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LEAN IMPLEMENTATION IN ESTONIAN SMEs BASED ON THE EXAMPLE OF THE COMPANY NARVA TES PLUS

Master's Thesis

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ABSTRACT

Small and medium enterprises constitute the main part of the market in Estonia. However, labour productivity of local companies is smaller than the EU average. This fact makes Estonian enterprises less competitive. Therefore, lean thinking implementation is an opportunity for improving the performance and empowerment of companies.

As small and medium sized organizations face bigger difficulties than large enterprises in lean adoption, the aim of the research was to develop the model of lean implementation for Estonian SMEs. For this purpose, the study was based on single-case study method of small Estonian company from food and beverage sector. As a foundation the author took the implementation process model from Miina (2013). The model was improved and completed for Estonian SMEs.

During the research, data collection included observation of all processes and documents of the company, conducting semi-structured interviews with the owner and employees. Further, data was assessed with content analyses. Operations were measured with flow process charts. This technique helped to detect non-value-added activities and weak places in the organization.

Lean implementation included several steps: assessment and description of all processes, lean knowledge acquisition and lean house development, training people, lean implementation planning, execution and results. Moreover, a special lean house model for SMEs was constructed as a foundation of adoption process.

Based on all these stages, developed process model has following steps: lean knowledge acquisition, process quality, lean house development, lean house training, selection of implementation area, lean implementation execution, evaluation of results, corrective actions, extension of implementation area and continuous improvement.

Answering the research question how to implement lean in Estonian SMEs, the step by step model was constructed based on concrete example of Narva Tes Plus. In the future, lean thinking approach and its implementation process can be studied more deeply to continue further development.

INTRODUCTION

Today, market rules are changing. In this new global environment customers want to have more variety of products and services. There are also competitors from different parts of the world and everyday barriers for them to sell goods and services become less and less. In this new competitive environment traditional way of operations management does not adopt so well. New approach of implementing lean thinking is getting more important for many companies.

Lean thinking is defined as the systematic elimination of waste (Santos el al.,2006). It was developed for Toyota Production System (TPS) and took the beginning in 20th century. First, lean principles were adopted for manufacturing companies. Today, lean principles are implemented in all sectors. In most cases, lean thinking is applied in large organizations. Nevertheless, small and medium enterprises make up more than 99% of all companies in the European Union. The number of SMEs in Estonia is even higher. Therefore, lean implementation takes an important part of a business. Moreover, lean thinking has an important effect on companies' productivity and performance. For instance, labour productivity of Estonian SMEs is smaller than in others European countries. It makes Estonian organizations less competitive in the market. Lean can be the solution to change this situation and improve the performance of Estonian SMEs.

However, SMEs have bigger difficulties of lean adoption than large companies. It is justified by the fear of changes, lack of financial support, poor knowledge about lean thinking and its philosophy. Moreover, the majority of owners and managers do not know how to start the implementation, which tools to use and how to follow lean adoption process. Therefore, it is necessary to investigate this field.

The aim of this thesis is to develop general model of lean implementation process for local SMEs and with this model to answer the question:

1. How to implement lean in Estonian small and medium enterprises?

To answer this question the author chose the implementation model from Miina (2013), which was developed based on the research of Estonian manufacturing companies.

The model is more specified for batch type enterprises. Therefore, it required changes and modifications for developing general model for SMEs.

For this reason, the investigation process was based on following all steps of the model of lean implementation in small-sized Estonian organization from food and beverage sector. The method of singe-case study was applied. Lean thinking was implemented in the company Narva Tes Plus.

The thesis has three main parts. The first part builds "Theoretical framework of lean thinking". It starts from a brief history of lean and its characteristics. Further, ways and tools of implementation are described. The emphasis of this part is made on lean implementation in SMEs, problems which concern it and how to overcome these difficulties. In the final paragraph of this chapter lean thinking situation in Estonia is described.

The second part is "Research methodology". In this study the author decided to use qualitative research method design for investigating lean implementation. This chapter is based on literature study, selection of the company, data collection and analysis. Moreover, it describes methods which were used in assessment of processes of the organization before and after lean adoption.

The final and main part of the thesis is "Lean implementation". It consists of describing all steps which were made during lean adoption process. First of all, the description of company's processes is presented. Further, the way of lean knowledge acquisition and training for employees is described. Moreover, all tools and changes which were applied in the company are presented with first results of implementation process.

The current thesis is focused on all steps of lean adoption following the model from Miina (2013). The results of the research become the foundation for developing general lean implementation process model for Estonian SMEs. The model provides step-by-step solution how to implement lean in Estonian small and medium sized companies.

1. THEORETICAL FRAMEWORK OF LEAN THINKING IMPLEMENTATION

1.1. A brief history of lean

Lean concept takes the beginning from the book *The Machine that Changed the World* which was published in 1990. This book describes how the Japanese implemented lean Manufacturing. More recently, Jeffrey Liker described 14 management principles in his book *The Toyota Way,* which also provides the information how to apply these principles. Liker's theory is based on a pyramid model which consists of 4 layers. It is also called 4P model. First layer is the foundation of management decisions which are based on a long-term philosophy, even at the expense of short-term financial goals. The most important here are long-term results rather than short-term. The second layer in the pyramid relates to processes, using pull system to avoid overproduction and standardizing problems and tasks for improvement. The next layer relates to people and partners, to treat them with respect, challenge and grow them. Here is important to grow such leaders who understand their work and teach it to others. The final layer of the pyramid is problem solving through understanding the situation (*genchi genbutsu*), continuous improvement (*kaizen*) and learning.

After World War II, Japan was in week and difficult situation, had limited resources in everything: skilled workers, land, capital and others. Companies faced problems of optimizing the operating systems. Mass production and product development increased, manufactories needed to enhanced output of production. These limitations and conditions led to use lean manufacturing, particularly in Toyota. Under these circumstances the company started to manage Toyota Production System (TPS) in lean environment. (Moore 2007)

TPS was based on two concepts. First one was the assembly line production system which was taken from the book *Today and Tomorrow* by Henry Ford. The second – was the supermarket operating systems from the United States. This system provided a continuous

supply of materials as supermarkets provided a continuous supply of items to customers or in other words – pull system. Moreover, TPS represents all attributes and characteristics of lean manufacturing. (Smith, Hawkins 2004, p.7)

1.2. Characteristics of lean

To understand, what lean is, it is important to know what wastes and losses in processes are. Lean thinking is defined as the systematic elimination of waste (Santos el al.,2006). Therefore, the main purpose of the TPS is to eliminate waste or in Japanese it is called *muda*. *Muda* means everything that creates no value for a company and its processes. Lean thinking is used as an antidote to waste. Everything starts from value, value of specific product or service to satisfy customer's expectations. (Womack, Jones 1996) Value for lean is defined as first principle which is used to mean that a company needs to do something that has value for a customer. It is important to be able to specify if something has value or not and the only person who can do it is the client. A company should know who the consumer is and what he expects to get. If a firm tries to guess what the customer wants, it is more likely to make mistakes in processes and have high losses. (Eaton 2013)

The next step after giving the definition of value is the value stream. The value stream is all steps which are involved in giving value in processes. One of tools of lean is to use value stream mapping for every product line. Using this tool it is easier to look for non-value activity, adding activities that are more valued. (Moore 2007, p.144-145) To reduce wastes it is necessary to have the sequence of processes where all possible activities are automated in their operation. Moreover, it is important that all different value propositions were understood and thought as the direct and indirect value to the company. Where direct value could benefit the consumer directly and indirect value could benefit another consumer but requiring that one or more consumers perform some procedure to enable the value to flow. (Hicks 2007, p.244) This is the basis of understanding the next principle which is called flow. Liker (2004) in his book *The Toyota Way* writes that to create continuous process flow makes problems clearer.

The "flow" principle suggests that the value stream needs to be made to flow. Here all the information should be available in real time as soon as it appears. Processes and procedures need to be performed in the simplest way as possible. Moreover, it is necessary to

minimise the duplication of information within the company, different departments, customers and suppliers and minimise unnecessary information within the enterprise.

After the flow goes “pull” principle which is based on designing and providing what the client wants and only when he wants it. So information needs to be delivered to the end-user only when it is demanded. Moreover, to facilitate pull system, procedures should be consistent across the company. (Hicks 2007, p.245-246) According to this principle production process should be organised as a pull system where wastes are eliminated from the process and the flow of the product is without or with minimum non-valued activities. The final step is continuous improvement techniques. In 2009 Wan and Chen developed a web-based decision tool using adaptive lean approach where they used stage of continuous improvement or final stage to access manufacturing leanness. The culture of continuous improvement techniques is based on attitude towards lean system. (Karim, Arif-Uz-Zaman 2013, p.179) It requires regularly review processes that support service or product change. It supports quick implementations and training. This is time from getting the system to its full implementation and adoption with the business processes. (Hicks 2007, p.245)

Using all these principles the company is able to achieve leanness. Being lean is to have minimum inventory in raw materials, work in process, finished goods. It is also to have minimum losses in production process through planned time, short stops, control and improvements in processes. It is minimum delays between processes, minimum unit cost of production, excellent delivery performance on-time, client satisfaction and gross profit. Moreover, being lean is continuing improvement. To achieve leanness is hard work. Furthermore, in a lean environment companies are less likely to focus on cost cutting and profit:

$$\text{Profit} = \text{Price} - \text{Cost}$$

And more likely to focus on cost reduction through improved processes and practices, and it is seen as:

$$\text{Profit} = (\text{Price} - \text{Cost}) * \text{Volume}$$

Companies are achieving a higher return on assets over the longer period. (Moore 2007, p.137-138)

To conclude, lean principles are based on understanding what value is and eliminating of all possible wastes in processes. It starts with philosophy of long-term thinking with

continuous improvement; and processes and flow need to be done in the way to match customer demands. (Moore 2007)

1.3. Why lean implementation is useful nowadays?

When people speak about lean they usually mean it in the context of large organizations or big manufacturing companies. Lean is characterized by Toyota, which is large automobile industry in Japan. However, lean implementation is also useful and it is a topic of interest in small and medium enterprises (SMEs). Why is it trending topic and why is it useful especially in SMEs? How lean implementation can affect SMEs? These are questions that are interesting nowadays and they require answers.

