

## **Improving competitiveness by optimizing the supply chain at Örum Oy Ab**

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<p>The commissioning party Örum Oy Ab is a Finnish provider of comprehensive solutions of automotive maintenance services, spare parts, and accessories for service shops in the private and commercial vehicle markets, manufacturers, authorized dealerships, tire shops, and spare part shops. It has been struggling in a highly competitive and stagnant market to regain profitability.</p> <p>The purpose of this study is the formulation of suggestions for optimizing the supply chain to improve competitiveness from a lean perspective. The goal is approached from a managerial point of view and is focused on developing the operational strategy and supply chain processes. The focus of the analysis is on creating value for the customers and developing methods to deliver value with minimal waste.</p> <p>This study consists of a theory section and an empirical section. The theory section discusses supply chains, supply chain management, and the philosophy of lean, its strategic implications, models, some tools, and limitations. It also introduces three generic competitive strategies. The empirical section consists of an analysis of the current supply chain at Örum and an analysis of the current structure from a lean perspective. Improvement suggestions are based on the findings of the analysis.</p> <p>The study is based on qualitative research data collection methods through means of the author's personal professional experience, qualitative discussions, observation, and a desktop study. The discussions were conducted with employees from various departments of the company, to gain a broader understanding of how the company functions as a whole. The collected data was analyzed using qualitative means.</p> <p>The results indicate that Örum's current supply chain structure is focused on resource efficiency, as opposed to flow efficiency. The inventory is bloated, the throughput time is long, and considerable amounts of working capital are tied into the supply chain at all times. Further development of supplier cooperation could also bring much needed agility to the supply chain.</p> <p>Reconsidering the operational strategy with an emphasized focus on customer perceived value could yield improved results in customer satisfaction. An orientation towards a flow efficient supply chain design could improve the flow of products through the supply chain and banish unwanted waste simultaneously. This could free up valuable resources to be used on improvements in customer value creation. In addition, further development of the IT-systems Örum uses could bring immediate advantages by supporting daily activities instead of limiting them.</p>	
<b>Keywords</b> Supply chain management, Lean management, Lean supply chains, Optimization	

## Table of contents

1	Introduction .....	1
1.1	Background.....	1
1.2	Case company.....	2
1.3	Thesis topic.....	3
1.4	Demarcation .....	4
1.5	Key concepts .....	5
2	Supply chains and lean .....	7
2.1	Supply chains .....	7
2.2	Supply chain management.....	8
2.3	Lean management .....	11
2.4	Lean management philosophy .....	14
2.5	Process flow .....	16
2.5.1	Little's law .....	17
2.5.2	The law of bottlenecks .....	18
2.5.3	The law of the effect of variation on processes.....	18
2.5.4	Improving flow efficiency .....	19
2.6	The efficiency paradox .....	20
2.6.1	Long throughput times .....	20
2.6.2	Many flow units .....	20
2.6.3	Many restarts per flow unit .....	20
2.6.4	Superfluous work .....	21
2.7	Creating a lean operations strategy.....	22
2.8	Developing a lean operations strategy .....	25
2.9	Toyota's philosophy of continuous learning .....	26
2.10	Competitive strategy .....	27
2.11	Summary .....	28
3	Research methods .....	30
3.1	Research approach.....	30
3.2	Research design .....	30
3.3	Primary data collection.....	31
4	Örum's supply chain.....	33
4.1	The market.....	33
4.2	Material and information flow .....	33
4.3	IT-systems .....	34
4.4	Suppliers.....	35
4.5	Product selection and pricing .....	36
4.6	Purchasing.....	37

4.7	Sales.....	38
4.8	Inventory .....	38
4.9	Inbound goods .....	39
4.10	Central warehouse.....	39
4.11	Outbound goods .....	40
4.12	Internal transfers .....	41
4.13	Reverse logistics.....	41
5	Results.....	42
5.1	Value in the current supply chain .....	42
5.2	Improving the current supply chain with lean to create more value.....	43
5.2.1	Operations strategy.....	44
5.2.2	Process flow.....	44
5.2.3	The efficiency paradox .....	46
5.2.4	Improved value creation and competitiveness.....	47
6	Discussion.....	49
6.1	Key findings .....	49
6.2	Suggestions .....	50
6.3	Reliability and validity.....	50
6.4	Recommendations for further research .....	51
6.5	Reflection on personal learning.....	52
	References .....	53
	Appendices.....	55
	Appendix 1. Key questions of qualitative discussions.....	55
	Appendix 2. Örum's material and information flow.....	56
	Appendix 3. Örum's material throughput cross-functional flowchart.....	57

# 1 Introduction

The introduction chapter presents an overview of the situation that presented the need for this thesis. The chapter begins with a background explanation of the situation in the case company, followed by an introduction to the thesis topic. The demarcation, international aspect, anticipated benefits, risk analysis, personal motivation are then defined. The chapter ends with an explanation of the central key for the topic.

## 1.1 Background

The commissioning company Örum Oy Ab has been facing financial challenges for the last few years. It has had to lay off employees and the company is going through structural changes. Due to the global economic recession that has severely impacted Finland's financial situation businesses and private consumers alike have become very careful in their spending. The result in the Finnish automotive sales and service market, has been that sales of new vehicles have shrunk and vehicle owners have been very careful with maintenance work. Many motorists have decided to follow the absolute minimal maintenance schedule recommended by manufacturers. On the other hand, more affordable alternatives to authorized dealership service stations, which do not void the warranty of new vehicles in the European Union, have become much more attractive. The cheaper service pricing and aftermarket parts combined with multi-brand service personnel offered by shops such as Örum's Autoasi concept service shops, have gained market share, and have become more trustworthy in the eyes of consumers.

It can be said that supply chain management (SCM) at its broadest concerns every task in some way within a company. All information and material flow can be considered as activity in the supply chain, which highlights the importance of SCM in meeting strategic goals and succeeding in everyday business operations.

The intention of this research oriented thesis is to study the processes of Örum's supply chain and the plausibility of implementing lean management practices, with the main purpose of freeing up working capital and increasing throughput, thereby improving Örum's supply chain performance and competitiveness on the market.

## 1.2 Case company

Örum Oy Ab is a provider of comprehensive solutions of automotive maintenance services, spare parts, and accessories for service shops in the private and commercial vehicle markets, manufacturers, authorized dealerships, tire shops, and spare part shops. The company's business is founded on customer concepts, reliable logistics, high quality products, and professional personnel. At the time of writing, the annual report for 2015 has not become available, so figures from 2014 will be presented.

In 2014, Örum's turnover was €57 million and it employed 270 people. It is part of the Finnish Mercantile Group, that had a turnover of €85,4 million and a staff of 400 in 2014. The group has been in business since 1901 and Örum has provided the independent aftermarket with spare parts for more than 80 years. Currently Örum has seventeen regional warehouses that also act as wholesale locations around the country in addition to the central warehouse and administration in Espoo. (Mercantile 2015)

Örum states that its field of business is in vehicle healthcare. The mission is to create happy entrepreneur customers and the vision is to be a constant pioneer in its field of business. The company's strategy is built around having the most capable repair shop customers. (Husberg 2015)

The company's business is built around the Autoasi and Autonomi concept chains for car repair shops. Örum offers comprehensive packages with everything from maintenance supplies and marketing to improving business performance and employee training. Independent repair shops can join the chain and become a part of the Autoasi or Autonomi brand and receive instant recognition benefits of the brand and have their business supported by one of the major aftermarket wholesalers in the Finnish automotive industry. There are approximately 300 Autoasi and approximately 90 Autonomi repair shops spread throughout Finland. Örum's customers are the businesses that purchase the goods and services, and not the end customers of the repair shops or the individual consumer. (Mercantile 2015)

Örum imports most of its products from foreign suppliers. Some of their customers are located abroad as well. Mercantile group has daughter companies located in Russia and Estonia. The Estonian daughter company Mercantile Group AS works in collaboration with its Finnish counterpart to gain mutual benefits. Örum also carries the Nordic Forum (NF) line of products, which has been created in cooperation with foreign companies in the automotive aftermarket, to create a competitively priced, high quality option to OE spare

parts and accessories. The products are currently distributed throughout Denmark, Finland, Norway, and Estonia. The products are supplied both by high-end original equipment manufacturers and unbranded manufacturers.

### 1.3 Thesis topic

This thesis aims to develop suggestions for optimizing Örum’s supply chain and improving competitiveness on the highly competitive Finnish automotive market.

The research question is defined as “How can Örum’s competitiveness be improved by optimizing supply chain processes from a lean perspective?” It has been divided into investigative questions (IQ) as follows:

IQ1. How does Örum’s supply chain work?

IQ2. How much value is Örum actually creating to their customers in their supply chain?

IQ3. How can lean management improve Örum’s supply chain?

IQ4. How can lean management improve Örum’s value chain?

IQ5. How can implementing lean management principles into Örum’s supply chain improve their competitiveness?

Figure 1 below depicts the research process and the focus on the different areas of the analysis.

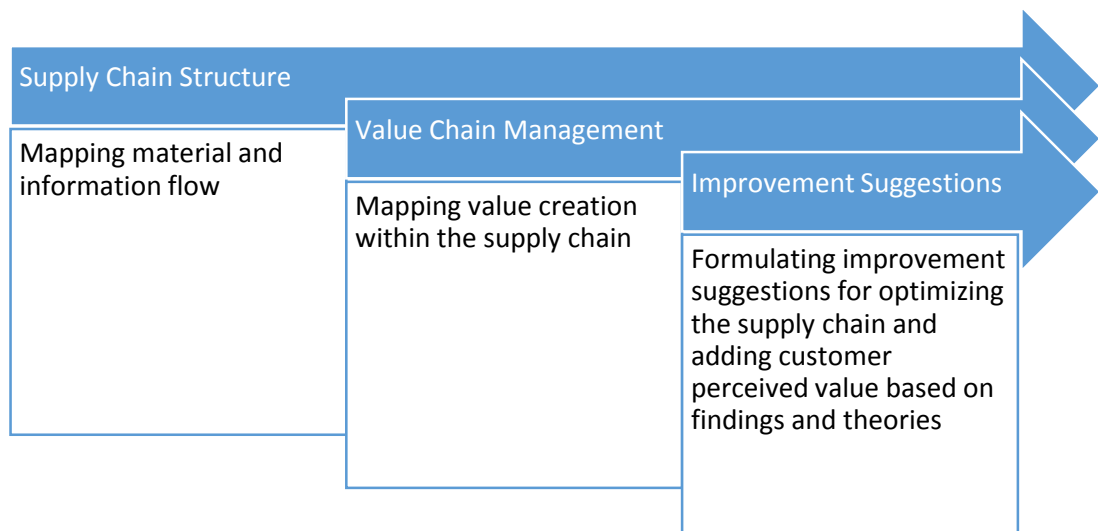


Figure 1. A visual representation of the investigative question structure

Table 1 below demonstrates the connection between investigative questions, theoretical framework, measurement questions, and results.

Table 1: Overlay matrix

Investigative Questions (IQs)	Theoretical Framework	Research Methods	Results
How does Örum's supply chain specifically work at the moment from vendors' to the end customers?	Chapters: 2.1., 2.2.	Qualitative research, desktop study, qualitative discussions	Chapter: 4.1.-4.13.
How much value to the end customer is Örum actually creating in their supply chain?	Chapters: 2.2., 2.4.	Qualitative research, desktop study, qualitative discussions	Chapter: 5.1.
How can lean management improve Örum's supply chain?	Chapters: 2.5.,2.6.,2.7.	Qualitative research, desktop study	Chapter: 5.2.
How can lean management improve Örum's value chain?	Chapters: 2.5.,2.6.,2.7.	Qualitative research, desktop study	Chapter: 5.2.
How can implementing lean management principles into Örum's supply chain improve their competitiveness?	Chapters: 2.9.	Qualitative research, desktop study	Chapter: 5.2.4.

#### 1.4 Demarcation

The intention of this research is not to analyze the market or the competition Örum faces. It will solely be focused on analyzing the current supply chain and formulating recommen-



dations based on lean management from an internal standpoint and reflecting on the effects on external parties. The results of this research aim to help Örum reach a point in which it could potentially improve its competitiveness on the market.

## 1.5 Key concepts

**Supply chain management** is the integration of the activities that procure materials and services, transform them into intermediate goods and final products, and deliver them to customers. These activities include purchasing and outsourcing activities, plus many other functions that are important to the relationship with suppliers and distributors. (Heizer & Render 2011, 452.)

**Lean** is a management philosophy with the core idea of maximizing customer value while minimizing waste. A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. To accomplish this, lean thinking changes the focus of management from optimizing separate technologies, assets, and vertical departments to optimizing the flow of products and services through entire value streams that flow horizontally across technologies, assets, and departments to customers. (Lean Enterprise Institute 2015)

**Optimization** is an act, process, or methodology of making something (as a design, system, or decision) as fully perfect, functional, or effective as possible. (Merriam-Webster 2015)

**Competitiveness** pertains the ability and performance of a firm, sub-sector or country to sell and supply goods and services in a given market, in relation to the ability and performance of other firms, sub-sectors or countries in the same market. (Kiel 2013)

Figure 1 below represents the hierarchy of the connection between the key concepts from the research question's viewpoint. Lean management forms the basis for the applied theories, followed by SCM representing a major part of lean management in this case. The supply chain is then optimized using the tools provided by the theoretical framework. The end result is competitiveness in the market.

