supply. Likely is that the simplicity of the method is advantageous when an increased understanding of the suppliers is to be gained, by for

instance visiting sites and analyzing processes. The purchasers have however not exercised gemba to a large extent but they expressed that it is important and could have been exercised more. This is believed to be true, as the work of go out and see is not that resource demanding.

The purchasers added that already in an early stage it is important to educate suppliers. The education can be linked to Isaberg Rapid's supplier day (where they presented how they work with lean and how the kanbans will be working) but also to suppliers that are visiting in order to learn from Isaberg Rapid's processes, kaizen events, etc. Thus is education believed to be important even this early in the implementation process but likely more in order to provide information and inspiration than real knowledge transfer. Substantial knowledge transfer is believed to be time- and resource demanding and consequently more suitable for later stages of lean procurement, when the strategic suppliers have been identified.

5.2.3 Hinders

Hinders found in the literature study of control versus trust and time demanding was supported by the empirical study. However, the empirical study also highlighted, linked to the time demanding, that the process also is resource demanding.

The issue of time (Liker & Choi, 2006) is enforced by the empirical study with additional emphasis on the resources to support the work of understanding the supply. In Isaberg Rapid's case, these factors are affecting their ability to for instance evaluate measurements and to give feedback to suppliers. A better understanding of the supply would be possible if time and resources were unlimited, as the purchasers stated. It can thus be difficult, and especially for medium sized enterprises, to find the time and resources to work further with this area.

The hinder of balancing control and trust (Liker & Choi, 2006) is supported by the empirical study as the purchasers confirmed that it would be optimal to trust suppliers that they deliver products in line with the requirements and thus not doing any controls. However, as the purchasers described, it is impossible because of the consequences it would have on the production when faulty articles are being used and not discovered early. Based on the purchasers views, and that controls do help to get an understanding of the supply where no controls of quality, delivery and costs give any indicators of suppliers' performances (MacDuffie & Helper, 1997; Simpson & Power, 2005), they are non value adding activities but currently necessary.

5.3 Establish lean suppliers

In this section will the opportunities, methods and hinders in the third implied implementation stage be analyzed.

5.3.1 Opportunities

In the literature study the main opportunity of this stage was categorized to rationalize the supply. This concept included to find strategic or important suppliers (Bergdahl, 1996; Bicheno, 2007; van Weele, 2002) and to reduce the supplier base (Krause, 1997) and components (Bicheno, 2007). The purchasers at Isaberg Rapid have identified their strategic suppliers, with a main aim similar to the one described by Bergdahl (1996), Bicheno (2007), and van Veele (2002) of facilitating collaboration and improvements. These opportunities are simple and straight-forward, and when these lean suppliers are

established, the further development, including the involvement of lean procurement, can continue with chosen actors. The empirical study did not however support rationalizing suppliers and components as main aims of this stage. The value stream manager for instance agreed that it would be good, but that it cannot be seen as a main aim in their case because it is time demanding, costly, and requires full commitment from the suppliers. However, reducing suppliers and components have been a focus to some extent from the company, but not to an extent as being a main aim of this stage. Thus is the main opportunity of this stage better explained as being able to identify lean suppliers. Rationalizing the supply can instead of an opportunity in this stage be seen as an aim during the whole process where and if it is possible to reduce the number of suppliers and components.

5.3.2 Methods

The main methods in the literature study were supplier classification and rationalizing suppliers and components. The empirical study supported supplier classification as a major concept and added single sourcing.

The empirical findings supported the importance of conducting a supplier classification in order to depict lean suppliers. The literature (Arnold & Chapman, 2005; Bicheno, 2007; van Weele, 2004) showed several methods for evaluating suppliers and identifying strategic suppliers to work closer with. Isaberg Rapid did not use any advanced method and the purchasers described their method as sufficient, and in this case probably it is, due to their straight forward aim to increase inventory turnover. In order to achieve this, the need was to identify what they called strategic suppliers that affected the inventory turnover the most.

Regarding the decrease of suppliers and components, the value stream manager explained that it would be good but that it requires substantial resources and commitment. This was also supported by the kaizen promotion officer who stated that there is a lot to be done in the lean work and that reducing suppliers and components are not currently prioritized. Reducing the numbers of suppliers and components would be good (Bergdahl, 1996; Bicheno, 2007; Krause, 1997) but with support of Isaberg Rapid's views that it is hard, time consuming, and a resource demanding work, it cannot be identified as a main method in this stage. Instead it can be a method used during the process where and if it is possible.