SMEs are divided into three classes: micro enterprises up to 9 people, small enterprises employing between 10 and 49 people and medium enterprises with 50 to 249 people. Companies which employ more than 250 people are defined as large enterprises. (Wymenga *et al*. 2012, p.16) Moreover, there is ranked criteria for SME:

1. Less than 250 employees;
2. Maximum 40 million euro annual turnover;
3. Maxim of 27 million euro balance sheets;
4. Minimum of 75 percent of company assets owned by company management;
5. Owner-managers or their families manage the company personally (Loecher 2000, p.263).

In the EU27 SMEs make up 99,8% of all enterprises and around 20 million companies employ almost 65% of total workers. (Matt, Rauch 2013, p.420) In Estonia this number even a little higher. There were 100 216 enterprises in Estonia in 2010 and 99,9% of them were SMEs which have less than 249 employees. (Kaarna *et al*. 2012, p.9) It is seen that SMEs are the major sector in the world and in Estonia. That is why to implement lean the same important in small and medium sized companies as in large organizations.

Perhaps, to implement lean in micro firms with employees less than 10 people does not make sense but to use lean environment and philosophy always good benefit. However, for small companies up to 49 people employed the implementation and use of lean and lean thinking can be an important step to increase the productivity and improve the performance and competitiveness. (Matt, Rauch 2013, p.421)

Large European enterprises have an advantage in labour productivity (59000 euro versus 39000 euro gross value added per employee). However, the productivity gap continuous to narrow showing that SMEs also increase using advanced production lines and processes with cost-effective systems. (Bartlett 2011) SMEs are considered as driving force of modern economy using upgrading technologies, product developing and process innovations. (Wymenga *et al*. 2012) One of technique which is used is lean manufacturing. However, lean implementation in SMEs is still debated theme. A lot of SMEs do not feel confident of the cost of lean implementation and expected results. Comparing to larger organizations, small firms have not so many resources. Very often small companies are leaded by one owner who wants to be convinced of benefits of lean thinking because the implementation requires high resources. (Matt, Rauch 2013) Despite this, managers who have strong leadership traits and good strategy vision do not afraid and are able to implement new ideas and technologies for its enterprise competitiveness. Therefore, there are researches that prove that lean can be implemented in SMEs successfully; however, the number of these cases is not high.

1.4. The benefits of lean

To be lean is to have financial benefits by decreasing operating costs, better understanding of customers' needs; to have benefits in quality of processes, products and services; to have good team with empowered multi-skilled people and to have knowledge of understanding of all processes and the whole supply chain in manufacturing. (Melton 2005, p.664)

Lean manufacturing has logical techniques. Applying these techniques in the right way with required tools can be efficient in a future for a company. The problem for many firms is that lean cannot be purchased and installed in any industry in the same way how Toyota did it. For any factory or enterprise lean is something unique. Managers should change their behaviour and attitude to lean thinking. Lean techniques can give the business a huge advantage being competitive in the market. Moreover, because lean cannot be purchased and implemented simply, it is difficult to copy this technique for competitors as they can do with any machine or new launched product. Companies are always looking to improve their business and increase profitability and lean thinking can bring extra profit for a company and its competitors cannot copy this process very easy. With lean it is possible to do several

things: extra output, lower costs, better yields (less waste), improved systems, better working environment.

Extra output can be reached with improved performance which releases extra production capacity. With extra product the company will improve its profit outcome. It can be also used to stream-line the production systems and to restructure them.

Lower costs will bring financial benefits to the company or can be invested in the business also to increase volume of production.

Better yields and less waste will result in increased profit margins for the company. The main idea of lean is to reduce all possible wastes in processes. If there will be less waste because machines do not break down, between processes there will no big stops and breaks so it is possible to say that lean is working.

Moreover, improved systems will make manufacturing to work faster, to react quicker to demands from customers and all these will also improve the company's performance. Quicker response will only come with flexible systems. It is important to have flexible suppliers, working arrangements with employees to be able to increase output tomorrow if something happened with your competitors.

Finally, the company will have better working environment that will lead to high performance and will increase employees' productivity. Everything will be more organised. (Dudbridge 2011)

1.5. How to implement lean?

There are a lot of different researches concerning lean implementation. Some experts and authors offer to use some methods, others - to start with tools of lean. Therefore, for some companies it is difficult to start the implementation process. Moreover, the enterprise needs to wish changes and understand that this process will take time and should be patient and ready to spend resources. It is also important to develop a methodology to implement appropriate lean thinking, tools, strategy along with proper methodology to evaluate improvements. (Karim, Arif-Uz-Zaman 2013, p.171)

First of all, the company needs a good strategy for any business to operate processes and resources. For lean implementation it is also necessary. Therefore, to apply an appropriate strategy at the appropriate time for right purposes is very important. The organization cannot

simply copy the strategy from other companies, because some features of the strategy cannot be implemented in the particular case. (Karim, Arif-Uz-Zaman 2013) So, how to start?

Michael Dudbridge who wrote the *Handbook of Lean Manufacturing in the Food Industry* (2011) believes that everything starts with a team. People who work in the organization should work together, they do not need to be afraid to bring new ideas and thoughts to managers how to improve any work process, product or service. Lean is not only about the way working together, it is also their beliefs and values, their attitudes and how they behave. Lean is not a result that the company wants to get; it is a journey to be travelled.

The main goal to improve teams is that they need to be together, to look at a particular issue and to work towards low cost or no cost solution. Some teams can be improved in a very short period of time. This will help to carry out new projects and changes very quickly. It will also help to implement lean techniques very rapidly. However people take time to change and teams take longer time to change their behaviour and values. To speed this process teams need to understand what managers expect from them to do. Their work should be recognised. Therefore, managers need to explain them the importance of lean implementation process. People need to be ready to start the implementation; they should understand and know how to do it and what they need to do. Moreover, it is personality and motivation, behaviour and values of people, which is the difference between less successful and successful factories. Some managers think that the most important is to have the best equipment and technologies which will guarantee success and less people, however, they are wrong. Even using know-how and modern techniques not always give expected results. The best people are able to improve the performance of the equipment. People can design things which will prevent wastes and losses; they may develop systems and techniques to ensure that key areas of the company are performing at the highest level. (Dudbridge 2011) Nobody knows problems of machines or processes in the company better than workers who spend all their time working with. If something is going wrong they are who know what is happening with concrete process or equipment. It is very important to involve employees in changes because they will be part of these changes and they will lose fear to them. To form lean team people need to be trained. Trainings about lean philosophy, lean techniques, implementation ways and tools are necessary to be organised for employees. Moreover, everything needs to be done for people. The company has the mission to support employees. It is necessary to organize a process in

that way that it works without any stops, without problems. Workers need to add value to the process all time but not to fix it.

After making the team it is important to collect information and data to measure and quantify performance. During this step all current processes need to be observed. (Melton 2005, p.668) Companies also need to define own systems considering type of production, volume of orders and demand quantity. The product or service's profile need to be set. Here can be different attributes as a product or service type, quality, quantity, market demands, the number of competitive, characteristics of process. (Karim, Arif-Uz-Zaman 2013, p.175)

Moreover, by Womack *et al*. (1990) the main steps of lean include the definition of the value, the value stream, flow the product, pull and strive for perfection. It is also necessary to define the waste. Weak performance has negative impact on the performance indicators of product or service cost and quality, development cost and time, production capability. (Wang *et al*. 2012) Different authors and researchers developed own waste features. Some of them are mentioned in Table 1.

The next step is to analyse data, what stops the process flowing. Further follows step of designing the change, of choosing the method or tool which can be applied. Appropriate tool at the right time and with the budget for the concrete type of a company needs to be chosen. Therefore, it is important to establish good relationship between lean strategy and wastes.