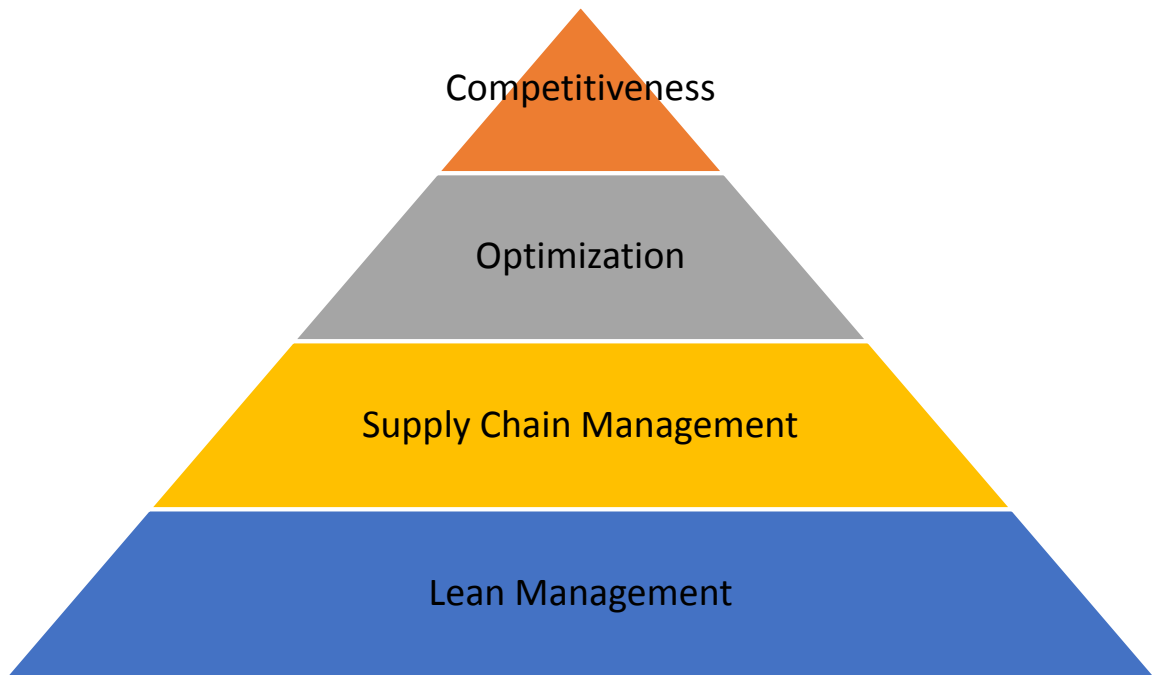


Figure 2. The hierarchy of the key concepts

## **2 Supply chains and lean**

Supply chains are complex networks that must be managed efficiently if a company is willing to succeed and meet their goals. Supply chain management can be designed based on lean theories to create effective flows of materials, services, and information that boost organizational performance. This chapter describes some of the theories behind supply chains, supply chain management, lean management, and lean supply chains.

### **2.1 Supply chains**

Supply chains include all of the required activities to transform production resources, such as labor and information, from raw materials to the end consumer. Companies within the supply chain are built up of processes that can be defined as a set of inputs transformed into outputs that satisfy customer expectations and needs in the required form (Oakland 2003, 11). The company is at the heart of the supply chain with different stages spanning out into upstream and downstream directions. Upstream activities include suppliers, vendors, and all types of material and service providers and they move towards the company at the center of the supply chain. Downstream activities can include warehouses, distributors, or any other intermediaries between the company and the end customers. The stages of a supply chain are typically arranged into tiers. If one were to consider an entire supply chain from natural resources to the end customer, the supply chain would be far too extensive. For the purpose of this research, the analysis will be mostly limited to first tier suppliers and first tier customers. (Schniederjans, Schniederjans & Schniederjans 2010, 43-44)

In an ideal situation, a supply chain will provide seamless flow across all stages within the supply chain. No waste is created, as perfect products and services are delivered to the customer on time, creating impressive results under the bottom line. The benefits of continuous improvement and growth are enjoyed in every stage of the supply chain. In practice, however, problems tend to decrease supply chain performance to under ideal levels. (Schniederjans et. al. 2010, 47)

Common supply chain problems are the bullwhip effect, the snowball effect, and supply chain disruptions. The bullwhip effect and the snowball effect are usually the results of inadequate information flow. The bullwhip effect is created by a sudden rise in demand downstream, which then aggregates as it travels back upstream through the different stages. For example, a few customers decide to increase their safety stock levels and place a few larger orders to a regional warehouse. The regional warehouse in turn places

an order of the same size with an added buffer to the central warehouse. The purchasing staff at the central warehouse react to the sudden demand spike with an even bigger order from the first tier suppliers. The size of the initial order multiplies as it travels upstream without a factual basis, but rather based on estimation and anticipation. This can create major inventory problems for all stages in the supply chain, all due to inadequate information flow. (Schniederjans et. al. 2010, 47-48)

The snowball effect is very similar to the bullwhip effect, except it will be based on a faulty forecast of demand leading to an overreaction in material flow that grows as it travels upstream. Deficiency in planning ordering quantities, lead times, and the use of forecasting are the root causes for the snowball effect. (Schniederjans et. al. 2010, 49)

Supply chain disruptions can be caused by almost anything in a long supply chain. A wide range of events either global or local in nature, from a natural disaster to power outages can lead to major disruptions downstream. Disruptions are inevitable in the long run, which highlights the importance of continuously properly assessing supply chain risks and preparing alternate plans for proactively steering clear of disruptions and reacting in case disruptions occur. Major risk factors include sudden increases in costs, availability shortages, legal issues, environmental and safety concerns. (Schniederjans et. al. 2010, 51)

## **2.2 Supply chain management**

As defined in the key concepts, supply chain management is the integration of supply chain activities. Coordinating the different stages of a supply chain into a seamless network serves many purposes around meeting the objectives of a company. Some common objectives of SCM include cost minimization, profit maximization, achieving competitive advantage, adding value, and being able to adapt to a constantly changing environment. (Heizer & Render 2011, 452; Schniederjans et. al. 2010, 51)

The tasks of SCM can be divided into three general categories based on time span: long-term strategic, middle-term tactical, and short-term operational. The tasks of SCM must be completed in accordance with the corporate, business, and operational strategies of the company. While each company within the supply chain pursues individual goals, the integration between stages provides mutual benefits for reaching individual goals. (Johnson, Whittington & Scholes 2012, 6-7; Schniederjans et. al. 2010, 53)

Supply chain performance affects all internal business operations within a company because of the deep integration into every activity, as well as those concerning external supply chain relationships. In order to assess the performance of a supply chain, the measured dimensions must be clearly defined and the correct tools must be utilized. See table 1 for supply chain performance dimensions, their effects, and measurement metrics.

Table 1. Supply chain performance dimensions, effects, and metrics. (Adapted from Schniederjans et. al. 2010, 56-59)

<b>Dimension</b>	<b>Effects</b>	<b>Metric</b>
<b>Cost</b>	Improving efficiency, competitiveness, and profitability	Supply chain cost as a percentage of total revenue
<b>Flexibility</b>	Adapting quickly to market and organizational changes	Customer response time in days
<b>Time</b>	Improving service and minimizing waste	Percentage of on-time delivery
<b>Quality</b>	Improving ability to satisfy customer needs	Percentage of perfect order fulfilment
<b>Inventory</b>	Supporting size and frequency of orders	Total inventory days of supply in days
<b>Assets</b>	Supporting financial and physical asset management	Cash-to-cash cycle time in days
<b>Operations</b>	Supporting internal business operations	Percentage of order fill rate
<b>Value added</b>	Adding more value to product or service	Value added in euros per supply chain employee
<b>Customer satisfaction</b>	Ensuring customer satisfaction	Total waiting time for service in minutes

Supply chain management faces a wide array of strategic, tactical, and operational decisions in designing, establishing, and continuously improving a supply chain. The nature of the market, business, and organizational goals set the foundation for all types of SCM decisions. Typical decisions that supply chain managers must make are presented in table 2.

Table 2. Typical supply chain management decisions. (Adapted from Schniederjans et. al. 2010, 60-63)

<b>Decision</b>	<b>Explanation</b>
<b>Supply contracting</b>	Arranging supply contracts with suppliers, taking into consideration contract terms, costs, and all rules and regulations. Creating and maintaining relationships.
<b>Balancing costs</b>	There are many cost balancing decisions, for example procuring small lots frequently to minimize inventory costs at the expense of increased transportation costs. Balancing trade-offs for overall benefits.
<b>Inventory control</b>	Controlling inventory levels between supply chain stages for balanced supply needs and minimal inventory costs.
<b>Distribution network configuration</b>	Configuring locations of all supply chain stages geographically to balance service coverage and costs.
<b>Distribution organization</b>	Centralized or de-centralized distribution for optimal flexibility.
<b>Outsourcing</b>	Outsourcing operations for gain within the supply chain via third party logistics providers.
<b>Information technology</b>	Critical success factor in SCM. Choosing best suited systems for the company's needs.
<b>Integration</b>	Integration within the supply chain upstream and downstream to aid achieving the company's goals.
<b>Global partnering</b>	Partnering up with other companies around the globe for mutual gain and achieving strategic, tactical or operational goals.
<b>Pricing</b>	Correctly pricing products and services. For example, deciding to keep fast-movers

in local inventory and offering direct shipment from suppliers to customers to maximize inventory turnover.

Many strategic, tactical, and operational SCM decisions and the potential results can be directly linked to lean management and lean supply chains. A combination of the two can result in improved supply chain performance, if implemented correctly.

### **2.3 Lean management**

Lean management in itself is a very broad management philosophy consisting of multiple models. The core idea is to maximize customer value while minimizing all waste in the process. While it may seem simple, actually reaching a point where the company is able to create more value to the customer with fewer resources is challenging.

*“Lean is an operations strategy, a strategy to achieve an objective. In particular, the objective is to prioritize high flow efficiency over resource efficiency. Having said that, by eliminating, reducing, and managing variation, the aim is continually to increase both flow efficiency and resource efficiency. But how does an organization become lean?” (Modig, Åhlström 2012, 127)*

The original concepts that modern lean thinking is based on were created by the Toyota Motor Corporation, when they established the Toyota Production System (TPS). To truly understand lean, it is of absolute importance to know how it all started.

Toyota was founded after the Second World War by the son of the creator of a revolutionary automated loom, which stopped when a thread snapped. The automated stops made it possible for the machine operator to seek out the root cause of the problem and it could be thoroughly fixed. This was named Jidoka, which stands for “automation with a human touch”, as the machines automatically detected problems. Jidoka is the first pillar upon which the TPS is built. The philosophy of finding the thread in a production process also led to the creation of the second pillar of the TPS, Just-In-Time (JIT). JIT is built on the basic idea of creating production flow by only producing what the customers want and eliminating all inventory. The goal is to have every product flow right through production. (Modig, Åhlström 2012, 68)

Why was it ever necessary for Toyota to consider the flow of their production? In the American car production system, which Toyota representatives studied, the goal was to maximize the use of resources and therefore they had enormous stocks of parts waiting for assembly. What set the two countries apart back then, was that the Japanese had very scarce resources to work with after the war. Companies had to make the most of what they had available. Land was a scarce resource, technological development lagged behind western countries, iron and steel were expensive and hard to come by due to high transportation costs, and finally, there were no financial institutions capable of financing the growth of the motoring industry. (Modig, Åhlström 2012, 69)

The first solution that Toyota came up with to overcome scarcity, was to focus on the efficiency, more specifically on the flow efficiency of production, to make the most of what they had. This became very apparent in their aim to focus on doing the correct things from the customers' viewpoint. It was crucial that investments into technology and materials were done correctly. This led to Toyota only producing only according to what customers had ordered. Getting to the root of customers' desires was of utmost importance and had been broken down into three questions:

1. What (which product) does the customer want?
  - a. a complete overall understanding of customer needs, led to developing products with desired design and function
2. When does the customer want the product?
3. What amount does the customer want?
  - a. 2&3 Creation of a pull system to avoid overstocking. Vehicles were not produced if there was no order.

Toyota saw a production process as being one continuous production flow built of smaller steps. Every step was designated two roles: an internal supplier and an internal customer.



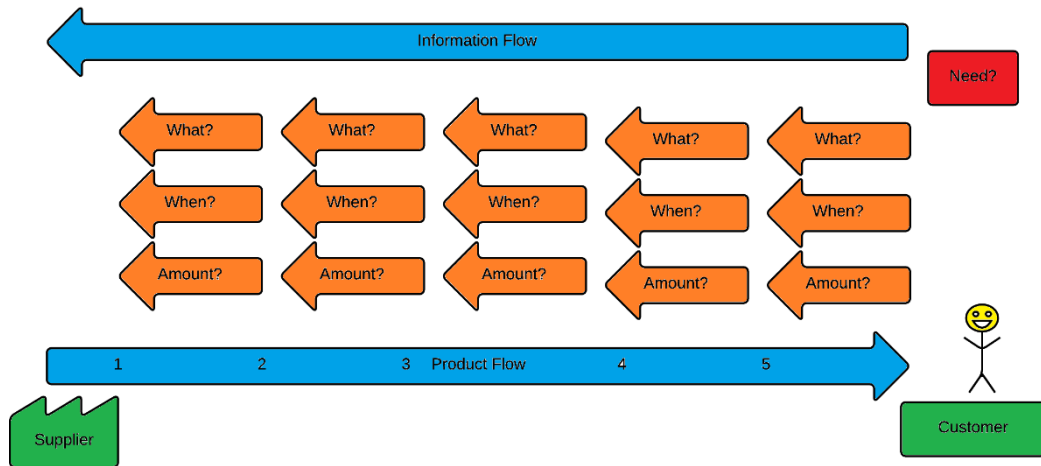


Figure 4. The Toyota Production Process. (Adapted from Modig, Åhlström 2012, 71)

Reading the figure has to start from the right side, where the customer is located. As the customer places an order, the information is then passed backwards through each step in the production process and the production of the vehicle may commence. Each step acts as the customer of the previous step upstream and similarly each step internally supplies the following step, to break down the customer's needs the corresponding steps. It is absolutely necessary that each part of production has to define and communicate exactly what they need to ensure constant value addition to the product as it flows downstream. Inventory does not have to be created, as the material is being pulled through the production process. (Modig, Åhlström 2012, 70)

The second solution for scarce resources was to do things right. Minimizing the work-in-progress and finished goods inventories, and thereby also minimizing the amount of cash tied up in them, by productively handling the goods. In essence, the goal was to free up cash from their products as quickly as possible by transforming materials into products rapidly. Toyota mapped out their whole production process to achieve a pull system. A customer order acted as the trigger for the whole process. Information would have to flow upstream very rapidly and products should flow quickly downstream. Anything that fought against the flow of the process was considered waste and had to be terminated. Based on their findings, Toyota identified seven forms of waste:

1. Waste of overproduction. Each stage in the manufacturing process should always produce only according to customer needs.
2. Waste of time on hand (waiting). All unnecessary waiting should be avoided at all costs, both for personnel and equipment

3. Waste in transportation. The factory layout should be optimized for minimizing all material and product transportation.
4. Waste of processing itself. Working a part or product past a customer's requirement is wasteful. This includes only utilizing tools that are not more precise, complex, or expensive than is necessary.
5. Waste of inventory. Inventory is capital tied up somewhere along the process. It makes problems harder to spot and should be avoided by all means.
6. Waste of movement. The working area should be organized in such a manner, where personnel do not have to move in order to do things like gathering material or fetching tools.
7. Waste of making defective products. Only fault-free parts should be manufactured at every stage of the process. (Modig, Åhlström 2012, 72)

## **2.4 Lean management philosophy**

The Toyota Production System became immensely popular in Japan as well as the rest of the world in a relatively short amount of time. Many Westerners have done their best to analyze the TPS and make use of it in their manufacturing and service company processes and it has been given the name lean. Most of what is considered lean thinking today has actually departed quite far from the original philosophy of TPS, although it has been built on the same foundations. Some define it as a set of tools while others see it as an abstract philosophy. Therefore, it can be concluded that lean and TPS are actually two different management philosophies, which have developed side by side. (Modig, Åhlström 2012)

If lean were to be a management philosophy derived more or less directly from the TPS, the ability to make use of it in other fields of business besides large scale automobile manufacturing would be terribly limited. This is why simply studying what Toyota has done and is doing and how these things are being done is too narrow of an approach to lean. Even if companies are able to adapt Toyota's tools to their field of operations, they will most likely miss the reason of why the tools exist and what they are originally intended to be used for. Just trying to become lean is an utterly senseless goal. Instead, the focus should be directed on where the company is trying to get by making use of lean, not on how it is achieved. (Modig, Åhlström 2012)

The fundamental idea of lean is all built around a form of efficiency called flow efficiency. It focuses on the amount of time a process takes from the point where a need is identified to

where it has been satisfied. Flow efficiency is the efficiency of throughput in an organization's processes. As processes are the building blocks of each company, the structure must be seen as a whole. It is important to note that the system boundaries of a process can be defined in any way. At the broadest, it can start when a need is identified and end when it has been satisfied, or in many narrower ways. The boundaries of processes play a key part in determining their flow efficiency. The units that move through the processes are called flow units. Flow units can be material, people, or information. Processes should always be defined from the flow unit's perspective. Imagine attaching a constantly filming camera to a flow unit within any company's processes and watching the film to determine the efficiency of those processes. The more action you see, the better it is. The number of processes depends on the company and how their system boundaries have been defined. (Modig, Åhlström 2012)

On the other hand, value in lean must always be defined from the end-customer's point of view. In addition, it is only purposeful when it is defined in terms of a particular product, service, or both, which accommodates the customer's needs at a particular price and at a particular time. Value is generated by the producer and from the customer's point of view and it is the only reason for the producer's existence. (Womack, Jones 2003, 16)

When a product or service is processed in a company through a set of mandatory actions to create it for the customer, it travels through the value stream. The critical management tasks involved in a value stream are problem-solving tasks, information management tasks, and transformation tasks. Analyzing the whole value stream for every product is an important step in creating a lean organization. It helps the company find steps in the value stream that create explicit value, steps that do not add value but are inevitable with current methods, and steps that create no value at all and can be immediately dismissed. (Womack, Jones 2003, 19-20)

Whether the flow unit is a microwave oven or a customer at a hair salon, value is only truly added when the microwave buyer or the salon customer perceives receiving that value. Having the microwave sit in a warehouse for two months somewhere in China does not add value. It merely increases the throughput time of said microwave. Consider watching the hair dresser's film at the salon and seeing it full of action, whereas the customer's film could mostly be filled with just waiting for the next available time. The film can easily be divided into segments that add value and to those that do not. Most of the segments that do not add value fall into the 7 categories of waste as defined in the TPS. The simplest way to calculate flow efficiency is  $\text{Flow efficiency} = \frac{\text{value-adding time}}{\text{overall time used to satisfy a need}}$ . The throughput time in itself is a good indicator of value creation, as

quicker processes are in most cases typically better. A shorter overall time also means that the process consists of mostly of value-adding time.

(Modig, Åhlström 2012)

The other important dimension of flow efficiency, when the flow units are people, in addition to value, is need. Direct needs are focused on reaching a specific and measurable outcome. Whether it be getting a new hair style or receiving new tires for your vehicle. In contrast, indirect needs are all about the experience. They support the direct needs to provide higher overall value. This could mean enjoying your time at the hair salon by reading a magazine or having a nice chat with the hair dresser to feel comfortable and relaxed. At the tire shop, it could be having your tire needs being serviced in a professional manner to help you as the customer to feel safe about driving your vehicle with a brand new set of tires. (Modig, Åhlström 2012, 25)

The problem with flow efficient thinking is that it seems counterintuitive at first. Most people are convinced that dividing an organization into departments and handling flow units in batches at high speeds is the most efficient way to work. While in fact, departmentalized thinking easily leads to sub-optimization. Value-creation focused process thinking is the lean alternative to traditional methods. (Womack, Jones 2003, 19-20)

## **2.5 Process flow**

There are certain laws that dictate how processes work. Regardless of how system boundaries are set and what the flow units are, the laws apply. Flow efficiency and resource efficiency can be considered two sides of the same coin. Resource efficiency can be simply determined as making the most of all resources that an organization has available. In practice this means that all resources, be it personnel or material, are used to their full capabilities. (Modig, Åhlström 2012)

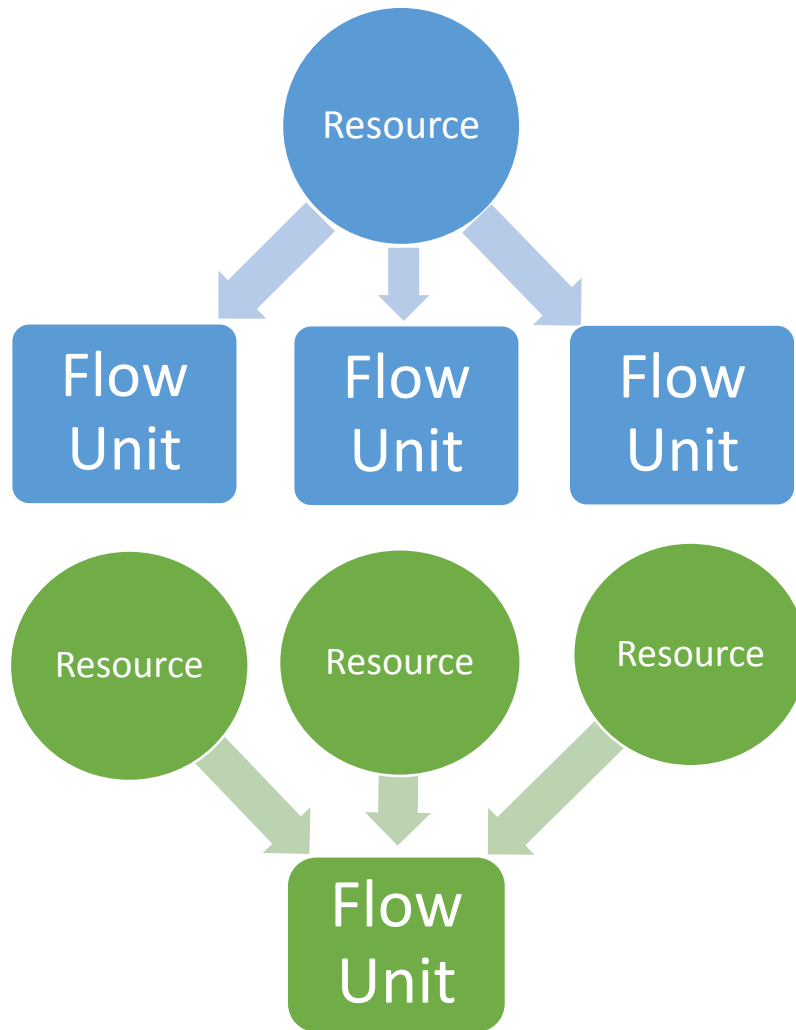


Figure 5. Resource Efficiency Versus Flow Efficiency. (Adapted from Modig, Åhlström 2012, 21)

The focus is maximizing the value adding time of a single resource to a flow unit. In contrast, as previously determined, flow efficiency focuses all resources on a single flow unit to maximize the throughput. It is extremely difficult to achieve both of the two worlds at the same time. The following laws attempt to provide an explanation of why that is.

### 2.5.1 Little's law

Throughput time = flow units in process \* cycle time. Regardless of where the system boundaries have been set or what the flow units are, Little's law applies. It is essentially very simple. The amount of units that have entered the process and have not yet exited multiplied by the average time each unit takes to process. A longer cycle time means a longer throughput time. The same goes for the number of flow units in process, the more there are, the longer it will take. To be resource efficient, there must always be work to do, in other words, flow units in process. However, the increased amount of units in process

increases the throughput time. Therefore, it is not possible to have the best of both worlds at the same time. (Modig, Åhlström 2012, 34)

### **2.5.2 The law of bottlenecks**

Bottlenecks are parts of a process that limit the flow of units. The throughput time of a process is mostly influenced by the part of the process that has the longest cycle time, and this is how bottlenecks appear according to the law. By limiting one stage of the process, bottlenecks definitely slow down the throughput time of every unit in the entire process. The simplest way to spot bottlenecks is by keeping an eye out for queues and an insufficient amount of work. Queues typically form right before a bottleneck because the flow is limited in contrast to the other steps of the process. Steps after the bottleneck have to work slower than they otherwise could, because the bottleneck holds back the amount of unit flow to that step. This phenomena also ties in with Little's law, as it is effected by the same factors. Bottlenecks usually appear because steps have to be completed in a certain order and variation in the time it takes to process different units. (Modig, Åhlström 2012, 37)

### **2.5.3 The law of the effect of variation on processes**

Flow efficiency is greatly impacted by variation in a process. Because no process is completely free of variation, it becomes terribly difficult to combine high resource efficiency with flow efficiency. Variation results roughly from the root causes of resources, flow units, and external factors. Equipment may fail, customers have different expectations, and the sudden surge of raw material prices distorts prices. Variation inevitably affects the time a process takes to complete and it is completely independent of the cause of variation. Flow units entering, exiting, and ones being processed are not identical and variation is therefore inevitable. This is especially true when flow units are people. (Modig, Åhlström 2012, 40)

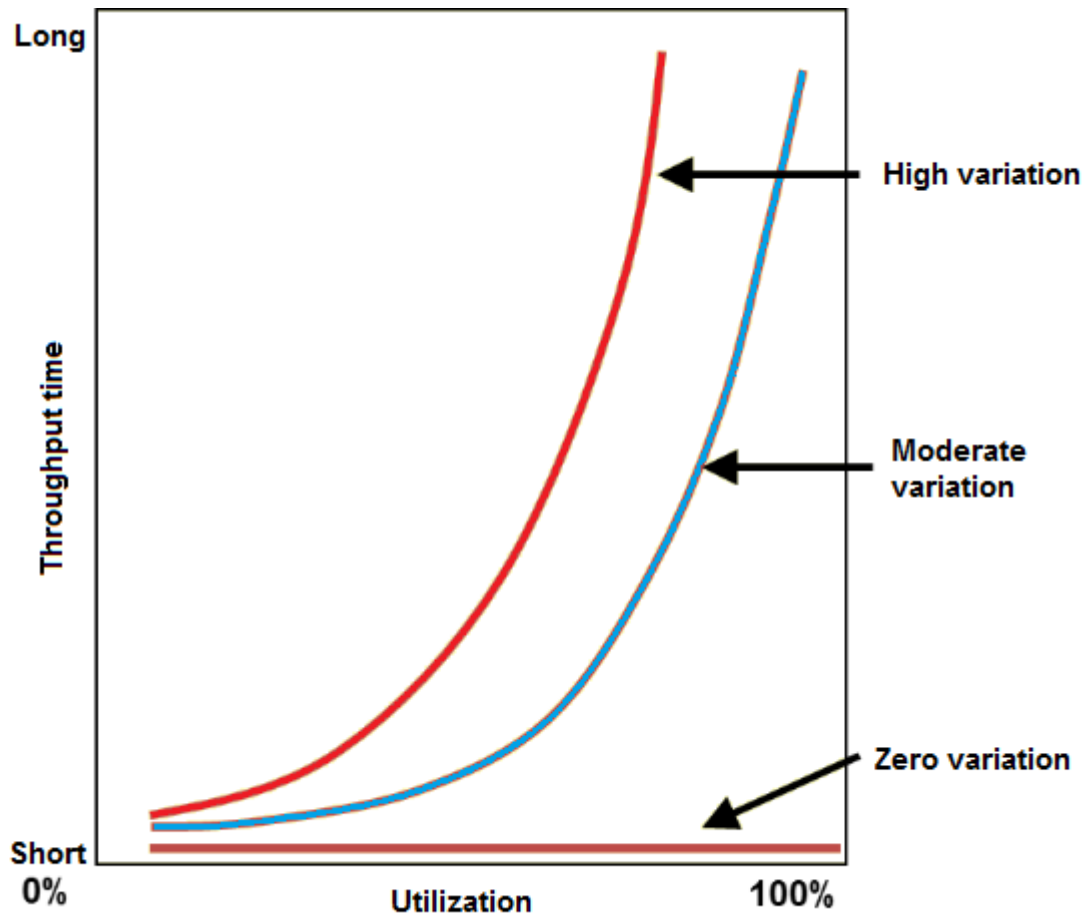


Figure 6. Kingman's Equation. (Adapted from Elias 2016)