What the empirical research emphasized is the importance of sourcing. As Liker (2004) and Waters-Fuller (1995) discussed, lean is much linked to single sourcing and preferably from local suppliers. Isaberg Rapid single source to a wide extent but dual source in some cases in order to create a price competition. In this thesis, sourcing was presented as a hinder in the literature study as medium sized enterprises often have no other choice than to single source (Wilson & Roy, 2009). However, considering that lean is linked to single sourcing and that Isaberg Rapid mostly single source, it can be more seen as method. Further, single sourcing supports the reduction of suppliers and components.

5.3.3 Hinders

The main hinders identified in the literature study were power circumstances and switching costs. These were supported by the empirical study. As previously discussed, sourcing was not supported in the empirical study where single sourcing instead were

added as a method. Tension was not clearly supported in the empirical study, as it was found that motivational issues is a more suitable hinder in this stage.

What both the literature study and the empirical study highlighted as a major hinder is power circumstances. For instance Cox (2001) stated that in order to work proactively with suppliers, the relationship must be buyer dominant, buyer-supplier interdependent or a combination. This is supported by the empirical study, and a good example is the band steel suppliers from Germany. These are important and major suppliers for Isaberg Rapid and there is a need to work more closely with them. However, due to the band steel supplier's dominance, it makes it much more difficult to facilitate a close collaboration. This shows the hinder of an especially supplier-dominant situation, and what difficulties it can lead to. This is of course an evident hinder for medium sized companies as they often tend to find themselves in a more supplier-dominant environment than larger enterprises. This means that it is hard to create a true lean environment in these situations (Stjernström & Bengtsson, 2004; Wilson & Roy, 2009).

A clear identified problem when establishing lean suppliers is whether to choose from existing suppliers or looking for suppliers that already are lean. However, both literature and the empirical study emphasized that it is usually more efficient to develop existing suppliers, thus showing the hinder of switching suppliers. MacDuffie and Helper (1997) discussed the substantial costs that can arise in the forms of economical, political, and reputational reasons. This is supported by the empirical study where it was emphasized that the economical and time-consuming work of finding new suppliers does not make it justified. Thus it is likely more beneficial for medium sized companies, that often do not have the necessary resources that enable to switch suppliers, to focus on existing relations and develop suppliers to fit their lean work.

When establishing lean suppliers, the literature study highlighted tension as a key word, whereas the empirical study enforced concepts like commitment and motivation. These are believed to be different sides of the same coin. Tension is because of the adaptation that the suppliers will need to make to the buyer and their lean work, and commitment is something that needs to be enforced by motivation. What can be considered in this stage is that motivating suppliers to support the work is more crucial and that tension is likely more apparent later when the consequences are more evident. This is why the motivational issue is seen as the major hinder and not tension or commitment. If motivation can be built up, tension will also be reduced. One way to foster motivation and prevent tension is, as the sourcing director stated, to help suppliers to become lean by in the future by for instance perform kaizen events at their sites or take some responsibility of the inventories that suppliers must hold.

An additional hinder was brought up in the empirical study; resources. The stage of establishing lean suppliers can be resource demanding, and mainly connected to the work of rationalizing suppliers and components. This is also why resources are included as a major hinder in the stage of establishing lean suppliers. As stated by the value stream manager, it would be of most importance to conduct more rationalizations in this area, and some work has been initiated. But to further achieve results, substantial resources would be needed, which is also why the company has not focused more on reducing suppliers and components.

5.4 Efficient inbound logistics

In this section will the opportunities, methods and hinders in the fourth implied implementation stage be analyzed.

5.4.1 Opportunities

All main opportunities from the literature study were supported by the empirical study but the concepts of low inventory levels, short lead times and small batches have been summarized by the concept of increased inventory turnover. The main idea is to create better logistical solutions and the literature study pointed out the main opportunities that lean practices will result in; responsiveness (Bicheno, 2007; Liker, 2004; Olhager, 2000), low inventory levels (Baudin, 2004; Bicheno, 2007; Olhager, 2000), short lead times (Baudin, 2004; Lamming, 1993; Liker, 2004; Olhager, 2000; Pohlen & Goldsby, 2003; Srinivasan, 2004), small batches (Baudin, 2004; Lamming, 1993; Srinivasan, 2004) and visibility (Arnold & Chapman, 2004; Cork, 2006; Liker, 2004; Pohlen & Goldsby, 2003; Srinivasan (2004). These were, as mentioned, supported by the empirical study as main opportunities of the stage of efficient inbound logistics.