Lean thinking starts with the customer and his demands and finishes with delivering values to the consumer removing possible wastes and non-valued activities. Therefore, people who implement lean use different lean tools for different production environment. Different techniques of lean can have better results in big companies and others in small firms. (Karim, Arif-Uz-Zaman 2013) Not all methods are applicable in small enterprises; however, many are suitable and recommendable. Matt and Rauch in their article *Implementation of Lean Production in small sized Enterprises* (2013) recommends to use:

- 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke)
- Benchmarking
- Kaizen – Continuous Improvement meetings
- Just in Time (JIT) delivery
- Pull-principle and Kanban

Table 1. Different waste sets

Womack *et al*. (1990) General	Leaney (1996) General	Bauch (2004) PD	Kato (2005) PD	Morgan and Liker (2006) PD	McManus (2005) PD	Ward *et al*. (2007) Information	Marcus and Pereira (2008) PD
Over-production	Over-production	Over-production / unsynchronized	Over-production of information (duplication)	Over-production	Over-production		Over-production
Waiting	Waiting	Waiting	Waiting of people	Waiting	Waiting		Waiting
Transport	Unnecessary transport	Transport/hand-off	Transportation of information	Conveyance	Transportation		Transportation
Processing	Over-processing	Over-processing	Over-processing	Processing	Over-processing		Over-processing
Inventory	Excess inventory	Inventory		Inventory	Inventory		Inventory
Movement	Unnecessary movement	Movement	Motion of people	Motion	Unnecessary movement		Motion
Defects	Defects	Defects	Rework	Correction	Defective products		Correction
"Wrong design"			Defective of information				Defects
	Unused employee creativity						Captured in inventory In over-processing In over-production and motion In transportation In happening
		Reinvention Lack of system discipline Limited IT resources	Reinvention				
			Hand-offs			Hand-offs Scatter Wishful thinking	Wishful thinking Happening

Source: (Wang *et al*. 2012, p.8)

- Visual Management in Production
- Zero Defect through process-integrated failure control
- Idea Management to utilize the worker's Know-How
- Setup Time Reduction to reduce waste
- Value Stream Mapping
- Efficient and ergonomic work stations
- Poka Yoke and standardisation in product and process
- Cellular Manufacturing and autonomous teams
- Job rotation to avoid monotony
- Low Cost Automation ("keep it smart and simple").

5S is five activities which are used to create a workplace suited for visual control and lean practices. Seiri means to separate required from unnecessary tools and remove the last one. Seiton means to arrange tools to use them easy. Seiso means to clean-up. Seiketsu means to do the above everything regularly, to maintain the system. Shitsuke means to use all 4S as a habit. (Melton 2005, p.669) 5S is the way how the environment in the company needs to be organised and people need to follow its rules to improve the performance. 5S becomes the way that the firm is operated. It is a lot about people's behavior and attitude in the company and they should be universal if the system is to be sustained over a long period of time. The implementation of 5S can be more successful if it is done in all levels of the company, not only in one sector or one process. Improved performance is easy step when workplace is organised. The firm becomes more efficient through the work done. Through the efficiency costs of the operation will reduce. Using 5S system there are benefits in terms of product or service quality and standards. (Dudbridge 2011, p.73)

The next of the 5S is Standardise. The method lies in the fact of carrying out any task the same, no matter who is doing the task. It is a standard method for every activity, the best way to improve efficiency, reduce wastes, mistakes and to keep the quality on required level. (Dudbridge 2011, p.69-70)

Kaizen is a continuous improvement method of lean manufacturing. This is method of improvement activity to create more value and remove wastes. (Melton 2005, p.669) Kaizen philosophy involves everyone: both workers and managers. It gives awareness of problems and provides clues to identify them. It is also a problem-solving process which follows after detecting weak moment in a system. Moreover, any improvement needs to be standardized to

reach the next level of improvement. This balance between continuous improvement and recommendations for future improvements daily is the heart of kaizen approach. (Magnier-Watanabe 2011, p.429-430)

Just-in-time (JIT) approach also emphasizes continual effort to remove waste from the production process through small lot sizes, high quality and teamwork. Here operations are made as they are needed, not more. The result is very little inventory. Applying JIT system the company can reach following benefits as reduced space requirements, reduced purchased materials and goods, and finished products. Also, product quality will increase, manufacturing lead times will reduce. Flow of production line will be smoother and worker participation in problem solving will be more. To apply JIT and apply it successfully companies should provide visible support, be prepared to long-term improvements and study operations carefully. Moreover, workers need to understand what JIT system is and why it is used in the company. (Stevenson 1990, p.624-641)

Kanban system is also one of the tools of lean manufacturing system using which the company can achieve minimum inventory. Kanban is a Japanese word which means "visible record". The system is based on a customer of a part pulling the part from suppliers of that part. The customer is an actual consumer of finished goods (external) at the succeeding point of production facility (internal). The factor of Kanban is that any material will not be moved or produced until the consumer gives the signal to do so. A lot of Japanese enterprises implement Kanban system because it saves costs by reducing over production, wastes, making the waiting time less and costs smaller. (Rahman *et al*. 2013, p.176)

To implement Kanban system successfully some factors need to be controlled such as management of inventory, supplier participation, quality improvements and control and people commitment. First of all, Heizer and Render, 2005, wrote that the firm never reaches a low-cost strategy without proper management of inventory. They classified inventory into 4 categories as raw material, work in progress inventory, finished products and operating inventory. Therefore, management of all these inventories is important. In supplier participation, quality improvement and people commitment is necessary not to mix two tools as JIT and Kanban. In supply chain management the goal of JIT is to eliminate stocks but not to move them to another point in the supply chain. Kanban system requires minimum level of inventories in the production line where the number of inventories is equal with the production numbers. Sometimes Kanban system is described as a simple JIT technique, but it

is wrong. Kanban process involves more than fine tuning production and supplier scheduling systems, where inventories are minimized when needed in production and work in progress is monitored. However, there are factors that hinder SME companies at least in Malaysia from implementing the Kanban system because of ineffective inventory management, lack of supplier participation, smaller quality improvements and control and lack of people participation. (Rahman *et al*. 2013,p.176-177)

What about visual control or management – it is a method that measures the performance at the "shop floor" which was visual and owned by the operator team. (Melton 2005, p.662) Visual systems help the performance of the company. To make the environment inside the firm more visual there are different ways as photographs, colour codes, floor markings, coloured paperwork, arrows, marked gauges and others. Using all these techniques control of a process can be achieved, because information will be easily interpreted. (Dudbridge 2011, p.73-75)

Another tool that can be applied to implement lean effectively is value stream mapping. According to Womack and Jones (1996), any process is seen as value stream and activities without wastes keep products from flowing down the value stream. To monitor flow and to remove wastes value stream mapping is used. Using maps it is easier to follow the information through all operations. It also gives information about cycle time, inventories and so on. (Ruiz-de-Arbulo-Lopez *et al*. 2013, p.648)

After choosing the appropriate method or tool to start lean implementation the important step is to make the change so that the team could monitor the performance and sustainability of the change and to make any improvements if necessary. Finally, the enterprise should to measure benefits. Data collection of the new process and analysis of the performance should to be continued. Further required improvements can be made and rational approach will be developed. (Melton 2005, p.668)

To make implementation easier the company may follow lean implementation process models. Miina in his paper *Critical Success Factors of Lean Thinking Implementation in Estonian Manufacturing Companies* (2013) proposes to use lean implementation process model for successful lean adoption in a company. (See appendix 1.) It consists of several steps. First of all, everything is based on processes quality and standards. After goes lean knowledge acquisition by all employees, managers and owners of the enterprise. The third step is lean house development. Toyota Production System house has four basements blocks

such as Toyota Way philosophy, Visual Management, Stable and Standardised Processes and Levelled Production. It is also based on two pillars: quality and just-in-time. They show why Toyota way reaches their goals, which are the roof of the house.

The company needs to develop own lean house for own values, principles and tools. It means that the company sees lean through own prism and finds the way how lean will be implemented for them.

After developing lean house the next step is to train people of the company. To explain and to be sure that they understand what is lean house and how it works. The next is lean implementation process planning. After, follows lean implementation process execution. The final step is continuous improvement. It shows the ability of the company for further analysis of processes to search for new wastes and improve the situation again and again. (Miina 2013)

1.6. Lean implementation problems in SMEs

Implementing lean the organization also can face problems and barriers, especially small and medium enterprises. Dora *et al*. in the research *Application of lean practices in small and medium-sized food enterprises* (2012) discovered 20 major barriers of lean implementation. They are long set-up time between product types, high spoilage of products, variability in raw materials quality and supply, inadequate process control techniques and lack of resources. Furthermore, many problems are connected with people: lack of training and knowledge, poor delegation of authority, lack of top management commitment and poor employee participation. Some barriers have specific characteristics of food industry, as quality of food products and environmental standards need to be followed and maintained during the implementation process. For instance, failure in temperature control can cause a growth of micro-organisms which will result in safety problems, product spoilage and consumer complaints. Therefore, a lot of food enterprises focus on food safety and lean practices are ignored. (Dora *et al*. 2012)

Moreover, SMEs face problems in lack of proper funding and leadership deficiencies. Lean should be well planned before implementation and management involvement is required here because it affects lean adoption. Many SMEs have a fear that lean implementation requires a lot of money and time. Financial factor is crucial and has an important place in any

successful project. Many SMEs have poor financing resources. They fear that lean consultants, different trainings for people, different techniques and new equipment will cost a lot, so managers think that this will be unnecessary loss of resources and money. (Achanga *et al*. 2005)

Other researchers of implementation lean in small-sized companies Matt and Rauch (2013) summarized 7 difficulties which have small firms in lean implementation. First of all, many companies do not well know what is exactly lean and its methods. Usually methods like JIT, Kanban or other are used by large enterprises and many small firms are trying to apply lean principles without using main methods and tools. They implement lean methods and these methods are not well planned, structured and not standardised. Some practise also shows that many firms use phased approach or implement lean practice only in certain way of the company and ignore the whole systematic nature which limits the potential of lean (Dora *et al*. 2013, p.160).