As can be seen in figure 6, there is a clear relationship between throughput time and the utilization of resources. Lower variation makes it possible to make better use of available resources decreasing the throughput time of units in process. On the other hand, high variation presents an issue with utilizing resources to their full capabilities, thereby increasing the throughput time. The greater the variation, the longer the time. (Modig, Åhlström 2012, 43)

#### 2.5.4 Improving flow efficiency

Taking into account the underlying laws of processes, there are essentially four things that can be done to increase the flow of a process

1. Reducing the number of units in process by ironing out queues
2. Reducing cycle time by working faster
3. Increasing capacity by adding resources
4. Eliminating, reducing, and managing variation in the process

Accomplishing these changes in practice is easier said than done, especially in companies optimizing resource efficiency. Due to the nature of the laws of processes, some resources typically have to be sacrificed to gain improvements in flow. (Modig, Åhlström 2012, 45)

## **2.6 The efficiency paradox**

From an organization's point of view, focusing on resource efficiency may appear beneficial but it may represent problems from a customer perspective. The paradox is that focusing solely on resource efficiency may actually lead to more work that needs to be done in comparison to a focus on flow. (Modig, Åhlström 2012, 47)

### **2.6.1 Long throughput times**

If a company's capacity utilization is at 100% all of the available resources would be in use. This inevitably means that there is a buffer of flow units waiting for processing. The units in the buffer receive no additional value as the throughput time drags on in the process. This delay can cause many secondary needs for the flow units, whether they be people, material, or information. People will have to wait for something to happen, material will need to be handled and stored or information may not be getting to the right recipients on time. The newly created secondary needs may even generate new ones, leading to a chain reaction. In addition, increasing the amount of waiting time in a process to utilize all resources, means that the company has no room to react to sudden opportunities or threats. (Modig, Åhlström 2012, 48)

### **2.6.2 Many flow units**

As the throughput time increases and the amount of units in process increases, it gets progressively harder to deal with the amount of work stacking up. When dealing with material goods, the growth of inventory always brings along additional challenges. Whether it be raw materials, work-in-progress, or finished goods, inventory involves additional work and tied up capital. Storage space and related costs, movement, transportation, bad overview, and hidden problems all come along with increased inventory. (Modig, Åhlström 2012, 51)

### **2.6.3 Many restarts per flow unit**

When work cannot be completed in one sitting, the need for many restarts for a single job is necessary. This is problematic because when a task does not get finished, it gets



stacked up waiting for a better time. It may ultimately lead to losing sight of the big picture of what has to get done. Also, reorienting yourself to start working on a job that has already been started once is a bad use of resources. The human mind has certain limitations and trying to work against the grain of these limitations leads to new secondary needs, such as categorizing, prioritizing, structuring of tasks, and handing work over to someone else. Handovers may cause defects and avoiding responsibility for the results. These tasks would not be necessary, if work could be completed in a more flow efficient manner. (Modig, Åhlström 2012, 54)

#### 2.6.4 Superfluous work

The three previously mentioned problems in the efficiency paradox can all lead to what can be defined as superfluous work. A customer usually engages a company with a primary need that needs to be satisfied. If the primary need cannot be directly satisfied, secondary needs, or superfluous work, may emerge. It is essentially work that does not progress the customers towards having their primary need satisfied. The problem with identifying superfluous work is that it may appear as if value is being added to the customer, even though the actual role is merely satisfying secondary needs. (Modig, Åhlström 2012, 58)

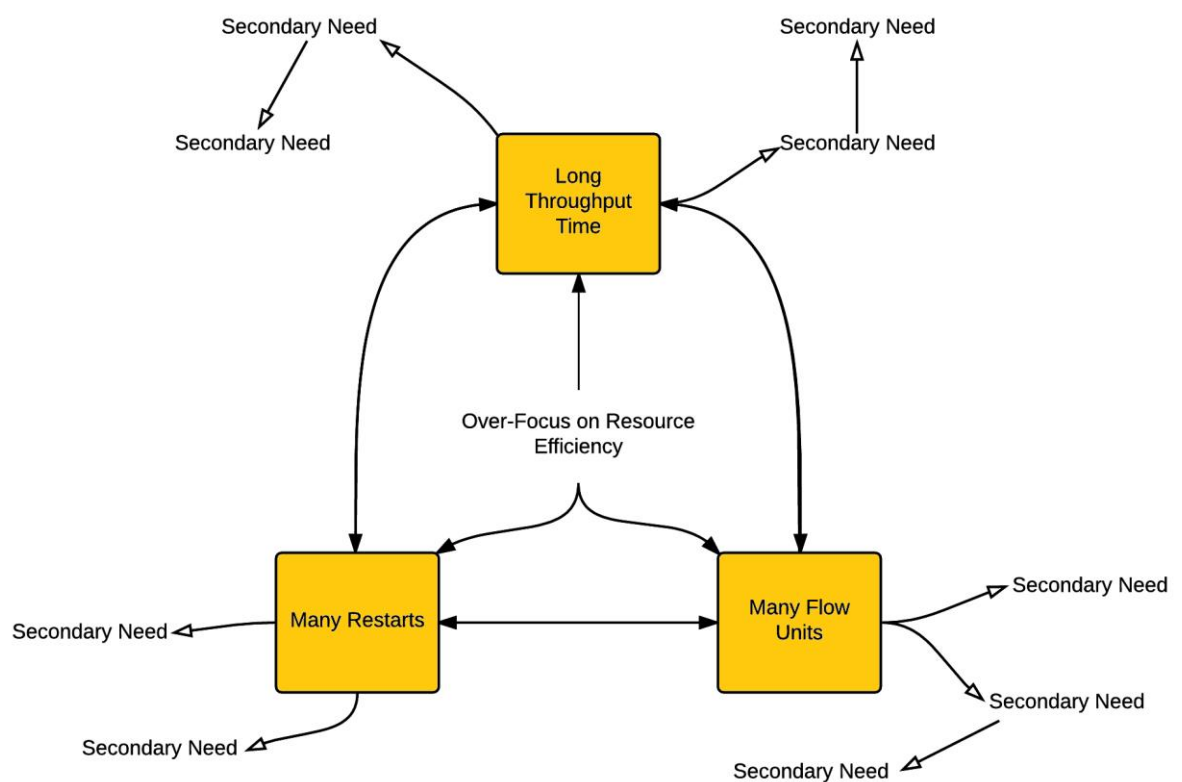


Figure 7. Secondary Needs Creating Superfluous Work. (Adapted from Modig, Åhlström 2012, 58)

As can be seen in the figure above, many types of secondary needs may stem from different sources. They consume a company's resources like any other work, but no value is created. Focusing too much on resource efficiency instead of flow may lead to an organizational structure that is only sub-optimized. In practice sub-optimization usually means that fulfilling a customer's primary need is split up into tiny multiple steps performed by different segments within the process. No segment has a complete overview of what is being done and as a result they focus their efforts on only what is done in their step. (Modig, Åhlström 2012, 59)

In the hair salon example, the customer may make an appointment a week prior to her suitable time via the company's online booking system. She however does not receive any confirmation of her booking even after a few days have passed. The receptionist has forgotten to get back to their customer because administrative work had been piling up. This leads to the customer calling the hair dresser to confirm her appointment. The hair dresser confirms the appointment with the receptionist and everything is settled. The receptionist and the hair dresser may easily think that they have added value to the customer, while in fact they have only completed a superfluous task that would not have had to be done at all, had the receptionist been able to confirm the appointment right away. A lean organization is able to quickly adapt to customer demand, which means that needs can be satisfied directly to order. This is referred to as a pull-system. Theoretically, this makes a sales forecast obsolete. Getting rid of the push method for selling products that often go unwanted and unloading discounted products onto market because no one wants them can actually help stabilize demand. It also reduces the paradoxical effects of resource efficiency, as the need to maximize resources is reduced. (Womack, Jones 2003, 24; Modig, Åhlström 2012)

## **2.7 Creating a lean operations strategy**

One way to try to ease the negative effects of the increased workload that focusing solely on resource efficiency brings, is to consider lean management and start focusing on the flow of processes. Ironically focusing less on resource efficiency and more on flow efficiency may actually free up resources. Creating a continuous flow that eases the emergence of secondary needs, superfluous work, and waste could serve as a solution to problems that many companies face. (Modig, Åhlström 2012, 64)

An effective framework that can be used to map a company's current situation and possible future development, in terms of resource efficiency and flow efficiency, is the efficiency matrix. It portrays four different alternatives for a company's operational status.

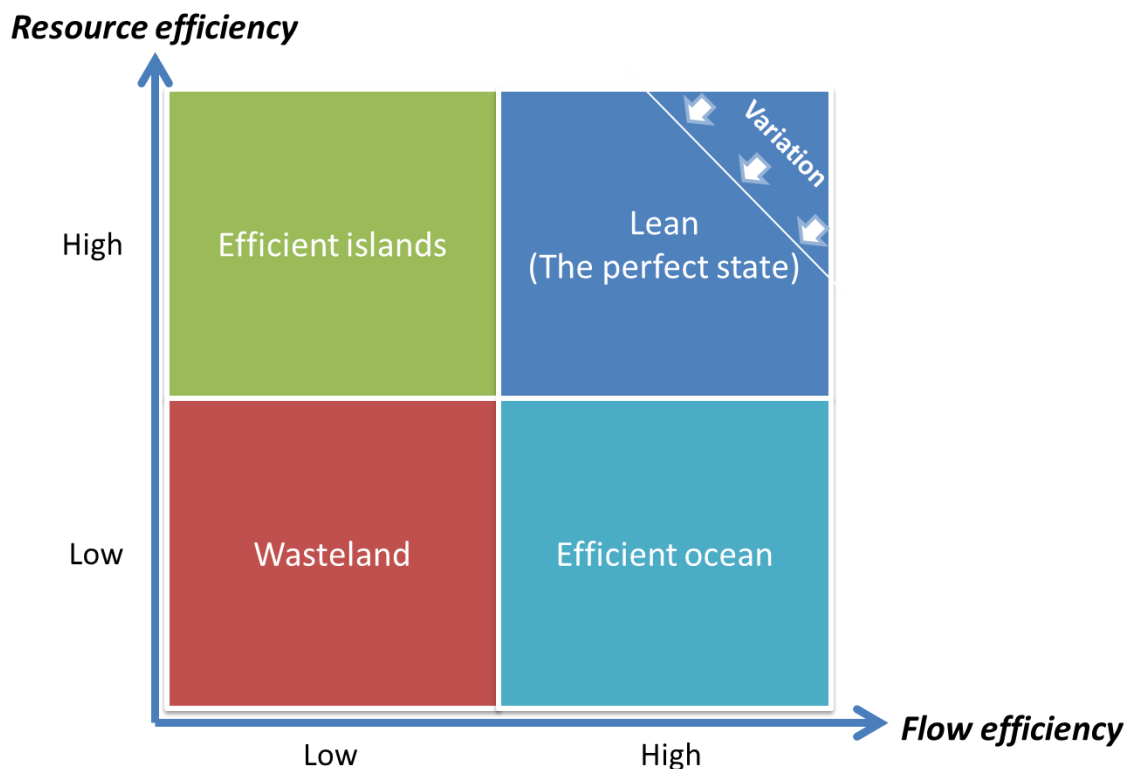


Figure 8. The Efficiency Matrix. (Modig, Åhlström 2012, 98)

The wasteland is the most undesirable state a company could be in. It is unable to establish an efficient use of resources or create flow efficiency. Resources go to waste and customer value creation is not maximized. (Modig, Åhlström 2012, 99)

The state of efficient islands means that resource efficiency in a company is high, at the cost of low flow efficiency. The company structure is sub-optimized, meaning that certain steps in the process operate in seclusion from the other stages and resource efficiency is optimized on a step by step basis. The goal is to minimize the cost of what is being produced, which leads to large inventories or long waiting times for customers. (Modig, Åhlström 2012, 99)

An efficient ocean company has sacrificed resource efficiency completely for flow efficiency. No resources are used when a need to satisfy does not exist. The focus is firmly placed on satisfying customer satisfaction as quickly as possible. Reaching this stage requires a good understanding of the big picture and constantly available free capacity. (Modig, Åhlström 2012, 99)

The most desirable state is the perfect state. Companies reaching this state are able to create efficient flow while utilizing resources optimally. The perfect state is impossible to achieve because of the laws of processes and the efficiency paradox. The key factor in determining whether the perfect state can be reached by a company is minimizing and managing variation. Variation in both demand and supply set the limits of achieving resource and flow efficiency. Achieving the perfect state theoretically requires both absolutely perfect information of current and prospective customer demand, as well as perfectly and immediately adaptable resources to fulfil all needs. The practical solution therefore lies in being able to meet these two demands as effectively as possible. (Modig, Åhlström 2012, 100)

The key pieces of information, when striving for the perfect state in terms of demand, are knowing what, when, and how much of it is demanded. Unfortunately, it is in the essence of customer demand to be variable. No matter the amount of resources spent trying to formulate a perfect prediction, it will not be possible. The further into the future the prediction tries to see, the more challenging it will be. The same requirements apply for the supply side of the equation as well. Perfect knowledge of what, when, and how much is supplied is theoretically mandatory, in addition to the resources being completely adaptable and reliable. Again, this is impossible to achieve in practice. Variation cannot be completely ruled out in real life, but reaching the perfect state in terms of demand and supply data is a goal worth striving for. (Modig, Åhlström 2012, 101)

The different positions an organization is able to reach in the efficiency matrix are dictated by the amount of variation in demand and supply. Variation simply sets the limits for reaching the top right perfect state in the matrix in the shape of an efficiency frontier. Operational states beyond the frontier are impossible to reach. Any state within the limits of variation is possible to achieve and if the position is anywhere besides right on the barrier, it presents a possibility for improvement. The higher the variation, the smaller the area of movement is within the matrix, so the ease of combining resource and flow efficiency follow the amount of variation. The strategy of an organization defines which state is the most desirable. (Modig, Åhlström 2012, 104)

In the end, lean is only a way of considering how something can be done. The essential question, which is engraved in the foundation of lean, is why things are being done. This rings true for corporate, business, and operational levels of strategy. A company's corporate strategy and its business strategy set the stage for a lean operations strategy. Simply put, the value a business provides is defined by the business strategy. The core question

is whether the company wants to compete through differentiation or cost. Differentiation can be anything that the customer perceives as value, when a product or service is consumed. It usually comes with sacrificing cost competitiveness, crudely put, it is an either-or-choice. It must be kept in mind, that the cost of satisfying needs is sacrificing time, money, or energy from both the organization's point of view, as well as the customer's. A company focused on a cost competitive business strategy is less likely to be able to fulfil a customer's needs as efficiently. (Modig, Åhlström 2012, 107)

## 2.8 Developing a lean operations strategy

The lean operations strategy that is used by Toyota in the TPS can help demonstrate the principles on which a lean operations strategy can be founded in any company. The figure below demonstrates Toyota's approach.