5.4.2 Methods

The methods and the use of forecast sharing, kanban, consignment inventories and milk runs, identified in the literature study, were supported by the empirical study. The difference between the literature study and the empirical study is the emphasis of EDI, which will be further analyzed.

The empirical study exemplified how milk runs facilitate the flow of kanbans in a cluster of suppliers in the proximity. The close proximity to suppliers enables the kanbans as it facilitates short lead times. For longer distances and lead times, consignment inventories might be more beneficial and a better solution in order to enable short lead times, as the purchasers stated. However, consignment inventories were by the kaizen promotion officer explained as more of a last resort. This is to some extent in line with Vaaland and Heide (2007) who stated that medium sized enterprises are less interested in consignment inventories.

The project employee emphasized the importance of forecast sharing to enable the kanban system, which is supported by Baudin (2004). On the other hand, Bergman and Klefsjö (2007) stated that one essence of kanban is that forecast are not needed. However, by support of the empirical findings, forecasts can be seen as important also in order to predict and prepare for peaks for suppliers to revise the number of kanbans. This might be even more important as the kanbans are new for many suppliers, and thus more challenging to predict how the flows will work and what dimensions of kanbans that will be needed.

The major difference in this stage is how the literature study advocated the use of electronic call-offs (e.g. Cullen, 2002; Drickhamer, 2005; Vernyi & Vinas, 2005), and the empirical findings that supported more a simple and traditional method. As the project employee stated, faxes function well and the purchasers further mean that EDI is hard to implement because of the issue of integrating suppliers. Esselte wants the entire corporation to use fax, as EDI is not worth the resources that need to be invested. Vaaland and Heidi (2007) stated that EDI and other e-solutions are less used in medium sized enterprises. This is thus supported by the empirical study, which suggests that simple call-offs are currently more suitable for medium sized enterprises than EDI.

What more can be emphasized, by support of the empirical study, as an enabling factor for the methods are geographical close suppliers, as Waters-Fuller (1995) and Liker (2004) also mentioned. These suppliers, as mentioned, enable kanbans and short lead times, but also responsiveness, better communication and close collaboration, which the kaizen promotion officer emphasized.

5.4.3 Hinders

The main hinders identified in the literature study were tension and distant suppliers. Both concepts were supported by the empirical study which also added hinders of knowledge and skills, and re-negotiations.

Distant suppliers are of course connected to longer lead times (Srinivasan, 2004) and it being a hinder is supported by the empirical study as the difficulties it creates is apparent. Lead times due to long set up times might be able to reduce but lead time due to distance is harder and thus consequently make it hard for kanbans and milk runs. The distance makes it harder to create transport solutions that can facilitate the opportunities of low inventory levels, short lead times, small batches, visibility and responsiveness.

Tension was supported by the purchasers as they believed it can arise during the process as more suppliers are involved and kanbans implemented. The shifted responsibility to suppliers is one explanation to the amplified tension (Wilson & Roy, 2009). The empirical study is in line with this as tension was explained to possibly arise when suppliers are not prepared for the new demands of delivering smaller batches more frequently and thus must hold inventories.

Knowledge and skills is a possible hinder as the purchasers stated that their theoretical knowledge was not sufficient for the implementation of kanbans. Also re-negotiations were highlighted as a hinder and that refers to the need to agree with all suppliers on new order quantities for instance, which of course is a time demanding effort.

5.5 Joint improvements and development

In this section will the opportunities, methods and hinders in the fifth implied implementation stage be analyzed.

5.5.1 Opportunities

The main opportunities for joint improvements and development that were identified in the literature study were capable suppliers, mutual benefits, and joint learning. These opportunities were all supported by the empirical study.

Baudin (2004) stated that supplier development and support is an important way to get capable suppliers. The purchasers discussed this as well, but that it is hard to find the time and resources for initiatives like this. Because of Isaberg Rapid's current state, it is hard for the purchasers to speculate exactly how capable suppliers and mutual benefits will be achieved. However, a step in the right direction is the project employee that has been hired to set up kanban solutions with suppliers. This can be seen as a first step towards a structured work of supplier development and support. If this function can continue to evolve, it is likely that mentioned opportunities can be achieved.