Further, small firms want to get production efficiency through larger batch sizes and a minimised machine capacity. However, such strategy has a risk of losing flexibility on the market. The third problem is that small companies are afraid to have close collaboration with their customers and suppliers. They have fear to betray company secrets. On the other hand, trust-based partnership can lead to reduction of delivery time and eliminating of wastes for materials. Moreover, small companies often do not implement lean thinking on their own initiative. Usually it happens when their clients or suppliers insisted in the implementation to gain better productivity in the whole supply chain.

Lean thinking is also difficult to apply in small enterprises because of owners who often are not well informed and have no enough knowledge of lean principles and have fear of implementing something new that they do not trust. Many of business owners are good technicians who do not know about lean production know-how. Furthermore, small companies have difficulties in hiring qualified employees. The lack in intellectual capital is a generally problem for SMEs. It happens because of limited budget and limited level of development own career for people, especially for good specialists. Small companies are attracted only for young people who are coming from the university without any working experience. The final problem for small firms is that know-how-transfer by public and a private association is needed. Because of limited resources of small firms, different organizations, universities, local chambers should work on an integration of new techniques

through trainings, internships, further education, consulting service and coaching. (Matt, Rauch 2013, p.422)

1.7. How to overcome problems concerning lean implementation in SMEs

Implementation of lean is not easy process and there are many cases of lean failures. Only 10 per cent or even less of enterprises succeeded at lean implementation (Bhasin, Burcher 2006). It is also difficult to answer the question how to eliminate problems concerning lean adoption. All companies are different and all have specific features and conditions. Not all firms can implement the same techniques and methods of lean. However, lean is not only methods and tools, it is business philosophy that is based on Toyota's reputation for high profit and quality. The point is that lean thinking is becoming the way of business, the journey that never ends. (Bhasin, Burcher 2006, p.64)

Many companies are not ready to adopt lean principles because of lack of financials resources and other barriers. However, the main barriers include owners and managers of small organizations. They need to believe in lean, to have enough knowledge about lean philosophy and principles. They are who make decisions and motivate employees. If they do not believe in changes, they will not achieve goals. Human skills such as problem solving, communication, teamwork, leadership are necessary for success, and only people are reasons for lean failures (Bhasin, Burcher 2006, p.65).

Belief can have an important effect on any success. It is critical moment of any transformation process. It is necessary to make sure that people of the company of any level believe in new initiatives. To change the atmosphere in the company managers need to communicative with workers. Authentic communication and wide vision of the organization can be a source of employee belief. Communication is a key element of change process. It should include everything, organizational goals, vision, strategy, resources of the company. More people know, more they trust. Therefore, good communication leads to better worker commitment and all this affect lean success. (Losonci *et al*. 2011, p.35)

Moreover, to succeed in lean implementation the company needs to extend the supply chain, bringing the suppliers on board. Partnership can benefit both parties and financial and non-financial goals can be achieved.

Furthermore, many owners of small companies refuse of lean implementation because of lack of financial resources. However, lean have excellent examples of operational improvement which are based on cost avoidance. (Bhasin, Burcher 2006, p.65-66) Moreover, some of lean tools and methods such as 5S, visual management, value steam mapping do not require big financial resources. However, training of people does. Most SMEs employ workers with low skills levels and they do not try to improve own skills. This is what needs to be changed in the organization while lean is implementing, because some techniques require employee experience and skills. (Achanga *et al*. 2005, p.467)

Moreover, many companies do not know from where to start the implementation process. In this case, implementation process model can be applied and used as a foundation of lean adoption. Therefore, Miina (2013) suggests enterprises to use his model for successful lean implementation. The model form Miina is useful because it describes step-by-step implementation process. It is understandable, easy to read and follow all stages of adoption. Therefore, the author decided to apply this model for further implementation in the chosen company. All stages will be used and described in the third part of the thesis.

1.8. Lean in Estonia

Estonia is a small country with a number of citizens less than 1.5 million people. However, Estonia is considered as technology leader. IT and different online systems are very developed here. Nevertheless, the labour productivity of companies is not on the high level. For instance, the labour productivity per person employed in Estonia in 2012 was only 68.7 that is relatively small number comparing other European countries (Table 2).

There are different factors which lead to this situation in productivity of local companies such as high unemployment level in the country. This situation influence that it is very difficult to find skilled employees with education. Statistics shows that in 2011 56% of companies responded that for them is difficult to find skilled specialist, 58% responded that for them is difficult to find technicians and midlevel specialists and for 70% companies is a problem to find top specialists. (Kaarna *et al*. 2012)

However, the growth of productivity in Estonia can be seen now. For instance, in 1998 the total Estonian labour productivity was 37% of the EU average and now it increased almost double. This means that technological development and innovations are becoming more

important in Estonia. (Jauhiainen 2002) In this environment lean thinking implementation is an opportunity for improving productivity and empowerment of local companies.

Tabel 2. Labour productivity per person employed. (GDP in Purchasing Power Standards (PPS) per person employed relative to EU-27 (EU-27 = 100))

geo\time	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
EU27	100	100	100	100	100	100
Denmark	108.4	108.9	106.7	109.1	107.1	106.8
Estonia	48.5	51.2	54.9	57.6	60.7	62.3
Latvia	41.7	42.7	44.1	45.8	47.8	48.8
Lithuania	47.5	48.5	52.5	53.8	54.9	56.7
Finland	113.3	112	109.9	113.5	111.1	110.5
Sweden	109.4	109.1	111.8	115.4	111.9	112.9
Norway	137.6	132	135.6	144	154.3	158.9
UK	113.7	113.2	113.9	115.3	114.9	114.3
USA	146	145.1	147.2	148.5	149.8	145.7
Japan	99.7	99.9	100.6	101	100.2	97.5

geo\time	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
EU27	100	100	100	100	100	100
Denmark	104.6	105.7	106.8	113	111.5	111.6
Estonia	66.6	65.6	66	68.5	69	68.7
Latvia	53.9	55.1	57.2	59.4	62.3	64.1
Lithuania	59.5	61.9	57.9	67.5	71.1	72.1
Finland	113.5	113.2	110.1	108.8	108.3	1047.4
Sweden	114.7	114.1	112	114.4	115	115.8
Norway	153.1	159.5	146.4	151.6	156	160.4
UK	111.7	108.8	106.9	107.2	105.3	105.1
USA	144.1	142.2	146.1	147.8	-	-
Japan	97.7	95.3	92.3	95.9	94.1	-

Source: Eurostat

However, lean principles and lean thinking is not well known in Estonia. Being based on the research which was led in 2006 by Miina, only 7% of 700 manufacturing companies responded the questionnaire about lean. 30% of responded firms were familiar with lean manufacturing and only 14% used some of lean tools. (Miina 2008) Therefore, the theme of lean thinking can open new perspectives for Estonian companies which suffer from low productivity and performance.

Moreover, lean thinking can help companies to improve their product development process. Research which was held in 2009 showed that 78% SMEs do not use modern product development tools. Each company just has their own ways how to manage the product development. Here lean tools and methods can be useful for improving the situation. (Tähemaa *et al*. 2012, p.3)

The productivity in Estonia is not on the best level; however, the situation is improving every year. Lean thinking can be the way of changing situation inside companies, improving firms' structure, processes and techniques.

Therefore, it is very important to develop the way how to implement lean in Estonian SMEs. Small and medium enterprises constitute the main part of local market. Companies require special model which will help to adopt lean successfully. Chosen model from Miina (2013) is not universal. Moreover, according to Miina (2013), it is suitable for the batch type of manufacturing organizations. It requires further modifications and changes to apply it for Estonian SMEs. Therefore, it is necessary to develop general model for all types of SMEs to help them to implement lean successfully. For this reason, the author decided to use the model form Miina only as a foundation to complete it and to construct own implementation process for local small and medium sized companies.

1.9. Conclusion

The main key is to find out how to implement lean in the company. This question has no concrete answer. There are many methods and tools of lean, however, all companies are different and it is important to find own way of lean implementation for every enterprise. It will depend also on the level of development of operations management of the firm, its structure, politics and human capital. People are the most important factor; they are clue of lean implementation. The first step that needs to be done is to let people believe in changes

and good results of implementation. Moreover, managers and owners of small companies have also an important role here. They need to understand the reason of lean implementation, to understand future long-set goals, what they want to achieve and lead the process of changes with the philosophy of lean.

Further in this work the author will describe the way of lean implementation on the example of small Estonian company, where some of lean tools are used to improve the company's performance. Some tools will help to detect wastes and problems of the firm. General vision of the company will help to detect areas where to start implementation and how to start it.

In the final part of the paper, results and developed lean implementation process model for Estonian small and medium enterprises will be described.

2. RESEARCH METHODOLOGY

There are two main methods: qualitative and quantitative, which are used as a strategy for the research. Quantitative research includes numbers, statistic, anything that can be measured. It should have data that is defined more than just opinion (Forsyth 2007, p. 55). Qualitative research produces scientifically defensive theory, analytical strategy and samples. Originally there were a lot of discussions about research design. However, the gap between qualitative and quantitative methods becomes smaller, and some researchers combine them using both. (Trotter II 2012, p. 398)

In this study the author decided to use qualitative research method design for investigating lean implementation. The research question of lean is based on Estonian SMEs. Lean area is not well known within local enterprises, because of this, quantitative method is difficult to use. Moreover, the study is based on the research of concrete example of the company; therefore, a qualitative design was chosen as main method of this paper.