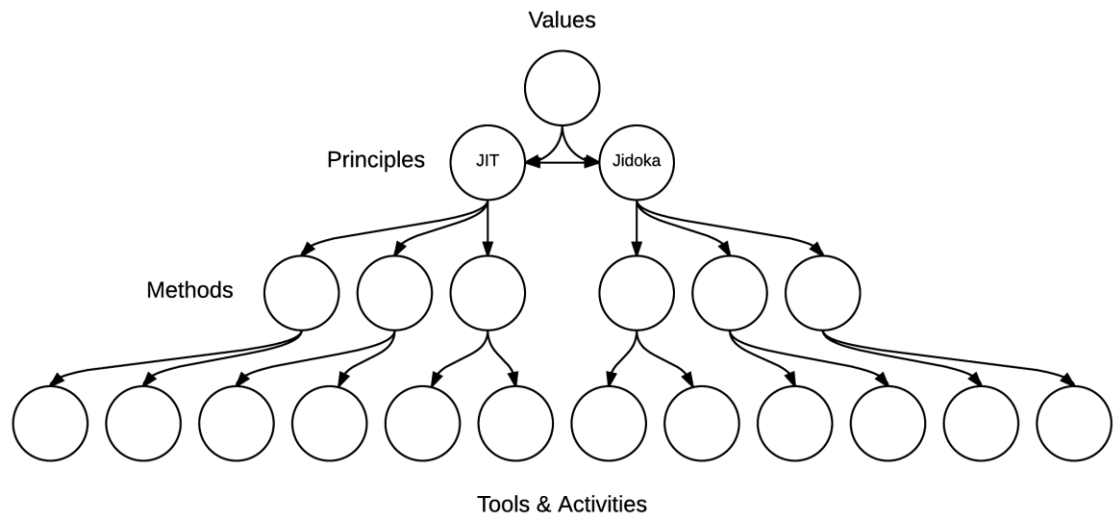


Figure 9. Toyota's Method to a Lean Operations Strategy. (Adapted from Modig, Åhlström 2012, 138)

The most important thing to a company's operations strategy are the values, they go above all else. In Toyota's case, satisfying their customers' needs is defined as the most important value. Values form the core of corporate culture and can always serve as a guiding beacon in decision making. (Modig, Åhlström 2012, 130)

After values, come the principles. They guide employees in terms of how and what should be prioritized in business to achieve core values. In contrast, they also point out what should not be done if values are to be preserved. In Toyota's case the first principle is just-in-time, which is all about creating flow. Their second principle is Jidoka. In this case,

it refers to seeing the big picture of the operations in play. It is about everyone in the organization having unobstructed visibility over what is happening, so that disruptions in the flow can be quickly identified. The connection between JIT and Jidoka refers to creating flow and overseeing it is maintained to ensure customer satisfaction. (Modig, Åhlström 2012, 131-132)

The principles could be thought of as a sports game, where all of the players are constantly aware of the rules of the game, they see the field, the ball, the goal, the other players, the score, how much time is left, their team members and the referee. Their only goal is to score against the opposing team as a team. The players of the same team do not create departments and smaller teams that play their own games with their own balls, instead, they all have one ball, one team, and one common purpose. (Modig, Åhlström 2012, 133-134)

The methods Toyota uses are all concentrated on realizing JIT and Jidoka. Their idea is to identify, standardize, and create best practices for all methods of working. Standardization and use of best practices is crucial for creating and maintaining optimal flow, as it limits variation. The combination of Jidoka's visibility and standardized operating procedures, an organization can be controlled by spotting and reacting to deviations from the standards. (Modig, Åhlström 2012, 135-137)

Tools and activities, on the other hand, are the way to realize methods. Methods consist only of activities and tools. They are necessary make methods come to life and that is their only purpose. (Modig, Åhlström 2012, 138-139)

## **2.9 Toyota's philosophy of continuous learning**

Toyota's learning philosophy, which acts as the core of their continuous improvement in every process, is built around the Plan-Do-Check-Adjust (PDCA) problem solving concept. The traditional western view of PDCA prefers to refer to the fourth step as acting instead of adjusting. It is also more focused on predicting and controlling processes to solve problems and standardizing proven processes as well as implementing best practices. Toyota's approach is based on learning by trying to improve on processes and developing the people. It accepts that the world is a dynamic and uncertain place. This is why finding the root causes of problems to develop a deeper understanding and sharing that learning with other employees is the long-term key to continuous improvement. As problem solving is at the core of lean, it is an essential part of the way Toyota functions as a whole. (Liker, Franz 2011, 25-29)

PDCA encourages people to find a standardized way of identifying, defining, and solving problems as they present themselves. The planning stage is critical, as it defines the gap between the current situation and the target to define the root cause of the problem. The development of countermeasures can be found best by trying and doing to test the formulated hypothesis. The phase of checking is seeing what actually happened by putting the hypothesis to use. Adjusting is comparing the target outcome and the actual outcome to each other and adjusting the approach for the next PDCA cycle. The positive findings are shared with other personnel and another cycle starts again. The figure below depicts Toyota's approach on PDCA problem solving. (Liker, Franz 2011, 28-29)

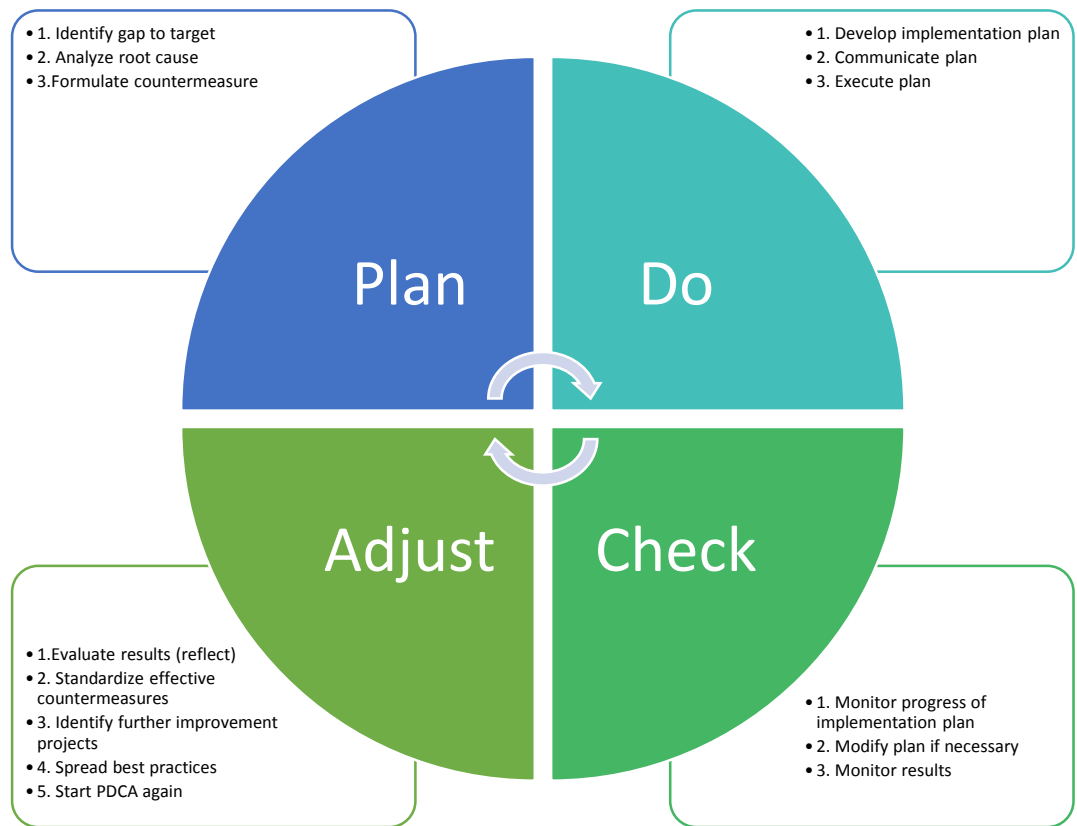


Figure 10. Toyota's Implementation of PDCA Problem Solving. (Liker, Franz 2011, 27)

## 2.10 Competitive strategy

There are three generally accepted competitive strategies that companies can pursue within an industry to outperform competition: overall cost leadership, differentiation, and focus. The choice will depend on the industry and organizational goals. For a competitive strategy to be successful, a full commitment and support from organizational arrangements are vital. (Porter 1980, 35)

The overall cost leadership is based on aggressive efficient-scale facilities, minimization of all costs in the areas of R&D, service, sales force, and advertising. Strict managerial cost control is a necessity. A low-cost approach yields returns because the lower cost levels on the market diminish the returns from competitors through rivalry. In cost competition, less efficient rivals will inevitably fail, as competitive pressures will eliminate their profits. Achieving the most competitive low cost position typically requires a relatively high market share or other advantage, like favorable access to material supply, for example. The cost leadership approach is extremely resource-intensive and requires large investments. (Porter 1980, 36)

Differentiation is designing a product or service so that it can be perceived as being unique industrywide. Differentiation can be done in many forms including, but not limited to, design or brand image, technology, features, customer service, and dealer networks. The ideal approach is to differentiate through several dimensions and gain protection from competitive forces due to brand loyalty, which results in lower sensitivity to prices. Achieving differentiation often requires building a sense of exclusivity, which is generally incompatible with high market share. Choosing a differentiation strategy means a trade-off with cost minimization and some customers may not be willing to pay a premium price. (Porter 1980, 37-38)

Focusing on a specific customer group, product segment, or geographic market is the third possible competitive strategy. It is based on the principle of serving a particular target especially well. Firms specializing in a narrow field are typically able to serve their customers more effectively and efficiently than competitors who have a broader approach. The result can be either differentiation from better serving the needs of a specific target, being able to offer lower costs to this target, or even both. Both of these positions provide protection from the competitive forces of the market. Based on a market analysis, focus may also prove useful in finding targets where competitors are the weakest or targets that are not as easily substituted. (Porter 1980, 38-39)

## **2.11 Summary**

In conclusion, supply chains consist of multiple tiers of upstream and downstream activities for the purpose of delivering products and services to customers. The ultimate goal is to establish flow and to deliver flawless products and services without creating any waste. Common disruptions that typically decrease supply chain performance are the bullwhip effect, snowball effect, and other supply chain disruptions.



Supply chain management attempts to integrate all of the supply chain activities to create a seamless network to serve the purposes of the organization and seek maximum benefits. SCM tasks consist of strategic, tactical, and operational categories that must be aligned with the corporate, business, and operational strategies of the company. SCM is central to a company's competitiveness, as it is deeply integrated into most internal and external activities.

Lean management focuses on maximizing customer value while minimizing all waste in the process. A lean organization functions according to a lean operations strategy where the customers' needs form the purpose for the organization's existence. Principles, and methods of working as well as tools and activities are all aligned to serve the customers. Lean operations emphasize the importance of flawless process flow to minimize the throughput time of units in the organization's processes. The amount of flow units in process, process cycle time, bottlenecks, variation, restarts, and superfluous work all contribute to the flow efficiency of processes. Lean also highlights the importance of continuous improvement.

A company's competitive strategy determines the approach to outperform competition on the market. Companies can generally choose to pursue cost leadership, differentiation from competitors, or a focus on a certain target. Cost leadership is based on being able to fulfil customer needs cheaper than competition. Differentiation aims to offer a product or service that is considered unique. The exclusivity of a product or service may reduce the price sensitivity of customers. Focusing on a specific customer group, product segment or market may provide the advantages of either cost leadership or differentiation due to serving a narrower field of needs more efficiently.

Companies with a lean approach to managing their organization and its supply chain should have a focus or differentiation strategy, as lean management is not ideal for pursuing a cost leadership position. Placing customer needs as the focus and delivering high value and perfect need fulfilment as quickly as possible is usually a trade-off with low costs but may prove to provide better results under the bottom line.

### **3 Research methods**

This chapter describes the research approach, research design, and data collection methods. The research question and the investigative questions can be found in chapter 1.3. The validity, reliability, and risk management are evaluated in whole at the end of this paper in chapter 6.3.

#### **3.1 Research approach**

Qualitative research is typically based on data collection that is non-quantifiable. The concepts are expressed in motives and generalizations. Each research is approached individually and individual measures are developed to interpret the primary data, based on the unique characteristics of the research. Data can be in the form of words, images, transcripts etc. Findings are typically presented by using words to describe the phenomenon. (Research Methodology)

This research has been conducted with a qualitative research approach, as it is the way gain a novel understanding of how the commissioning company's supply chain currently works without any preconceived ideas of how it should work affecting the results (Strauss, Corbin 1998, 11). The use of quantitative research would not have worked in favor of the research problem.

The challenge with qualitative research is that the results could be affected by many factors, as all analysis of the data is up to interpretation. On the other hand, it allows the researcher to adapt to the research process as new findings are made. To manage the potential for subjectivity, the steps taken in the research process have been accounted for in this chapter and the sources for the data have been listed. (Holliday 2002, 5-8)

#### **3.2 Research design**

This research has been designed around the theoretical framework, which the research question and the investigative questions are based on. Prior to starting the research process, the author gathered approximately two years of working experience in the commissioning company's supply chain. This experience in combination with supply chain management studies, formed a realistic starting point for this research.