Joint learning with a focus on continuous improvements and knowledge sharing was emphasized by Bicheno (2007) and Liker and Choi (2006). Even though Isaberg Rapid has a long way to go before they can fully trust and fully collaborate with their suppli-

ers, there have been some important steps taken in the direction towards joint learning with suppliers. Some kind of visibility has been achieved by for instance forecast sharing, and a first kaizen event has been performed with a supplier. Further some suppliers have been invited to Isaberg Rapid in order to see their work. The purchasers said that they have a long way to go, but mentioned steps are important for further development. It would require resources and time to start practicing joint learning with suppliers, but is a likely scenario that mentioned opportunities can be gained in the future.

5.5.2 Methods

The literature study showed the main methods of knowledge sharing, supplier association, and kaizen with suppliers. The empirical study supported knowledge sharing and kaizen with suppliers as important methods, but not supplier association. Instead the focus was more towards clear and assigned lean roles, similar to the internal roles that the company already have with for instance a kaizen promotion officer and value stream managers.

Bicheno (2007) and Liker and Choi (2006) emphasized the need for serious investments in order to create a network for knowledge sharing. This is supported by the empirical study by developing a more of a strategic procurement function so that the purchasers can assist the suppliers to reduce lead times, inventories and improve the kanban systems for instance. Knowledge sharing is further important to have before a company can focus on joint improvements, according to Lamming (1993) and Liker and Choi (2006). This must be improved for Isaberg Rapid in order for further benefits to be achieved. Currently forecasts are at least being shared, but it seems like they have to start open up more to their suppliers to achieve an efficient knowledge sharing that can lead to joint improvements. A start can for instance be to share the reports of the supervisions and to even more invite suppliers to study Isaberg Rapid's lean work and kaizen events.

The supplier association is, according to Hines (1996a), an important mechanism when it comes to lean procurement. However, by considering Hines definition of it, it is questioned whether it is relevant for medium sized enterprises. Stjernström and Bengtsson (2004) stated that a supplier association enables collaboration and mutual learning if the hinders are removed. For a medium sized enterprise, a focus of a supplier association might be more of establishing a group where cooperation and mutual learning is possible, in Isaberg Rapid's case likely its local suppliers that are of equal or smaller size. Bicheno (2007) and Hines (1996b) described a supplier association that has meetings in order to develop collaborative forces to create value for the final customer. The supplier association would perhaps in Isaberg Rapid be more of group of important suppliers along with individuals from Isaberg Rapid with clear assigned lean roles where they can focus on supplier development and support (like kaizen events, invites to sites, education, etc.) and not an association where the suppliers also work with each other. However, as the purchasers said, there is still a long way to go and more resources are needed before more emphasis can be directed towards assigned lean roles within lean and joint improvements and development.

To conduct kaizen events at suppliers' sites is definitely supported by the empirical study. This has even been mentioned earlier in the process of lean procurement as efficient tools to for instance increase the relations with the suppliers, and to educate them in the lean work. These kaizen events are also likely to increase in the future, and there have been some suggestions from Esselte as well to help with the events at suppliers premises. Methods like these are likely to affect important parameters such as lead times

and inventory levels at the suppliers as well. Parameters that would also increase are their commitment for lean in general, as they previously have been forced to build inventory.

5.5.3 Hinders

Identified hinders in the literature study were serious investments, trust and commitment, and dividing shared benefits. These concepts were supported by the empirical findings, which also added power circumstances as a major hinder in this stage.

Bicheno (2007) and Liker and Choi (2006) discussed the need for serious investments in this stage in order to achieve a culture of continuous improvements and to be able to build networks for knowledge sharing. This is definitely supported by the empirical study and their discussions about how the focus of the procurement function would have to be completely different in order to work more with joint improvements and development. Serious investments are thus needed in order to reduce waste to eventually release resources for joint improvements and development. Further, knowledge sharing, kaizen events and assigned lean roles demands resource investments, as supported by the purchasers, kaizen promotion and the value stream manager.