The author also constructed several steps in the research. These steps are presented in the table 3.

Table 3. Research methodology

Research step	Methods	Results
Literature study	Systematic research using domain-based strategy and snow-balling technique.	Theoretical framework of lean, lean implementation and problems concerning lean adoption in SMEs.
Company selection	Single-case study method; Criteria to refer the company to SME.	One Estonian small-sized company is chosen as the example of lean implementation in practice.
Data collection	Observation, archival source (documents), semi-structured interviews.	Fundamental and essential data is collected.
Data analysis and assessment	Content analysis; processes assessment by flow process charts.	General model of lean implementation for small companies is composed.

Source: (Miina 2013, complemented by the author)

The first step of the study was based on literature review through systematic research using domain-based strategy. As lean thinking implementation has not been studied so widely, snow-balling technique was also used to increase the number of authors and their works concerning lean thinking and implementation process. Moreover, only qualified databases were used for searching articles and electronic books for the thesis. Literature study results are presented in part 1 of the paper.

The next step of the research was based on the company selection. Single-case study method was applied. Only one small Estonian enterprise was chosen as an example of lean adoption in SMEs.

This allowed the author to collect fundamental data for the study through holding semi-structured interviews with the owner and employees of the firm; observation of the whole company's work, attending meetings and all processes; and archival source such as working with documents. After, all data was analyzed using the content analysis method. Processes of the enterprise were assessed by flow process charts. More detailed and open information about methodology and methods is described further in this chapter.

2.1. Literature study

In this study domain-based strategy was used as starting point in the research. The aim of this method is based on entering a new domain, or to give an overview of articles for the study to classify the literature. It can consist of an index range in the library, list of journals and articles, databases and a keyword search for e-databases. (Sorensen 2004, p.5) In the current study keywords were lean thinking, lean implementation and lean in SME. Further, the literature was categorised by information: historical background of lean thinking, lean implementation process and tools; and lean thinking in SMEs and problems concerning the implementation process.

Moreover, the snow-balling technique was also used in this study. Snow-balling strategy provides structured results. It includes identification of at least one article of relevance, and then reading reference sources. (Sorensen 2004, p.5) Especially, this method was applied for finding books and verified sources of information about lean thinking.

Combination of these two methods helped the author to optimise time required for material search, because domain-based is time-consuming technique; however, combining it with snow-balling reduces time spent on finding the information.

Table 4. Literature study methods and current study combination

Study type step	Domain-based	Current study	Snow-balling	Current study
Source	Domain in question.	*Lean thinking and lean implementation is SMEs.*	Not precisely defined, starts from e.g. overview article or "famous" article or book on the subject.	*"Famous" books such as "The Toyota Way" by J. Liker (2004), "Lean Thinking" by James I. Womack and Daniel T. Jones (1996) and others.*
Selection	Dependent on study.	*Lean implementation in SMEs.*	Not precisely defined.	-
Relevance	"Fit" with purpose of study.	*Fits with purpose of the study.*	"Fit" with purpose of study.	*Fits with purpose of the study.*
Validity	The subjective evaluation of the researcher.	*All used materials are valid and reliable.*	The subjective evaluation of the researcher.	*All used materials are valid and reliable.*
Completeness	Relevant, probably using the cross-search test.	*All used articles were completed and performed well-known sources of reference.*	Not relevant.	-

Source: (Sorensen 2004, p.6, complemented by the author)

All information about theoretical framework of lean thinking and lean implementation process is described in the first part of the thesis.

2.2. Selection of the company

First of all, the author used single-case study in the research based on an example of one company. As the author decided to base the research on analysing the situation of lean implementation in one Estonian company, single-case method is appropriate for the study.

Such technique has reliability, validity and generalizability (Beverland, Lindgreen 2010, p.58). Single-case study represents the critical case or experiment in testing a well-formulated theory. The theory has a clear propositions and circumstances within which the propositions are believed to be true. Using single-case method can confirm and extend the theory. Such studies can even help to refocus future research in the field. Single-case also is a unique case. Moreover, the researcher has an access to a situation previously inaccessible to scientific observation. (Yin 2003, p.47-49)

The author chose small-sized company from food and beverage sector. The research question of the paper is how to implement lean in Estonian SMEs. Therefore, first criteria for the company were to define, if the firm has these determinants of small and medium-sized enterprises or not (see point 1.3.). Therefore, the author composed table 5 to compare all criteria.

Table 5. Quantitative criteria for definition the company as SME

Criteria	**The Company (numbers from annual business report 2012)**	**"Fit" with the criteria**
Less than 250 employees	*45*	*Fits*
Maximum 40 million euro annual turnover	*582 384*	*Fits*
Maxim of 27 million euro balance sheets	*117 024*	*Fits*
Minimum of 75 percent of company assets owned by company management	*100%*	*Fits*
Owner-managers or their families manage the company personally	*Owner manage the company personally*	*Fits*

Source: (composed by the author)

Data from table 5 shows that chosen company has all elements of small and medium enterprises. However, the SME is subdivided into medium, small or micro companies (Loecher 2000, p.263). Characteristics of the firm refer it to small-sized enterprises with employees less than 50 people.

2.3. Data collection

The research is based on concrete example of the company. Therefore, general information of the enterprise was collected first for the study. The procedure included several methods such as observation of all processes in the firm, archival source (documents) and semi-structured interviews with the owner and employees. The emphasis was made on:

- Evaluation of main processes;
- Flow the products and information;
- People understanding of procedures during the work;
- Main goals and perspectives of the company;
- The level of lean in the enterprise;
- Vision of lean thinking in the company in the future;
- The process of lean thinking implementation.

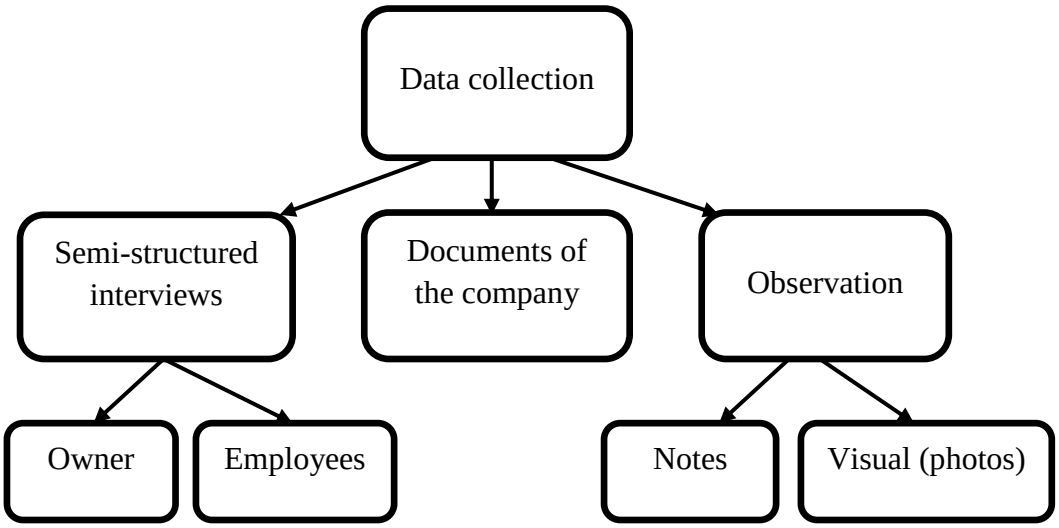


Figure 1. Methods of data collection

Source: (constructed by the author)

Interviews

First of all, the author started data collection from semi-structured interviews with the owner and after employees. The list of questions which were asked during interviews was composed by the author and it is presented below:

- Do you know what lean thinking is?

- What is lean thinking for you?
- What do you think lean can do for your company?
- How do you think lean is connected with the performance of the company?
- How lean is connected with continuous improvement?
- Does your company has continuous improvement culture? Is this culture shared between all workers?
- Do you have any procedures for work or processes improvement?
- Have you already started any lean implementation?
- What do you think will be the biggest difficult for lean implementation? How to overcome these difficulties?
- What do you expect from the first step of lean implementation?
- Which further steps can be for the implementation?
- How do you see the situation of the company now and in the future?
- How can you reach the future vision of the company?

These type of questions helped to provide the information about employees' awareness about lean, continuous improvement and company's future.

Moreover, during interviews with people the author found out that lean thinking is not known term. Therefore, several meeting were done to give the owner and employees the information and knowledge about lean, process of implementation and continuous improvement.

Observation

After interviews and meetings with people observation of processes of the company and document were held. Observation was done in two ways: notes and visual.

Visualisation is a method that helps to get insight into data. Visual factors transform data into pictures, which help to understand the problem more quickly. Visual data also support change process and can enable to see how it affects on implementation. It also helps to manage a large amount of data. (Arlbjorn 2011, p.152) During data collection a lot of photos were made to be able to analyse the situation in the company before and after first steps of lean implementation.