The theoretical framework has been constructed by making efficient use of select literary sources directly related to the research question at hand. It has been designed to create a

natural progression between the two main topics: supply chain management and lean. The topics are first introduced at a general level and then finer details are presented.

Using the theoretical background as the foundation for the empirical research guarantees that the collected data is relevant to developing suggestions for improving Örum's supply chain operations, to improve their competitiveness and reach their strategic goals.

Secondary data has been used from multiple literary sources to form the theoretical framework and support the end results of this research. Relevant books, internet sources, and other publications have been used as sources.

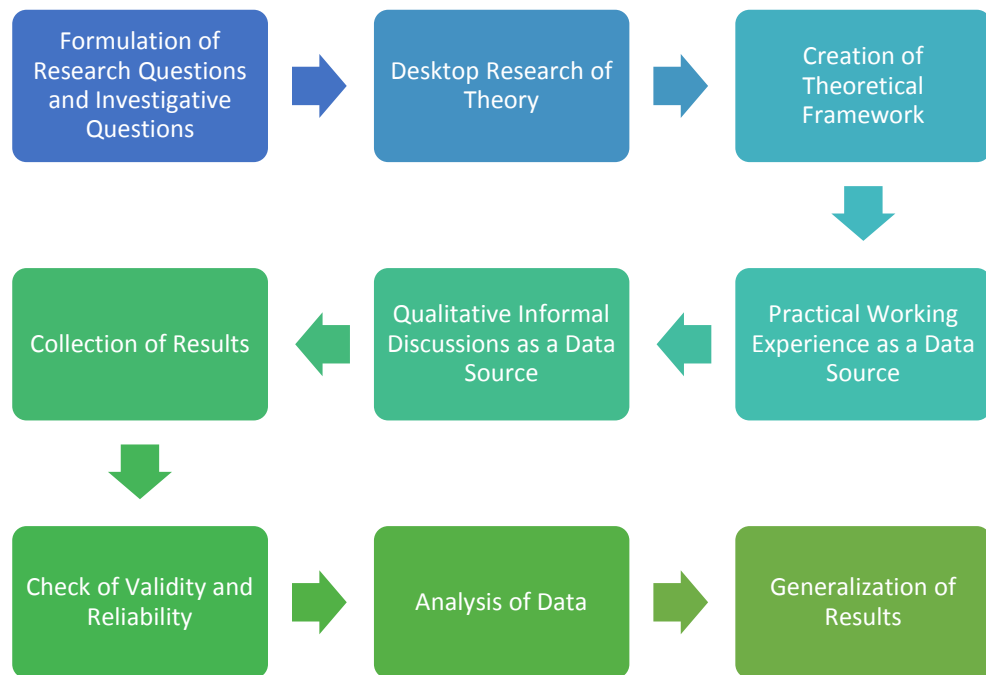


Figure 11. Visualization of the Research Process

### 3.3 Primary data collection

The primary data has been mainly collected through personal professional experience over multiple years by means of observation. Face-to-face communication has also been utilized to complete partial data through qualitative discussions. The main data collection period began in June 2015 and ended in April 2016. Working experience has amounted from a total of two years and seven months of working for Örum. The first year and nine months were as a part-time material handler in the warehouse, five months as a purchasing trainee, and the remaining 5 months as a full-time purchaser. Countless informal qualitative discussions, orientation, and practical working experience in diverse tasks have given the author plenty of data to utilize in this research. The discussion data was recorded by the author in hand written form.

Employees from various departments have contributed to the data utilized in this research. Material handlers and supervisors from logistics, sales personnel from the retailer sales as well as the wholesale departments, purchasers and the purchasing manager, product managers, product data management staff and IT personnel have contributed to the data presented in this thesis. All of the employees that participated in the informal qualitative discussions all have more than five years of working experience with the company. The most experienced employees have been with Örum for more than twenty years and have been through various positions within the company. The discussions varied according the department at hand. The key questions answered in the discussions can be found in appendix 1.

## **4 Örum's supply chain**

This chapter will briefly present the status of the automotive aftermarket wholesale market in Finland. It then goes on to describe the current supply chain structure at Örum. The purpose is to first provide a broader overview of the entire supply chain, followed by a more detailed analysis of key stages of interest. The material and information flows in the supply chain are depicted in appendix 2. In addition, appendix 3 presents the material throughput in a cross-functional flowchart.

### **4.1 The market**

The aftermarket automotive maintenance business in Finland is currently extremely competitive. The field is dominated by less than ten companies, less than half of which account for the majority of sales. The challenge is that most wholesalers have very similar offerings that can easily be substituted across the selection. The field is limited to mostly the same suppliers as well. This leads to the price competition being absolutely fierce. Differentiation through products is not very effective, so specialized customer support services and cost leadership are the generally accepted competitive strategies on the market. The second major factor is the availability of products in stock. Customers usually focus their daily purchases to the companies that are able to sell what is needed without any extra delays in shipping. If one necessary product within an order is not available from one wholesaler, it is highly likely that another one will carry everything that's needed. Some customers, however, prefer to purchase from multiple wholesalers to get best prices on individual articles.

### **4.2 Material and information flow**

The material and information flows at Örum are depicted in a simplified manner in appendix 2. The figure depicts the different flow possibilities from first tier suppliers through the supply chain to first tier customers. Reverse logistics is not separately depicted, but it flows back upstream along the exact same channels as forward logistics. The trucks and airplane represent the range of possible lead times between the internal customers of the supply chain. Appendix 3 depicts the material throughput between departments in cross-functional flowchart form.

Material goods mainly flow upstream from the suppliers to the main warehouse. Some purchases are made in collaboration with the Estonian daughter company to achieve the

benefits of economies of scale. The deliveries are then split up in either of the main warehouses and forwarded to the other. Downstream flow begins at the main warehouse and flows either directly to the customer through the retail sales department located at the main warehouse or the wholesale department that sells directly to car service shops. Material can also flow from the main warehouse to one of the regional wholesale warehouses around the country that sell to local car service shops. Direct express shipments to the customer are available from some suppliers, as well as express shipments from the suppliers to the main warehouse that are then forwarded to the customer.

Information flow is primarily divided into three separate stages. The administration at the main warehouse are in direct contact with the suppliers and handle all matters between them and Örum. The regional wholesale warehouses are in contact with the central warehouse concerning all matters within the supply chain. Retailer and wholesale departments at the main warehouse fall into this category as well. Retail sales and wholesale points primarily maintain the customer interface in whole. Sometimes customers are in direct contact with product managers concerning specific technical matters.

### **4.3 IT-systems**

Örum's PUPESoft ERP-system is tailored for Örum's operations. The system contains functions for customer relationship management, sales, procurement, product management, inventory management, various reporting tools, and transfers between warehouses.

Other pieces of software are linked to PUPESoft to further expand the capabilities of the system. From the supply chain's viewpoint, the most important pieces are Relex Solutions and TecCom. Relex solutions is an all-in-one inventory management software that helps optimize the amount of goods ordered and stocked. TecCom, on the other hand, is used exclusively for sending information between Örum and most vendors. Most orders and related documents pass through TecCom's service TecLocal via electronic data interchange. TecCom also acts as a way of accessing suppliers' technical data by the product managers. In addition, Mercantile has a piece of software called Örumnet, which is an online sales channel designed to provide sales personnel and customers clear visibility of all products. Many customers have their own accounts for Örumnet for browsing the selection based on vehicle license plate numbers.

Sales personnel and product managers also have access to multiple pieces of OEM and aftermarket software containing technical and compatibility information of vehicles and parts. This software is used to support sales and serve customers to find the correct products for every vehicle service. Some car manufacturers have decided to deny access to

their information systems from any party outside of the official distribution and service channels. This has created a noticeable lack of information regarding certain makes of vehicles.

Pupesoft is unfortunately very prone to malfunctions. The system often slows down to a standstill, does unwanted things on its own, and is generally too complicated to use for simple tasks. Staff have received insufficient training for use of the system and learning how to operate it has been mostly left to one's own wits. There are also far too many ways of completing the same tasks, which often leads to unwanted end results. The unreliability often causes problems for everyone in the company, as all of the functions are connected to the same system. Sometimes sales personnel are unable to even make sales due to system malfunction, leading to direct monetary losses. The system is a critical hindrance to the performance of the entire company and leaves much room for improvement.

#### **4.4 Suppliers**

Because Örum's selection covers everything automotive from lubricants to wheel bearings, the array of suppliers is also vast. Örum's suppliers are both original equipment manufacturers and non-OE manufacturers from Europe and Asia. Supplier relationships are mainly handled by the product management and purchasing departments.

The differences between how the suppliers operate from Örum's perspective are apparent in everyday business. Factors affecting the means of supplier relations include, but are not limited to, the country of origin, the level of technological development of IT systems, Örum's importance as a customer, and general means of conducting business. Even national stereotypes are somewhat present in how the vendors conduct business, so cultural sensitivity and understanding play an important part in creating and maintaining a successful business relationship.

The vast differences between vendors present a major challenge for Örum. The inconsistency makes it extremely difficult to create a standardized operating procedure for dealing with them. Some suppliers have the necessary availability and technical data directly available electronically, whilst others can only be contacted via email and each case is handled individually by local service staff. The lead times span from days from domestic suppliers to months from bulk Asian suppliers. Most of the suppliers are also large multinational corporations that are not dependent on Örum's business and it reflects on their service level. Developing meaningful supplier relationships of mutual interest is difficult, if not impossible, in many cases. This is inevitably relayed to the customers as well. If customers want specific data on availability or compatibility, for example, it is sometimes very

challenging to provide. The table below presents some specific examples of lead times from different European countries.

Table 3. Suppliers, Lead Times, and Countries of Origin.

Supplier	Lead Time (approx.)	Country of Origin
Bosch Automotive Aftermarket	21 days	Germany
ZF Friedrichshafen AG	21 days	Germany
Brembo S.p.A.	40 days	Italy
Fennosteel Oy	6 days	Finland
Telko Oy	3 days	Finland
Total S.A.	40 days	Belgium

Product information management varies between the vendors as well. Some prefer to constantly update everything from product numbers to packaging, resulting in menu costs, while others are more consistent. The level of providing Örum with the updated information also varies, so product managers need to stay on their toes and keep databases up to date as best they can.

The quality levels of Örum’s suppliers are generally sufficient. The amount of warranty cases overall is acceptable, but it should be noted, that some vendors are much more likely to have quality issues than others. A rough generalization can be made between OEM and non-OEM suppliers in this regard, where the standard level of quality is better from the OEM suppliers.

#### 4.5 Product selection and pricing

Acquiring an item into the product selection and inventory begins either through the decision of adding of a new product into the selection by the product manager, a customer requesting a specific product not in inventory, or by simply needing to restock an existing active product. Product categories are divided between the product managers, who specialize in their fields of expertise. Product managers ultimately make the decisions regarding which products are selected into Örum’s selection. The decisions are made based on



information on current and upcoming car models in use, information from vendors, and customer requests. Comprehensive analysis of the market prices and selection, as well as the current car population in Finland, are regularly conducted by the product managers to improve the selection and pricing. Product information is then entered into the ERP-system, where it is accessible throughout the company. Product managers are also primarily responsible for creating and maintaining supplier relations. This data is used by the purchasing department when creating orders.

Purchase price negotiations and sales price decisions are also handled by the product managers. Factors that affect product pricing are purchase price of the product, the predetermined cost factor of the supplier, and the desired margin. The cost factor is calculated by dividing the annual realized importation costs (shipping, customs, and other fees) by the total value of annual purchases. The generally accepted procedure for pricing is taking the average purchase price calculated by the system, adding the predetermined cost factor and the desired margin. The result is then compared to market prices to determine the feasibility.

#### **4.6 Purchasing**

All orders are handled by the procurement department. Each member of the procurement department has specific suppliers assigned to them to maximize the efficiency of the ordering process. Most vendors have specific days of the week at predetermined intervals when orders are to be made. The specifics depend on the contract made with each vendor. Once selection decisions have been made, purchasers are responsible for keeping optimal quantities of products on the shelves at all times. Due to the individual nature of each vendor, purchasers typically develop a deeper understanding of what the best method of dealing with each vendor is. Some require significantly higher safety stocks than others to ensure availability, for example. The order proposals created by the system are based on demand forecasts, which are calculated using past purchasing and sales data and predetermined calculation parameters.

In practice, purchasers first make use of the procurement software at their disposal and then send the orders to the vendors via order processing software or email. The vendors then typically send order confirmations to verify the order has been received and processing started. Around the time the order is ready to ship, depending on their system, many vendors are able to send an advance shipping notice of pending deliveries. The notice is received by the purchaser and relayed to the warehouse staff by the ERP system. Express and direct express orders are also handled by the purchasing department.

## **4.7 Sales**

Örum's goods can be sold or forwarded through many different channels. Sales consist entirely of business-to-business sales. Retailer sales are handled directly by Örum's retailer sales department and they account for approximately 20% of total sales.

The primary sales channel is, however, through Örum wholesale. Sales are made by one of the seventeen wholesale locations around the country in the distribution chain that sell parts to maintenance shops in the Autoasi concept chain, as well as other repair shops and spare parts dealers.

Customers can place orders by using Örumnet or by calling or emailing the sales staff. Orders placed via telephone or email are manually entered into the ERP-system by the sales personnel. The online orders are much more cost efficient but lack the level of technical support needed for more complex purchases.

## **4.8 Inventory**

Inventory management presents a major challenge for Örum. The number of stock-keeping units (SKUs) is approximately 80 000. This is mainly due to the fact that one car is built up from about 30 000 parts. The parts used for different models and makes are also different, so the number of possible combinations is astounding. Naturally, it is not feasible to stock all the possible parts for every model, but even having the most commonly needed products to cover the majority of the Finnish vehicle population is a challenge and inevitably results in a large number of SKUs. In addition, Örum's previous strategy of a wide selection and availability, has resulted in a bloated inventory with lots of obsolescent products. The current value of inventory is approximately 18 million euros, which is far too much at approximately 31,5% of total revenue. Based on this figure, the inventory turns over approximately three times in a year. The state of the inventory product quantity data has improved over the last few years but the accuracy still needs improvement.