Likely is that the concepts of trust and commitment can be connected to the hinder of dividing shared benefits. Baudin (2004) stated that a lack of trust hinders joint activities, and commitment must exist, mainly from the buyer in order to facilitate improvements that are to be made at the suppliers' premises, which was also discussed by Modi and Mabert (2007). These ideas were supported in the empirical study, mainly by the value stream manager that discussed the importance of the buyer's own lean work to encourage the supplier. But even though aspects like these are important, it is likely that more has to be done in order to facilitate trust to share the benefits created. Thus trust and commitment must be on a much deeper level to facilitate the joint improvements and development, which closer relations may enable (Hines, 1996b; Liker & Choi, 2006). If this commitment and trust can be accomplished, it is likely that benefits can be shared more equally and that also investments can be more equally made from both parties. The concept of co-opetition (Brandenburger et al., 1996) may however be the easiest way to divide the benefits. If the parties co-operate for mutual benefits, and then compete for benefits, it may not be any hinder. However, as Liker and Choi (2006), and the kaizen promotion officer agreed with, if the resources are unequal it might be good to regulate how the benefits are divided. On the other hand, the purchasers currently do not see any problem with this, but it is mainly because they initially are happy if just lead times can be reduced. Thus it is a future problem for Isaberg Rapid how the benefits are shared, but still a hinder that also depends on how much resources are invested to conduct kaizen events with suppliers for instance.

What larger enterprises logically have more of than medium sized enterprises is power, which enables a more proactive work with suppliers, considering Cox's (2001) discussion. This is supported by Stjernström and Bengtsson (2004) who stated that medium sized enterprises lack the bargaining power, and it makes it more difficult to facilitate successful joint activities. This is further supported and emphasized by the empirical study, and especially by the difficulty of influencing larger actors to fit the lean work and aspirations.

5.6 An extended lean enterprise

In this section will the opportunities, methods and hinders in the sixth implied implementation stage be analyzed.

5.6.1 Opportunities

Main opportunities identified in the literature study connected to an extended enterprise were aligned systems and enhanced performance. These concepts were supported by the empirical study.

While this stage being more of a vision of lean procurement, the theory have described this stage in a more comprehensive way than the empirical study. This is of course natural, as Isaberg Rapid has a long way to go before being able to achieve an extended enterprise. But meaningful insights were however given by the empirical study.

Aligned systems refer to what Bicheno (2007) discussed, with systems aligned not only by information systems but also by culture and logistics, where material is pulled from the very beginning to the very end. This vision was supported by the empirical study but the purchasers doubted whether ever being able to achieve it. This is hard to speculate in, but one thing that is certain is that the company has a long way before even being able to consider a supply chain like this. Especially, if it as the purchasers stated, that all actors in the supply chain focus on their own benefits and not what is best for the entire supply chain and the final customer.

Enhanced performance for the focal company and the entire supply chain is the ultimately opportunity, where the procurement is the link to suppliers and the value creation and supply chain waste reduction (Bicheno, 2007). This is linked to Isaberg Rapid's aim of achieving a more strategic procurement function to enable it. The kaizen promotion officer stated that it would be hard to achieve mentioned opportunities without the strategic focus. For an enhanced performance there has to be, as discussed by Langley et al. (2008), closer relations and common visions with the main suppliers. It is likely that medium sized enterprises would suffer difficulties to achieve it, as the purchasers described the environment where every company thinks about their internal goals and benefits without having the supply chain in mind, and thus, not seeing the point of sharing benefits to enhance the supply chain's performance.

5.6.2 Methods

The literature study emphasized partnerships, integration, and supply chain waste reduction as main methods in this stage and the empirical findings supported these concepts.

A discussion in this stage is whether partnerships are suitable for medium sized enterprises. According to Mudambi and Schründer (1996) they are, as long as the power circumstances are favorable. This is supported by the empirical study and the purchasers that discussed the fact of how hard it is to influence larger enterprises. However, if they are in a situation where they can influence, motivate and achieve results with other companies, there is no reason to believe why partnerships should not be able to be achieved in medium sized enterprises.