Moreover, the performance was measured using Key Performance Indicator (KPI). A KPI is a measurement which helps to record all important areas of a process, starting from a

performance point of view. A KPI can be anything about a process, which have an impact on performance. It can be any measurement to indicate the overall performance of flow of a process. It is also normal that a KPI is a combination of two or more factors, not a simple measure. It relates these factors into one number so that the value of the KPI is comparable day-to-day or week-to-week. . (Dudbridge 2011, p.39)

The mapping technique was also used in data collection of processes. It is a simple but powerful tool to visualise what happens in daily work of the company (Arlbjorn 2011, p.153). Employees of the company also were involved in the process of mapping, especially people, who worked in the area where mapping were held. According to Arlbjorn (2011, p.153) "the mapping process not only creates an overview of what is going on, but the process of creating the maps is also a strong collegial exercise that increases the knowledge level of the employees on what is actually going on in their companies".

Through mapping method it is necessary to detect value-added and non-value-added activities in the process. Therefore, after collecting data, the author decided to use for data processing and analysis flow process charts, which characteristics are described in point 2.4.

Documents

During the work in the company different document were observed, such as:

- working timetables of employees,
- process and work descriptions and standards,
- delivery routes of products,
- plans of work and flow of products,
- different standards requirements connected with food companies (Hazard Analysis Critical Control Points (HACCP) documents),
- plan of employees training for future,
- financial criteria of the company and others.

Data collection was performed during two months. After it was analyzed and assessed focusing on lean implementation procedures.

2.4. Data analysis

The method for content analysis was applied for data processing. According to Neuendorf (2002), "content analysis is defined as the systematic, objective, quantitative analysis of message characteristics". Therefore, the information and data collected in the research was measured and assessed.

In this study technique of flow process charts was used to analyse processes of the company. Moreover, these charts were after analyzed and compared before and after implementation.

Flow charts are a type of visualisation method that is used for information processing. Flow charts are based on several elements, which are characterised by different symbols. The most important signs are the start and the end points, which reflect the beginning and the end of a process. Information flow is also marked in charts. These types of charts are easy to read and understand. (Biege *et al* 2012, p.942) The example of flow process chart is shown below.

Table 6. Flow process chart example.

	Description of activities					
1	Receive orders					
2	Compose all orders					
3	Wait for processing					
4	Check availability of products					
5	Wait for processing					
6	Order products					
7	Wait for storage confirmation of delivery					
8	Confirm the delivery					
	Totals	4	0	3	1	0

Source: (complemented by the author)

First of all, to understand the process flow charts, it is necessary to know what means each symbol. The meaning and description for signs is given in table 7 below.

The example of charts shows that the process has 4 operations, 3 delays and one control. Using this information it is easy to notice that the process has many delays for small amount of actions. Eliminating these wastes it is possible to get new process with new combined flow chart. Moreover, comparing two charts before and after changes, it is easy to see improvements. Therefore, the author decided to use this method in the study.

Table 7. The meaning of symbols.

Symbol	Meaning	Description
	Operation	Task of a process, adds value
	Transport	Some distance move
	Delay	Waiting in a process
	Control	Some actions on checking
	Storage	Formal warehousing

Source: (composed by the author)

Before developing something it is important to measure it before and after. Karlsson and Åhlström (1996) described in their paper *Assessing changes towards lean production* measures how to assess different changes towards lean production. However, there are not given strict rules about grades and determinants in the paper; therefore, the author of this thesis decided to use grades form 0 to 3 to measure the level of first steps of lean implementation in the company (see table 8). Moreover, the choice to use this type of measurement was made based on the research made by Miina (2013). According to Miina (2013, p.56), grades "help to make a simple assessment of the result of companies' lean thinking implementation and are suitable for the Estonian case due to the same simplicity". Miina proposed to use the grades from 0 to 2; however, the author expanded the scale to 3 to assess the usage of determinants more accurately. Therefore, grade 0 means that the determinant is not applied and represents 0-25% of all possible activities and results. Grade 1 means that the determinant represents in the company 25-50% of all possible activities. However, the usage of the determinant is on a low level. Grade 2 means that the determinant

is applied on a medium level and represents 50-75% of all activities and results. Grade 3 means that the determinant is applied and used in the company on a high level with 75-100% of all activities and results.

Table 8. Grades for assessment the situation in the company

Determinants	Description	Grade
Implementation of 5S	Not implemented	0
	Implemented partly	1
	4S implementation	2
	Implemented with continuous improvement	3
Visual management	Not implemented	0
	Poor implementation (difficult to read)	1
	Implemented, visually recognised	2
	Implemented with technology help	3
Use of standards	No standards	0
	Unwritten standards	1
	Defined standards on paper	2
	Standards and document control	3
Level of stocks	Not controlled. Old materials	0
	More than 6 months	1
	Between 1 and 6 months	2
	Less than 1 month	3
Delivery	Not planned	0
	Routes	1
	Optimised routes	2
	Just in time	3
Lean knowledge	Not familiar with lean term	0
	Low level	1
	Medium level but without any use	2
	High level and usage in practice	3
Storage	Chaos	0
	Some products are not identified	1
	Products are identified	2
	Location and visual management	3
Continuous improvement	Not implemented	0
	Rarely used	1
	Used	2
	Implemented successfully	3

Source: (composed by the author)

This part of the thesis gives the review of way of literature and data collection, methods and their assessing techniques which were used during the research. The main part of the study with results is described in third part of the paper.

3. LEAN IMPLEMENTATION

3.1. Background of the company

Lean implementation process model is constructed based on real lean adoption in the company Narva Tes Plus. The enterprise works in food and beverage sector in Estonia. All data which demonstrate that the organization refers to small-sized companies is presented in table 5 in point 2.2.

Narva Tes Plus provides food service in different manufacturing companies and factories which are situated in Ida-Viru Country in Estonia. Moreover, the firm has canteens in three schools in Narva. Further in the paper all these places are named as food service areas (FSAs). The enterprise is also engaged in catering and delivery food to customers. The structure of the firm is presented below (see figure 2).

The company was founded in 1998. Nowadays, it hires more than 45 employees with the turnover about 600 000 euro. The organization is focused on development and improvement of performance in the market. In 2009, in the contest of Narva best enterprise, Narva Tes Plus got the nomination of "The Best Employer" of the year.

During lean implementation process Narva Tes Plus acquired several new everyday customers. The firm started to deliver fruits and vegetables to local kindergartens. The new project is supported by European Union food programme. This situation only extended company's position in the local market.

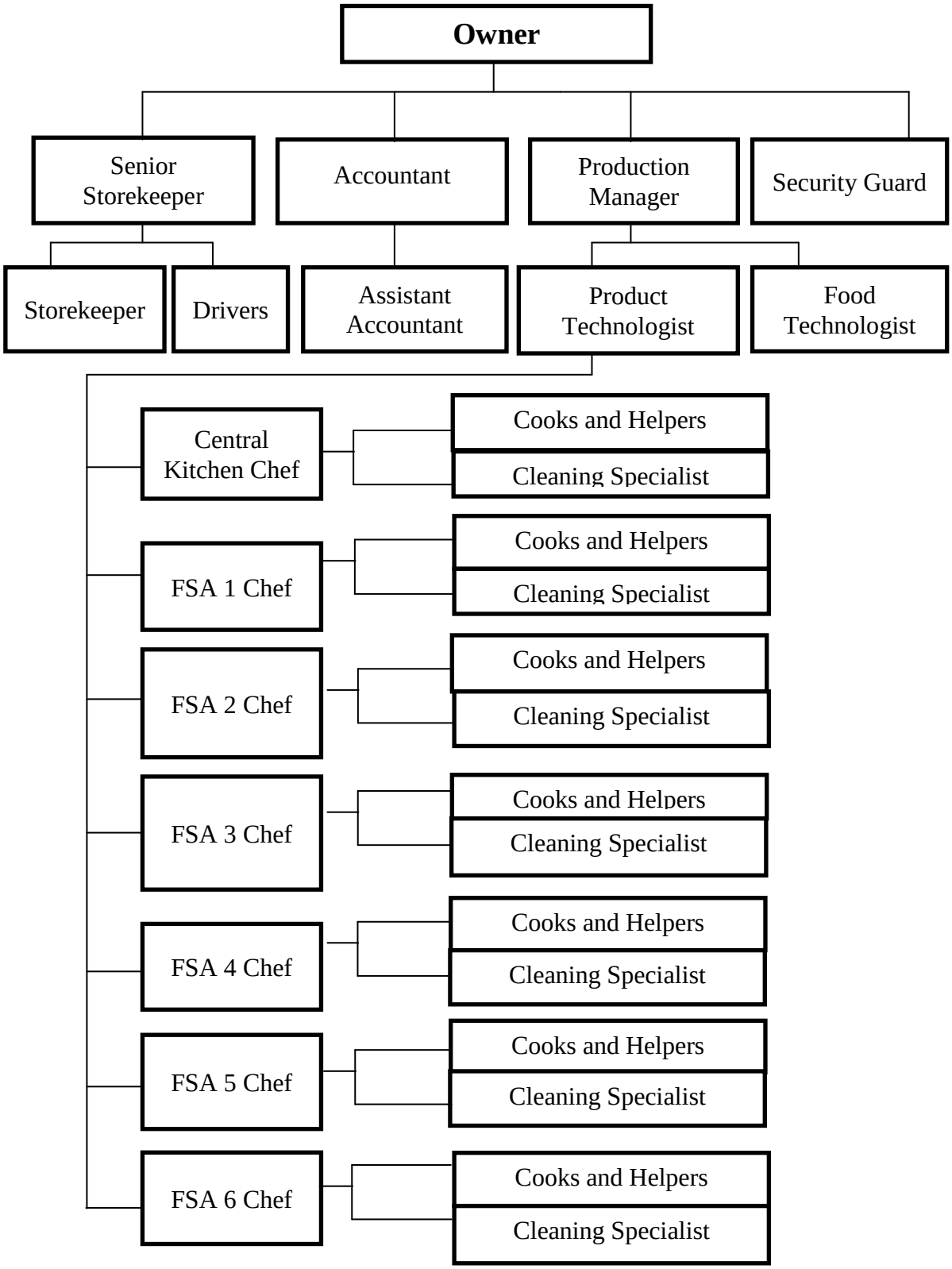


Figure 2. Structure of the company

Source: (composed by the author)

3.2. Description and assessment of processes of the company

Every process of implementation starts from analysing the situation, collecting data, processing and assessing it. The author decided to use the model from Miina (2013) (see point 1.5.). First step for lean adoption was to measure quality of processes in the company. This is the basis of any production enterprise.