The inventories of the regional warehouses are controlled by both the staff operating the warehouse, who are free to stock goods the way they see fit, to a certain extent. The staff are allowed to choose which products they stock based on local demand but they are not allowed to decide the stocked quantities themselves. This is due to a general lack of resources for optimal inventory control. The stock levels of routinely sold items that have high inventory turnover rates are controlled by the procurement team at Örum with the help of Relex. By taking advantage of Relex's inventory management, the stock levels are

kept optimal. It also minimizes the effort needed on part of the regional warehouse staff to maintain goods in stock.

#### **4.9 Inbound goods**

Shipments from vendors arrive to the central warehouse where goods are received and booked into the ERP-system, and shelved. The warehouse makes use of the advance shipping notice when preparing to receive an inbound shipment. The staff are assigned flexibly to meet the requirements of inbound shipments on a daily level. The lead times vary greatly between vendors, depending on factors such as geographic distances, modes of transport, and the ability to supply orders. Some examples can be found in table 3.

Once the shipment reaches the warehouse, the pallets are first unpacked into dedicated shelving pallets that are divided according to warehouse zones. This is done to optimize the effort needed to shelf the products, thereby minimizing waste movement. Depending on the need, products are shelved either onto lower picking shelves or higher storage shelves. The target time for shelving inbound goods is 48 hours from the time of reception.

Some products are shipped to the Estonian daughter company Mercantile's warehouse because, depending on the contracts, some suppliers are able to offer significantly better purchase prices and shipping options to Estonia, as it is still in continental Europe. There the staff splits the incoming shipments into Finnish and Estonian batches and the products are then transported using internal shipment to import the goods into Finland. The Estonian staff may also perform other value-adding tasks such as sorting, checking contents and applying product number stickers to the packaging. In some cases the setting is reversed, so that the Finnish central warehouse splits a shipment and forwards it to Estonia. The development of the cooperation between the two companies is ongoing.

#### **4.10 Central warehouse**

The central warehouse holds most of the inventory within Örum's supply chain. It is divided into eleven zones that are used to optimize the shelving and picking of goods. The zones are filled with shelves in accordance to the height available in each zone. Shelves are further divided into picking and storage levels. The picking shelves are replenished using the remaining stock on the storage shelves as necessary.

Table 4. Örum's Main Warehouse Fact Sheet

<b>Main Warehouse Fact Sheet</b>	
<b>Surface Area</b>	12 500 m <sup>2</sup>
<b>Shelf Spots</b>	35 000
<b>Shelf Meters</b>	35 000 m
<b>Number of Stock-Keeping Units</b>	80 000
<b>Number of Inbound Rows per Year</b>	160 000
<b>Number of Outbound Rows per Year</b>	1 200 000

The table above presents figures that describe the scale of the material operations at the main warehouse. Due to the great number of shelf spots available, the warehouse is able to hold a wide array of different products or large quantities of single products. The figures presented for the number of inbound and outbound rows per year are calculated in a manner where one single product coming through inbound handling once, regardless of quantity, counts as one row.

#### **4.11 Outbound goods**

Goods are delivered from the central warehouse via freight forwarding companies or Örum's own delivery service that ships deliveries directly to nearby car repair shops three times a day. Some customers prefer to pick up their goods directly from the warehouse.

The picking and packing of outbound goods from the central warehouse is done by material handlers who are guided by a voice operated system. The headset lets the pickers know where to go, which product to choose and in which quantity. A picker typically gathers products for one to five shipments simultaneously. The process is optimized according to warehouse zones to minimize the required effort. When all of the goods are picked, dedicated packers close the boxes, apply the address stickers, and place the boxes on the correct pallets for further transfer into truck trailers. Orders placed into pickup boxes or delivery containers do not require further action by the pickers. Depending on the mode of transport, outbound goods are sent in cardboard boxes, half size pallets, full size pallets, trolleys, or are placed into pickup boxes or delivery containers.

Örum wholesale has multiple delivery routes that are driven three times a day, visiting repair shops along the way to drop off orders for upcoming maintenance and repair work. The repair shops typically carry very limited inventory and always order according to estimated needs, so the reliability of the delivery routes is crucial.

#### **4.12 Internal transfers**

All of the sixteen regional Örum wholesale points carrying regional warehouses are replenished regularly from the central warehouse. The concentrated replenishment runs are made using the purchasing software twice a week for every regional warehouse. The shipments consist of products that have been sold at least three times within the last eighteen months. The aim is to stock only actively sold products locally. Uncommonly sold items can be overnighted from the central warehouse or directly from some of the vendors according to order. All shipments to regional warehouses are delivered by third party logistics providers.

The concentrated replenishments were widely put into use in June of 2015. Since then, the availability of top selling products has improved significantly and the regional warehouse staff have more time to concentrate on making and improving sales instead of maintaining inventory.

#### **4.13 Reverse logistics**

Reverse logistics refers to logistics activities and management skills used to reduce, manage, and dispose of waste from packaging and product (Bloomberg, LeMay & Joe 2002, 200). In Örum's case, reverse logistics come into play when the delivered product does not satisfy the customer's needs. This could be due to a product being wrong, incompatible, faulty, or damaged.

In all cases, products are returned to the place of sale and reimbursed or replaced. Many cases requiring reverse logistics are due to faulty compatibility information provided by the system to the customer. It results in customer dissatisfaction and unnecessary extra costs. As a workaround, customers sometimes purchase all of the potentially compatible products, use the right ones, and return the rest. This procedure is extremely costly and diminishes profits on cheaper products quickly.

Warranty cases, on the other hand, are handled by the warranty handlers and shipped back to the supplier for further inspection. The supplier then reimburses Örum for reimbursing the customer.

## 5 Results

This chapter reflects the data of the previous chapter on the theoretical framework. The purpose is to answer investigative questions 2-5. First, the value Örum provides and how much value the current supply chain is able to deliver to the customer is analyzed. Investigative questions three and four are analyzed in a similar manner. Finally, the potential effects on competitiveness of implementing lean practices into Örum's supply chain are analyzed and improvement suggestions are formulated based on all findings.

### 5.1 Value in the current supply chain

In accordance with lean principles, it is necessary to begin this analysis from the customers' end of the supply chain and traveling back upstream towards the suppliers. The primary needs of Örum's maintenance shop customers are all related to being able to complete the necessary repair work on their customers' vehicle. This need can be divided in two from Örum's point of view. The first half is being able to satisfy material needs. The retail customers need to be able to satisfy their customers' needs by having the correct products. To be able to satisfy that need, Örum has to be able to deliver the right products, to the right place, and at the right time.

Completing work on a vehicle may also require specialized expert knowledge of the task at hand. This is the second half of the primary need. Being able to provide the customer with specialist knowledge can add tremendous value. Whether it be compatibility data from the system or help on how to perform the actual job, it will help satisfy primary customer needs. Correct compatibility data is crucial, as sales cannot be made based on lacking or false information.

It is in the nature of car repair shops' needs that they tend to emerge and have to be satisfied quickly. When a customer reserves a maintenance time, the personnel inquire about the exact model of the car and which maintenance or repair is needed. Based on this information, the shop looks up which parts and accessories are needed to complete said work. These products are then ordered a few days or even hours before from Örum to be delivered on time to start work on the vehicle.

Basically, interacting with Örum is very simple from the customer's point of view. When they recognize the need, they first come into contact with Örum either through Örumnet, find what they need and place an order or by calling or emailing the sales staff possibly asking for advice and then placing the order. As a result, the customer's need is fulfilled

completely, partially, or not at all. If all of the products are not available at the time, or sufficient technical data is not available, the need may only be partially filled or not at all. The customer may then choose to take their business somewhere else. However, the solution can often be found with more time or by someone else than the person the customer initially came into contact with, but it stretches out the lead time and reduces customer satisfaction.

The current supply chain overall is able to provide adequate customer value in terms of product availability as well as compatibility and other information but there is much room for improvement.

Customers are sometimes faced with a situation where they cannot purchase parts from Örum, if no one is able to tell which parts are the correct ones. The other alternative would be to order all of the potential parts, reducing experienced customer value due to the confusion and diminishing profits with logistics costs. Even if the data is able to provide correct information, products are sometimes out of stock and would have to be backordered, which takes too long. Other times the system might freeze preventing the creation of a sale altogether.

## **5.2 Improving the current supply chain with lean to create more value**

In a perfect world, according to lean, Örum's supply chain would be much simpler and faster than it is today. A total pull-system would be in effect, eliminating all inventory and warehousing. Orders to the suppliers would be placed precisely according to the customers' orders and be immediately processed through the organization and sent to the supplier. Throughput time would be 1-2 days via direct express shipments from the supplier to the customer. Units in process would be precisely limited to what customers have ordered and cycle time would be greatly reduced. All processes would be highly standardized to reduce variation and implement continuous improvement of processes. Seamless supplier relations would be established, leading to an integration of the supply chains. All of the suppliers would be immediately accessible for data exchange and orders through Tec-Com. Personnel would be able to focus solely on value-adding tasks, thereby minimizing all waste and maximizing customer value creation.

Naturally, it is not feasible or realistic to suggest that Örum would overtake such a major transformation, but it does describe the ideal state that the implementation of lean practices strives for in this research.

As previously mentioned, Örum's field of business is in vehicle healthcare, the mission is to create happy entrepreneur customers, the vision is to be a constant pioneer in their field of business, and the strategy is to have the most capable vehicle maintenance shop customers. The values of the organization are not specifically listed but it can be deduced that the customers are at the heart of the company's values. In other words, satisfying customers' needs.

### **5.2.1 Operations strategy**

Transforming Örum into a lean organization has to begin by developing a lean operations strategy. Making use of Toyota's approach to a lean operations strategy (figure 9), Örum could also adapt a similar approach. Satisfying customers' needs would be pointed as the reason for the company's existence. Principles that guide everything that is done should be outlined to make sure all efforts strive for achieving core values. JIT and Jidoka could be adapted as the two guide principles to facilitate focus on flow creation and improved visibility of the operations for everyone. Standardized methods of working should be established by first mapping all of the variations of working at the moment, choosing the best practices and setting them as the standard. The benefits would be the reduction of variation in processes, facilitating the continuous improvement of methods of working, and identifying disruptive variations through Jidoka. The tools and activities currently in use should be thoroughly analyzed, evaluated and chosen to realize the best methods of working. The new operations strategy should be highlighted to and implemented by everyone in the organization.

In the efficiency matrix Örum can be currently situated around the center of the efficient islands quadrant. The primary focus is on resource efficiency and the flow through the processes is limited. Steps operate secluded from each other and the flow between them needs improvement. Some steps are more resource optimized than others leading to overall sub-optimization of the processes. The focus is on cost minimization to stay in the tough cost competition on the market. Inventory is bloated at roughly three turns per year and the lead times from suppliers' to inventory is generally long.

### **5.2.2 Process flow**

For the purpose of examining Örum's supply chain as a whole built up of smaller processes, the supply chain be divided into smaller segments. These steps act as internal customers and internal suppliers to each other. The point where the customer first comes into contact with Örum will be the start of the first process, sales. The sales process ends when the order is entered into the ERP-system. The second step is outbound logistics. It



begins when the order is entered into the system for handling and ends when the customer receives the goods. The third stage is inbound logistics, which begins when a shipment arrives to the main warehouse and it ends when the goods are shelved. The fourth process is purchasing, which begins when a need for restocking is identified and ends when the goods leave the supplier's warehouse. The figure below depicts these processes.

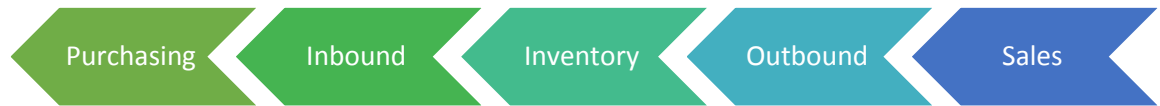


Figure 12. System Boundaries and Processes.

The purchasing process is divided into two activities: identifying the need and placing an order and waiting for the goods to be sent. The ordering itself takes less than an hour, and the delay between receiving an order and shipping it varies greatly between suppliers. For the purpose of this research, the throughput time of the purchasing and the inbound process will be presented as one figure.

It can be assumed that the average lead time for an order is 22 days (including the supplier waiting time) based on the figures in table 3. The target for unpacking and shelving inbound shipments is 48 hours, which is accomplished on average. If the inbound process extends to the inventory of a regional warehouse, an average of three days can be added to the throughput time due to replenishment cycle delay and outbound logistics from the main warehouse. The throughput time of the purchasing and inbound processes is therefore 24 days on average.

A crude calculation showed that the inventory turnover rate is roughly 3 based on annual revenue and inventory value. Using this figure, it can be calculated that the average product sits in inventory for approximately four months or 120 days.

The outbound process typically has a throughput of 1-2 days for picking, packing, and shipping, depending on whether the product is shipped via 3PL or delivered by the wholesale delivery ring. The sales event itself can usually be counted in a matter of minutes, unless a product is backordered, so it does not add throughput time in this calculation. As can be seen in the figure below the throughput time of an average product is 145 days in total.



Figure 13. System Throughput Time

To improve the throughput of Örum's system, the process flow laws can be used to improve the system. According to Little's law, throughput time can be reduced by reducing the amount of SKUs (flow units) in process or by speeding up the cycle time (Modig, Åhlström 2012, 34). In practice, this means that inventory should be significantly reduced to gain the biggest advantage. Cycle time could be improved by reducing the lead times of the inbound process and by increasing inventory turnover.

Products in inventory do not add value according to lean. In Örum's case, having some inventory is inevitable, but not to the extent as it is currently. According to the law of bottlenecks, the processes with the longest cycle time are clearly bottlenecks in the process (Modig, Åhlström 2012, 37). The lead times of inbound shipments are the days in inventory are the culprits in this case as well.