Integration is an important concept in order to achieve aligned systems in the supply chain, where information systems are helpful to make processes efficient and to integrate suppliers. Currently Isaberg Rapid is using fax for call-offs but they stated that

they in the future can be supported electronically to be made more efficient. However, as the purchasers and the project employee emphasized, it is a matter of resources where simple methods as fax currently works well and is also cost efficient and requires little infrastructure. However, it can be concluded that technology and electronic solutions would give positive effects, but the gains of it, compared to the use of simple methods and the investments, must be assessed. Likely is though, when it comes to this level of integration for an extended enterprise that technology adoption must come to another level, where systems like EDI, as the project employee stated, is important for the future development.

Elimination of supply chain waste is achieved, according to Hines and Taylor (2000), by supply chain coordination and supply chain development. Methods already used by Isaberg Rapid to reduce supply chain waste are kanban, consignment inventories, and milk runs. These are likely methods that the company will continue to pursue in the future with suppliers and to make more efficient in order to reduce waste, including administrative wastes such as invoices and call-offs. Regarding the development, the kaizen events can be seen as a first step in this direction, in order to help suppliers to reduce waste and improve process. It may eventually support, motivate and encourage suppliers to conduct own events to spot internal waste and to improve processes and thus reduce waste in supply chain.

5.6.3 Hinders

The main hinders identified in the literature study were lack of systems thinking, technology adoption, and commitment. The empirical findings supported these concepts, and added resources.

According to Bicheno (2007) systems thinking is an important concept where it is the total supply chain costs and result that matters and not local goals. This has been identified in the empirical study as a main hinder, and as previously discussed, the difficulty of when companies had an internal focus and not a supply chain focus. Thus also supported by the sourcing director, this hinders the supply chain's further development and competitiveness. Without a shared and comprehensive view of the supply chain, it hinders the creation of mutual benefits that gain the whole chain and not just single companies. By increased collaboration or partnerships with suppliers, an increased systems thinking and understanding of the supply chain can be gain (Bicheno, 2007; Gilbert et al., 1994). However, currently Isaberg Rapid also can be seen as having systems thinking, according to the statements by the sourcing director, which highlights Isaberg Rapid's long way to go before the environment enables an extended lean enterprise. The value stream manager did also see problems with the increased dependency with suppliers, especially smaller as you never know what can happen.

According to Fawcett and Magnan (2002), few companies are engaged in extensive supply chain integration where the reason for medium sized enterprises may be, according to Vaaland and Heidi (2007) that they do not keep up with the technology and system adoption. Vaaland and Heidi meant that medium sized enterprises are less focused on integration and also EDI and e-based solutions in the supply chain. This is evident at Isaberg Rapid, which currently does not integrate its systems with suppliers and does not use EDI for instance. An example of how challenging the work could be is to look at the situation of the value stream manager. She has currently problems with visibility over the entire value stream, and it would be even harder if suppliers would be even more integrated. As mentioned earlier, Isaberg Rapid does currently use fax for call-

offs, etc., but for an increased integration, more technology may be necessary because of the wider extent of information sharing.

Lack of commitment or conscious efforts is also a hinder when establishing successful partnerships (Baudin, 2004; Langley et al., 2008). Even though the empirical study suggested that aspects like commitment is getting easier to achieve as time moves on, it cannot be discarded as a hinder in this stage. Commitment and conscious efforts to facilitate the partnerships and trust is especially evident when thinking about all resources that need to be invested, which was added as hinder by the empirical study. Serious investments are needed for the technology adoption and also partnerships due to the conscious efforts it demands.

5.7 Summary - analysis

In figure 5-1 the result of the analysis is given which presents the final opportunities, methods and hinders that also conceptualizes the implementation process of lean procurement for a medium sized enterprise. Many opportunities, methods and hinders from the literature study have been supported by the empirical study and some have not been supported. The empirical study has also highlighted additional opportunities, methods and hinders.

Kaizen events have been the driving method for Isaberg Rapid to create a supportive lean organization that has reduced resistance as well. However, other methods like assigned lean roles have been important. The supportive lean organization has also given great insights for the procurement function and their work of implementing kanbans and also the ability to motivate and influence suppliers. The focus for the procurement function has been toward to create an efficient inbound logistics which is a comprehensive work as it demands knowledge and skills, re-negotiations and could give tension with suppliers. The basis for the work was to identify strategic suppliers where for instance power circumstance and to motivate suppliers may create difficulties. In order to increase the inventory turnover Isaberg Rapid has mainly used methods like kanbans and milk runs. A lot of opportunities are found by working closer with suppliers to reduce waste in the supply chain where knowledge sharing by for instance kaizen events with suppliers are seen as great future method to support Isaberg Rapid's future development. However, there are several hinders for the joint improvements and development and also to integrate suppliers, like systems thinking, technology adoption and the need for serious investments.