To understand better how Narva Tes Plus works and which processes has, the author analyzed flow of products in the company (see appendix 2).

As it is seen from the scheme, there are 4 main processes in the firm:

- purchase process – ordering goods and raw material,
- delivery process – includes delivery to different food service areas (FSA) and customers,
- storage process which includes unloading and loading products and
- production process – main process.

Every process is described separately below based on specific features of food enterprise.

3.2.1. Purchase process

The senior storekeeper carries out the purchase process. The working day starts at 8:00 in the morning from ordering products and goods from suppliers by phone. The list of all raw materials and products is done on the previous day based on all requests from employees from all kitchens and food service areas of the company. First of all, the ordering process starts with all local suppliers who deliver products during the same day, after the storekeeper calls to suppliers who are situated out of the city. Usually, till 10:00 the ordering process ends. It helps to organise work in a rational way without ordering unnecessary products.

The delivery of goods and raw materials are done by suppliers during a day usually till 14:00. The process ends with the confirmation of arrival of products.

Flow chart below shows that the purchase process has only 6 activities, which consist of 4 operations, 1 delay and 1 control. The process is organised on a good quality level, which is done every day on the same way, following task by task in the right sequence.

Table 9. Flow chart for purchase process.

	Description of activities	Operation	Transport	Delay	Control	Storage
1	Receive orders from kitchen and FSAs					
2	Compose all orders					
3	Check availability of products in the storage					
4	Order products and goods					
5	Wait for storage confirmation of delivery					
6	Confirm the delivery					
	Totals	4	0	1	1	0

Source: (composed by the author)

3.2.2. Storage process

The main part of products after delivery to main building is separated and sorted by food service areas and central kitchen. Some products after separating are delivered straightaway to the kitchen on the second floor of the building, others which do not require necessary storage temperature are sorted among 6 food service areas and left on special shelves of the warehouse. These shelves are situated near the place where vans load and unload products.

There is one shelve stand for every food service area. However, during observation of the process was noted that it is difficult to understand for a new person which shelve stand is allocated for which FSA. Signs are made not for every shelf, not clear and by hand. Moreover, there is not enough space for all products; therefore, some of them are placed near the shelf stand on the floor. This situation blocks the passage for employees and causes wastes for the company (see figure 3).

Figure 3. Shelves stand for storage products before the delivery

Source: (made by the author)

Products and raw materials which require special temperature conditions after delivery are situated in special for this environment. Therefore, the company has several equipped rooms for keeping goods and raw materials. (See figure 4.)

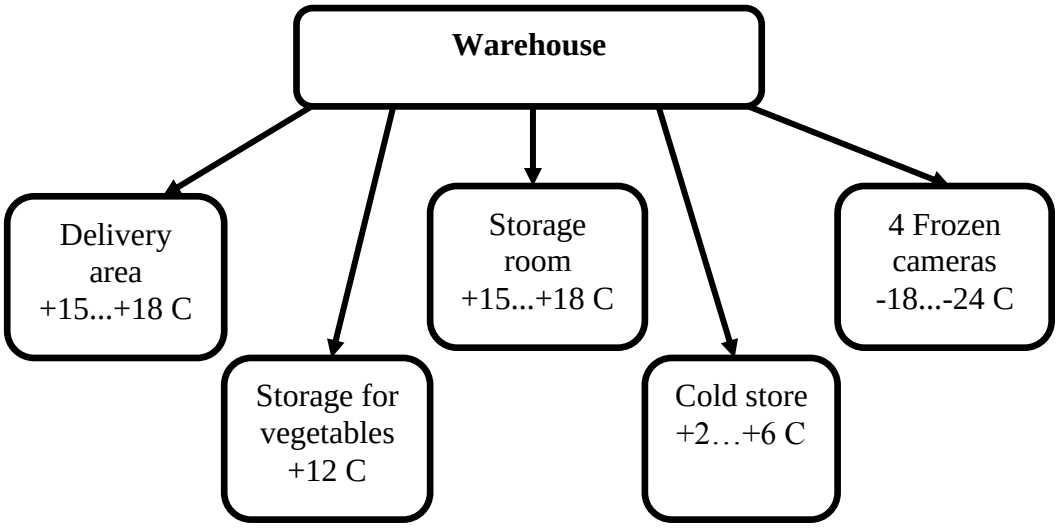


Figure 4. Scheme of warehouse of the company

Source: (composed by the author)

There are some daily demand products and goods which are in the storage every day such as vegetables, milk products and different kind of grits, frozen meat and fish, flour, salt, sugar, eggs, oil, raw material for confectionery products and others. They are also separated and stored in special temperature conditions required for every type of product.

There is one special storage room for vegetables with temperature not higher than +12 C. Usually lots of vegetables are not stored there more than two weeks. It is also depends on season. Vegetables ordered in autumn have better quality and longer shelf life. Vegetables that ordered in spring have smaller shelf life and worse quality.

There is also big cold store for products that require temperature +2…+6 C. There are several shelves for different kinds of raw materials and goods. One shelf stand is planned for keeping milk products and products for confectionery goods. Usually, milk products are kept in the cold store for 2-3 days and then the order is done again.

Another shelf stand is for storage vacuum packed vegetables and fruits and the last one is for eggs. It is very important to keep eggs separately not to infect other raw material and products with salmonella.

Moreover, the company has also special frozen cameras for storage meat, fish and ice-cream. There are two cameras for meat, one – for fish and one – for ice-cream.

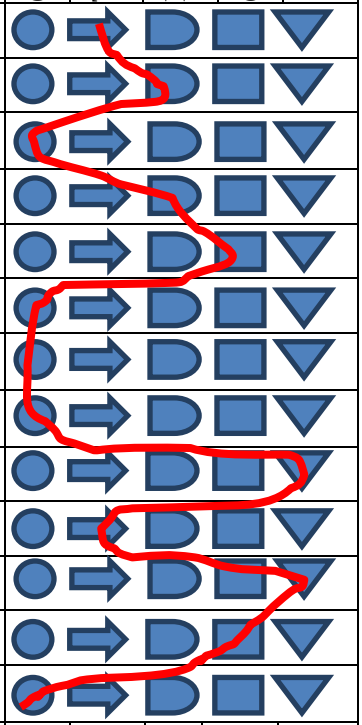
The firm has also one room with the temperature not higher than +18C to store products such as sugar, flour, different grits, spices, water, juices, chocolate and others.

It is very important to follow all necessary rules and standards in storage process. It is not possible to keep huge stock of products in the warehouse, because shelf life of food goods is short comparing with other materials. It is impossible to have 100 tons of milk for half a year because the raw material will be spoiled. Therefore, managers and owners of food companies need to understand all these moments during lean implementation.

The storage of raw materials and products is very important in food enterprise. Therefore, the quality of the process needs to be on the high level without wastes and have minimum number of non-value-added activities if it is impossible to eliminate all. Description of all activities in the process is shown below (see table 10).

Table 10. Flow chart for storage process.

	Description of activities	Operation	Transport	Delay	Control	Storage
1	Products arrive					
2	Wait for invoice					
3	Take an invoice					
4	Wait for unloading of products					
5	Check goods and documents					
6	Accept the delivery					
7	Confirm the purchase about the delivery					
8	Separate and classify products					
9	Leave some products in delivery area					
10	Transport other products to special storage rooms					
11	Storage					
12	Check conditions of storage rooms					
13	Insert documents into information system					
	Totals	5	2	2	2	2



Source: (composed by the author)

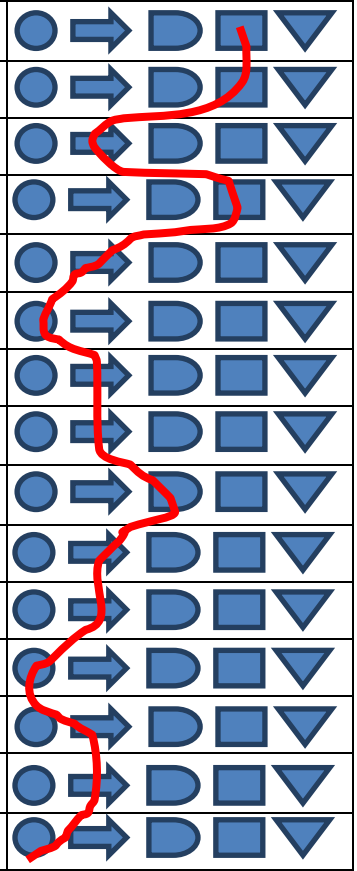
3.2.3. Delivery process

The firm has several FSAs and clients where they need to deliver products and goods. Moreover, there are four suppliers who do not have transportation service, so Narva Tes Plus takes products itself. To deliver raw material and different goods the company rents two vans. One van has less capacity than another one because of additional seat places for people. These places are used for transportation employees to food service areas which are situated out of the city (FSA 1, FSA 2 and FSA 3).