Variation is the third law of process flow (Modig, Åhlström 2012, 40). By standardizing methods of working, Örum could accomplish further gains in improved process flow. At this point the removal of variation will not make significant changes to the throughput times presented in figure 11. However, it will improve value creation from the customer's point of view as processes develop and the system works more consistently.

### 5.2.3 The efficiency paradox

By focusing too much on resource efficiency, Örum's current supply chain restricting the flow of processes. The long throughput time of the average product leads to many forms of superfluous work stemming from secondary needs. The long lead time of inbound shipments may create secondary needs if stock runs out, for example. A customer may have a need that has to be satisfied, meaning that extra resources must be utilized to satisfy the otherwise unnecessary secondary need. In this case, sales, procurement, and logistics personnel will have to act in collaboration to make an extra express order to a supplier.

The large inventory of SKUs (flow units) results in a bad overview, issues with storage space, all sorts of hidden problems, as well as superfluous work in handling, storing, cycle counting of inventory, products becoming obsolete or damaged as well as other secondary needs.

#### **5.2.4 Improved value creation and competitiveness**

The potential improvements from implementing lean management practices go hand in hand with improving competitiveness on the market. As the cost leadership competition is vigorous, being able to further differentiate from competitors may take some pressure off of pricing and concentrate focus on the customer experience instead.

Liquidating a major share of the current inventory would be the single most effective course of action to facilitate value creation and improved competitiveness. Assuming that half of the inventory is liquidated, it would free up around nine million euros of working capital to be used on other investments. For example, IT-systems, product data systems, and customer service developments would all be direct investments into creating more value for the customer. More precise product data would not only improve the customers' perceived value but in addition it would decrease the amount of expensive return logistics, as customers would get the correct parts the first time.

Realizing nine million euros from obsolete inventory would also reap other benefits. Firstly, the selection of products could be expanded to cover more SKUs in smaller quantities. A broader range of different products readily in stock would satisfy a broader range of needs. It must be noted, however, that to keep inventory from becoming obsolescent once again, products that have not sold in a certain period of time, 365 days for example, should be realized quickly, even at the cost of profits. Express and direct express shipments could also be used to a much further extent in the case of slow moving products. This would allow for a wide array of products without the burden of carrying them in inventory. This would also mean, however, a 1-2 day delay in delivery.

Secondly, the benefits of eliminating secondary needs related to inventory management reduce the overall amount of material handling work there is to be done. This could free up man hours that could be focused on customer service, supply chain process, or IT system improvements, for example.

Thirdly, the remaining inventory and the related data would be much easier to manage. The increased turnover rate would permit quicker reactions to changes in the marketplace. The supply chain would become much more agile as a whole. The reordering cycle

could be shortened to facilitate more frequent stock replenishments, further decreasing the need for a large inventory. Adding to the agility of the supply chain, ironing out queues caused by bottlenecks would reduce the throughput time of units in process permitting quicker adaptation. The standardization of processes and minimizing variation in them, also serves to improve cycle time and reduce superfluous work.

Most importantly, a leaner, quicker, and agile supply chain is much easier to make work like it is supposed to work. As simple as it may seem, it is the single most important factor in improving the value provided to customers. The basis for the operations is sound, it just does not work in the most optimal way. If customers are able to purchase from a company that is able to provide precise compatibility data that conveniently helps find all of the correct parts and the necessary parts are immediately available in stock, it is sure to provide excellent value. In this case, pricing at market level or even slightly above market level is sure to be attractive. Being able to provide the right product and service at the right time, in the right quantity, for the right price, and to the right place is a guaranteed recipe to success.

## 6 Discussion

This chapter concludes this thesis research by presenting the formulated suggestions that are based on the key findings of this research. This is followed by an evaluation of the reliability and validity of this research, and the author's own learning. In addition, some further research topics are provided.

### 6.1 Key findings

A lean organization focuses on the creation of perceived customer value while minimizing waste and constructs the organization accordingly. It also emphasizes the standardization of processes to reduce variability and establish continuous improvement. The PDCA concept is an effective way of implementing continuous improvement. Establishing a lean supply chain has to be based on the values of the company to promote an organizational culture that always strives to act according to the values. Satisfying customer needs should form the core of the organizational values. Company principles, methods, tools, and activities should be predetermined and aligned to always promote working towards the values. This acts as the basis for creating a lean operations strategy. The strategy should be clearly communicated to the whole organization to create a common guideline for working.

In practice, it is impossible to create a resource and flow efficient company simultaneously. Considering the possibilities of process flow and taking into account the efficiency paradox that lies between flow efficiency and resource efficiency to find the optimal balance for a company, are the first steps towards creating a leaner organization. Banishing forms of waste from processes comes as an added benefit of implementing lean. Even a small change towards a lean organization can bring benefits to resource efficient organizations.

The current supply chain at Örum has a very heavy and capital-intensive structure that ties up a relatively large amount of the company's resources. Freeing up capital and other resources from the inventory and the associated tasks for other use could provide more value to customers through a more efficient use of resources. The added agility would also make it easier to adapt to changing market conditions and evolving customer needs.

Developing the IT-systems to improve reliability and data quality would result in direct financial and value creation improvements. An improved IT-system would stop limiting employees and instead support them in daily tasks to provide superior service. Implementing standardized operational procedures in the ERP-system as well as material handling

tasks would reduce variation of the results. Developing the online ordering interface would also encourage customers to use it more, reducing the amount of simple and mundane tasks of customer service staff and instead providing more time to assist customers in complex issues. Improving the value creation capabilities at Örum could be an effective alternative to the cost competition on the market.

## **6.2 Suggestions**

Based on the findings of this research, adapting a lean operations approach or parts of it could provide Örum with improved performance on the market by further developing their differentiation from competitors. Considering the already present part of the differentiating competitive strategy, the concept car service shops, improvements to Örum's supply chain could complement the competitiveness of the organization as a whole.

The choice of resource efficiency could also be worth rethinking. Implementing even parts of the lean approach into the current supply chain could provide it with much needed flow efficiency and flexibility resulting in improved profitability. Shifting the focus from resource efficiency could improve perceived customer value, increasing the ability to satisfy customer needs.

Considering the result of the unit throughput time calculation, 145 days, it serves as proof that inventory turnover is far too stagnant. Focusing more on creating flow through all of the company's processes could free up working capital for other investments and resources to be used on more value-adding tasks.

Developing Örum's IT-systems would bring many needed improvements to every process in the company, improving both resource and flow efficiency. Improving the product data database would improve the effectiveness of all of the processes within the supply chain. Most importantly, it would increase customers' satisfaction by helping Örum to provide the right parts every time.

## **6.3 Reliability and validity**

The theoretical background of this research has been constructed with care to ensure the reliability and validity of the material that acts as this research's backbone. Material from carefully selected and highly appraised authors has been used and interpreted in a manner that conveys the original message of the author.

To ensure the reliability and validity the qualitative research as much as possible, it has been carefully planned prior to execution and the theoretical background has formed the

basis for everyday systematic data collection while working for the company. The analysis and interpretation of the data has been done with care. It has been taken into account during qualitative discussions, especially as they were informal in nature, that subjective data may not be entirely accurate. To counter this, care has been taken to verify the validity from multiple sources including other members of personnel as well as case company related data.

These results are purely based on the personal observations, professional experience, and data gathered by discussing with multiple staff members from different departments. These staff members include managers and operative personnel alike.

The results are also based on the author's views of supply chain management and lean management practices, as described in the theoretical framework, that have been reflected on the qualitative data collected during the research phase.

This research has been conducted entirely based on the current state of the company. The interpretations and suggestions are solely the results of the author's personal research and reasoning. Therefore, the results may not remain relevant if changes that alter the premise take place. The results have been formulated in a universal manner to help keep them relevant despite potential changes.

#### **6.4 Recommendations for further research**

In general, the field of lean management has much to offer. This paper only covers the basic principles and methods of establishing lean organizations. Implementing lean into wholesale and distribution companies is an especially interesting topic, as it offers quite an array of opportunities for a traditionally resource efficient business model. It also delivers an interesting way of potentially transforming wholesale businesses that could otherwise become obsolete in a world of rising manufacturer-to-customer (M2C) sales.

To complete an extensive transformation to lean management at Örum, a need for further detailed research exists. As the suggestions formulated based on the findings presented in this paper are rather general in nature, further detailed research would be helpful.

To begin with, long-term strategies would have to be reconsidered based on lean management principles. Processes would have to be mapped in great detail with throughput time measured in minute or second accuracy. Evaluating the possibilities of standardizing

operative processes and establishing a visual management system would have to be investigated. Suppliers' adaptive capabilities to facilitate creating a lean supply chain with minimal inventories would have to be evaluated.

## **6.5 Reflection on personal learning**

The writing of this thesis was a very educational experience for me. It unintentionally spanned to a much longer and more extensive research project than I originally planned, but it actually turned out to be a positive aspect in terms of the results. Having worked for a longer time at Örum's administrative side rather than just the five months of work placement has taught a great deal about the company and the whole field of business in general. It allowed me to write a much better research thesis than I otherwise would have. Gradually developing my understanding of lean management and adapting the approach of my qualitative data gathering based on my findings made for much higher quality research.

It was also very interesting to reflect my theoretical findings on my empirical findings. I found it very encouraging to experience the two coming together and finding a real life basis for the claims in the theoretical framework, as they seemed rather abstract the first time reading about them.

In the end, I am happy with the way this research turned out and I hope it might showcase an alternative point of view on conducting business for the case company's management.



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## **Appendices**

### **Appendix 1. Key questions of qualitative discussions**

#### **Qualitative Discussion Key Questions**

##### **Tasks in supply chain**

1. How does your work contribute to the material flow through the supply chain?  
Please explain the different stages of the process(es).
2. How long does it take for one unit to pass through your process(es)?
3. What forms of information related to the supply chain does your work handle?

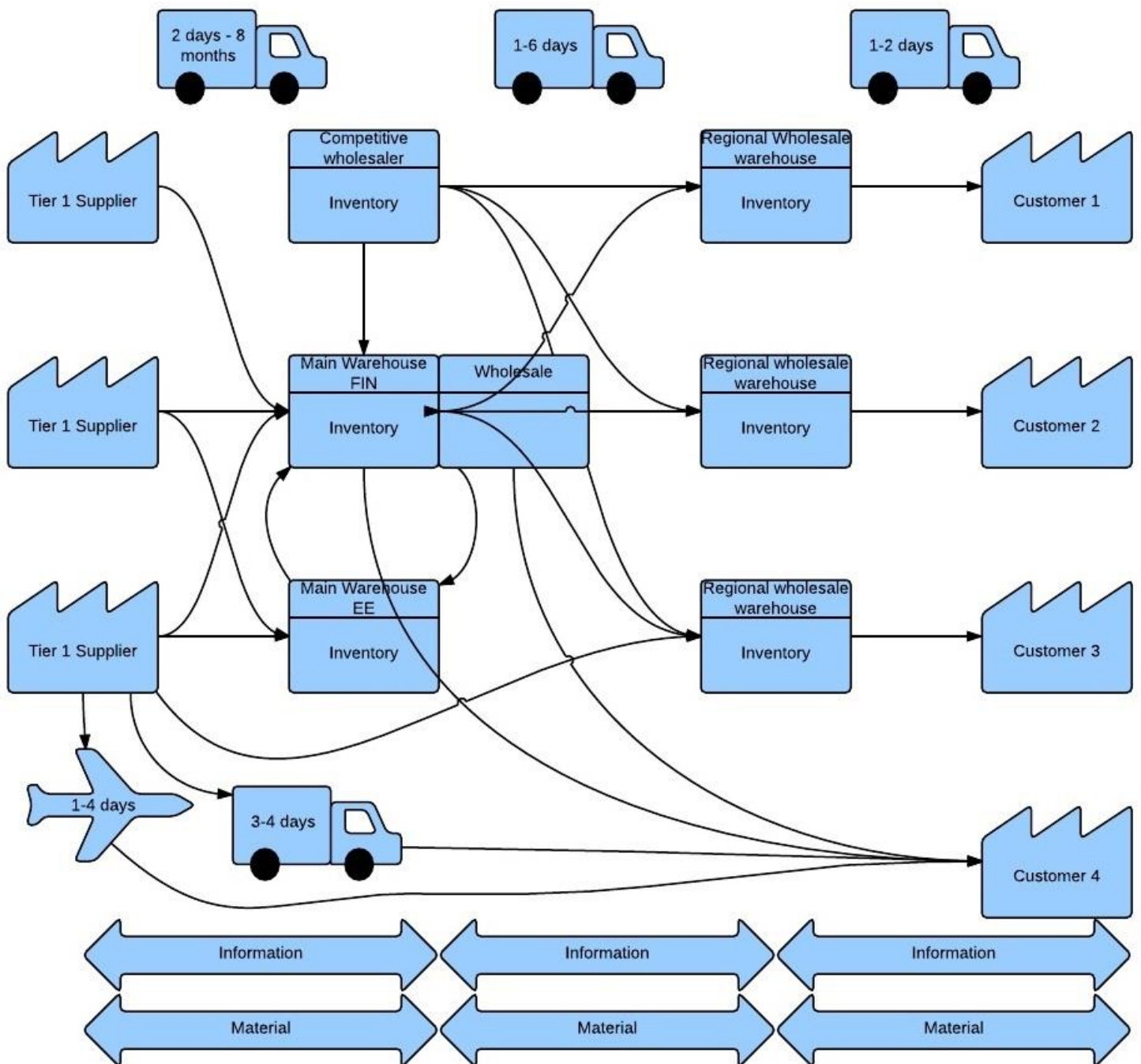
##### **Improvement potential**

4. Do you think the way you complete your work could be improved?
5. Would these improvements allow you to process units faster?

##### **Primary customer need and value**

6. What do you think customers actually need and want from Örum?
7. How do you think you are able to contribute to fulfilling those needs in your work?
8. How would you improve your work to better fulfill customer needs?
9. How would you improve Örum as a whole to better fulfill customer needs?

## Appendix 2. Örum's material and information flow



### Appendix 3. Örum's material throughput cross-functional flowchart