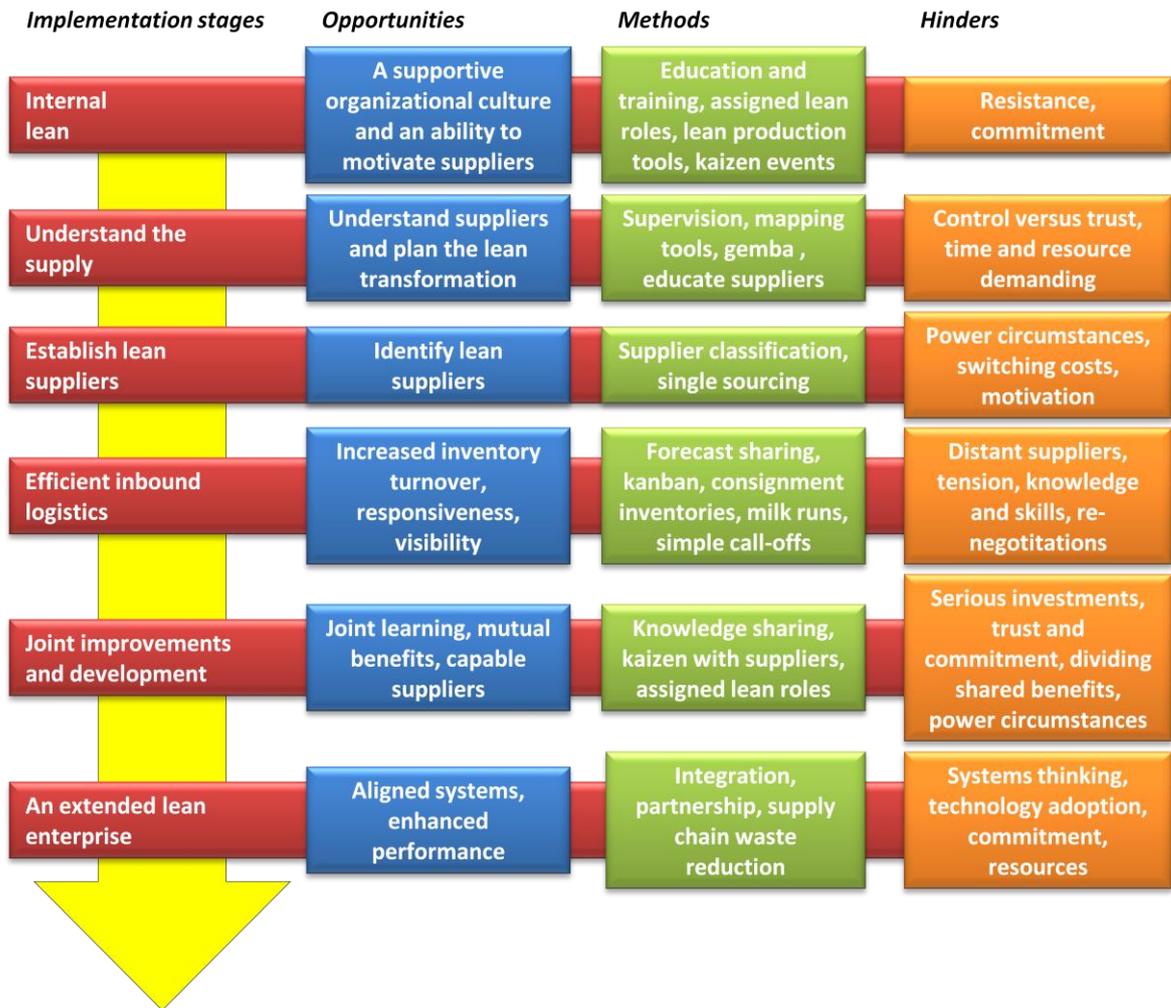


Figure 5-1. Opportunities, methods and hinders identified by the analysis.

6 Conclusions

This chapter presents the thesis's conclusions based on the analysis of the findings in the literature and the empirical study.

This thesis has described lean procurement by focusing on the implementation process where six implied stages have permeated the conceptualization. Even if the stages cannot be determined, conclusions can be drawn about opportunities, methods and hinders in different phases in the process as figure 5-1 compiled. The opportunities, methods and hinders found in the literature study have been challenged by the empirical study in the analysis. The conclusions of the study are the following.

By anchoring lean in the organization it eases the involvement for the procurement function. It does not only give experience and knowledge about lean but also an opportunity to motivate and influence suppliers to be involved. Quality, delivery and costs are central during the entire process, mostly linked to supplier performance and selection. Important is to identify and decide which suppliers that will be included in the lean work. Geographically close suppliers have a major advantage by normally being able to provide short lead times and better support because of the geographical proximity. Integrating suppliers and creating mutual benefits by joint improvements and development with suppliers give significant opportunities for lean procurement but have several hinders as well.

The inbound logistics has been the dominating focus for Isaberg Rapid where kanbans have been mainly used in order to increase the inventory turnover. Other activities beyond direct linkages to inbound logistics, such as product development and administrative processes with suppliers have been secondary. The importance of the inbound logistics is reflected in the relations with suppliers where focus is to increase their efficiency in order to support Isaberg Rapid's aspirations. It appears relatively likely that other medium sized enterprises have the same focus on the inbound logistics in the implementation process of lean procurement as Isaberg Rapid.

Based on the analysis, some opportunities, methods and hinders can be more emphasized. One main opportunity is that a lean organization is established to support lean procurement and to motivate and influence suppliers. Further main opportunities are increased inventory turnover, capable suppliers and reduced waste in the supply chain. Main methods to enable the opportunities are assigned lean roles (including for supplier development and support), education and training, kaizen events, kanbans, milk runs and knowledge sharing. Consultancy is an enabling factor for education, training and kaizen events. Main hinders for the methods and opportunities are resistance, tension, commitment and trust but also power circumstances and distant suppliers create difficulties. Many hinders are also connected to joint activities and integration where resources, technology adoption, systems thinking and how to divide benefits may be emphasized.

It is relatively likely that by the awareness of the opportunities, methods and hinders, it eases a successful implementation process of lean procurement, which eventually and ultimately, supports a more efficient and productive production.

7 Future research and critique of method

This chapter gives recommendations for further research and discusses critique and weaknesses of the thesis.

7.1 Further research

More research on medium sized enterprises and their way of working with lean is sought from the authors. As the literature is heavily weighted towards larger enterprises and especially within the area of joint improvements and development, it would be an interesting area to further study in medium sized enterprises. Linked to this is how these companies handle the power circumstances with suppliers that are of a much larger size, in order to facilitate joint improvements and development and an efficient inbound logistics. Further studies are also sought on kaizen events with suppliers and how to control and regulate resources invested and the distribution of benefits.

A similar study as in this thesis on other medium sized enterprises would be interesting in order to challenge the opportunities, methods and hinders. Also a study over a longer period to cover the whole implementation process and to explore the implied stages would give a better understanding of how medium sized enterprises work and can work with lean procurement.

7.2 Critique of method

Criticism of the thesis and its method can be directed to the fact that the Isaberg Rapid Group is more of a larger company than a medium sized enterprise. Some consideration of this should be taken into account, but as the study has only been directed to the site in Hestra, the purpose of studying a medium sized enterprise has anyway been fulfilled. Furthermore, as Esselte entered as the new owners of Isaberg Rapid, the company have been incorporated into a larger group where Esselte's assistance in the lean work has been an advantage which many other medium sized companies lack. Therefore it may be complex to apply the same opportunities, methods and hinders for other similar sized companies that do not have the same support as Isaberg Rapid has got.

In addition, Isaberg Rapid was the only company involved in this study which thus questions the general applicability of identified opportunities, methods, and hinders to other companies. As the perspective of these aspects is of the buyer's, it does not fully cover the suppliers view of the problem and how these actors would react to the implementation of lean procurement. Suppliers' perspectives have come from the literature and Isaberg Rapid but it can be concluded that an involvement of suppliers would have given an extra dimension to the study.

The thesis had a focus around six implied stages. Even if they are influenced by literature they cannot be named other than, as the authors have called them in the thesis, implied implementation stages of lean procurement. However, as the stages merely have functioned as a way of structuring both the thesis and the opportunities, methods and hinders, they have not been in the centre of the study and not a part of the general aim itself.

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