To organise work easier, the company has route schedules for every van. The schedule is standard and does not change every day. The delivery starts at 7 in the morning and ends at 4 p.m. All activities of the process are presented in table 11.

Table 11. Flow chart for delivery process.

	Description of activities	Operation	Transport	Delay	Control	Storage
1	Check the delivery route for the day					
2	Check documents and products in delivery area					
3	Take other products from storage rooms					
4	Check all products again					
5	Take and load products into the van					
6	Sign the delivery					
7	Start the route					
8	Arrive to customer or FSA					
9	Wait for customer or chef					
10	Unload products					
11	Move products to storage					
12	Take signed documents					
13	Continue delivery					
14	Come back to main building					
15	Give to storekeeper all signed documents					
	Totals	3	8	1	3	0



Source: (composed by the author)

The quality of this process was assessed before lean implementation and got score 1 for using standard routes in everyday delivery. This process is not ideal, there are some activities that do not give value and can be eliminated: such as checking products twice. Moreover, implementation of cross-functional team also can reduce or eliminate waiting time in ninth activity.

3.2.4. Production process

Production process is the main process of the company. There are more activities than in other processes. Therefore, this part is important for lean implementation and it needs to be standardized.

The process is carried out in the central kitchen of the main building of the company. Different types of semi-finished and finished products are cooked there and then are delivered to all FSAs and customers. This process is followed every day.

First of all, the chef checks the forecast menu two days before. Then she orders food from the storage. After delivery, raw materials are transported to central kitchen storage and are stored there till production. After, required goods are moved to different shops, such as: cold shop, confectionary shop, meat-fish shop, vegetable shop and hot shop, where semi-finished products are prepared. Further, goods are moved to central kitchen where starts operation of cooking. When the food is ready, it is placed into thermos containers and delivered to others FSAs and clients. The flow of the whole process is presented in appendix 3.

The analyses of all tasks and activities showed that the process quality is not on a high level. There are non-value-added activities. Moreover, fluctuations of performance of tasks are not constant every day. Based on this, the author decided to overview the production to improve the performance.

This process adds a lot of values for the company. All operations and tasks should be based on standards, in this case – food standards and security control. Therefore, 5S (clean and tidy) is one of the most necessary tools of lean implementation in this area. For this reason, it is the most important process of analysis.

3.2.5. Summary of assessment processes

Analyses of the company showed that Narva Tes Plus has four processes: purchase, storage, delivery and production. All these processes were assessed with the flow charts technique.

The quality of the purchase process is on a good level. All operations are carried out every day task by task without fluctuations.

Storage process is organised with disadvantage and wastes. Some products and goods are stored on the floor in the delivery area after separation. It is caused by limited capacity of shelves. For this reason, products and goods block the passage for employees. Moreover, the quality of process suffers from poor visual management and non-value-added activities.

The quality of the delivery process was assessed and got the grate 1 for using routes in delivery every day. However, the process has some wastes that can be eliminated and the standardization of the process should be improved by writing all tasks on the paper and provide these documents for employees. Moreover, implementation of cross-functional team can help in performance improvement.

The main and key process of the company is the production. The analyses of activities showed that the quality and standardization of the process is poor. Fluctuations of performance of operations are not constant every day. However, the performance of this process should be on the high level because the production area adds key value for the firm. Therefore, it is important area of the assessment.

3.3. Lean knowledge acquisition

Following the model by Miina (2013), the second step in lean thinking implementation process is lean knowledge acquisition. The first part of this step was made with interviewing Narva Tes Plus management before measuring operations in the company. The process started with investigation if the owner was familiar with lean thinking and which perspectives on the future of the company she had. Therefore, questions which are presented in point 2.3 were asked.

Received information showed that the owner of the firm had never heard about lean thinking before. Therefore, during the interview the author also presented information about lean, such as:

- what it is;
- some basic characteristics of lean;
- why lean implementation is useful and important for the company;
- benefits of lean.

The next part of this step was held during observation of operations. Semi-structured interviews were held with employees who were directly connected with processes which were analysed. The author found out that lean thinking is not known term among workers. Therefore, some basic explanations and knowledge were presented for people. The information was introduced in a simple way based on examples and showing how some tasks can be changed to optimise working environment and performance.

Based on the implementation experience of this step in Narva Tes Plus, the author proposes to put lean knowledge acquisition before process quality step. According to Dudbridge (2011), everything starts with a team. Therefore, first of all, it is necessary to build a team with lean understanding knowledge capacity and then to start all other steps of implementation.

3.4. Lean house development

The next step of lean implementation is lean house development. Standard lean house for Toyota Production System is described in chapter 1.5. In general this model is a foundation of lean and its implementation. It is based on global levels such as philosophy, visual management, standardised processes and analyses of production.

However, analysing Toyota Production house the author made a conclusion that it is difficult to adopt this model for SMEs at once. Small and medium enterprises are not ready to spend significant resources on changes because of lack of them. Moreover, considering the situation of concrete Estonian small-sized company, the author decided to focus and develop basic levels and tools of lean house, which are suitable for local SMEs. Therefore, it was developed general lean implementation house which is suitable for lean adoption in Estonian small and medium enterprises. (See figure 5 below.)

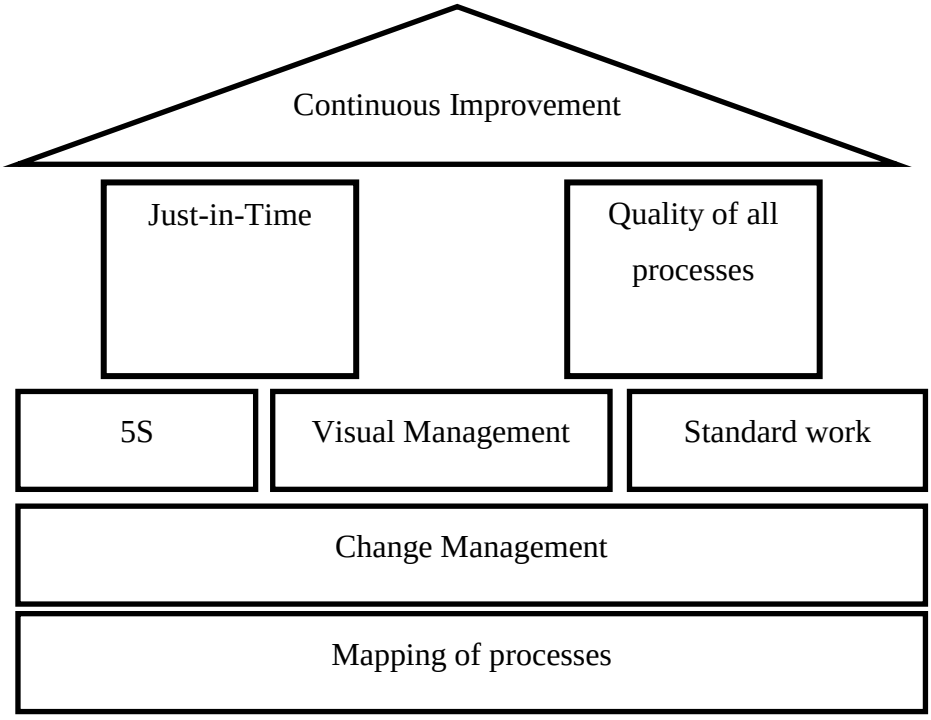


Figure 5. Lean house for SMEs.
Source: (constructed by the author)

The author constructed the foundation of lean house, where first tool is mapping of processes. It helps to understand all processes of the company, their connections, flows and value-added activities. To start with mapping will give the idea of how the enterprise works. Usually, the only person in SMEs who knows the general vision of the firm and all processes is the owner. However, sometimes his or her vision can be different from the reality. Therefore, it is a good point to start and make first measurement and assessment of the situation of the company. For mapping it can be used Value Stream Mapping or flow process charts and other techniques. In this paper the author used flow process charts to measure processes before lean implementation and after. This method was applied because it is clear, understandable, easy comparable and visual (see point 2.4.).

The next step is Change Management. It is necessary to manage the change of philosophy to be able to reach the success of lean implementation. In SMEs the influence of the owner is very important. He/she is the one who needs to understand what lean thinking is and why it is effective and useful for the enterprise. He/she has the influence on employees and can convince people to follow right direction. Otherwise, successful lean implementation

will not be reached. After, it is necessary to explain employees that lean thinking is a solution, not a problem. Lean is the way to be competitive and to survive in the market, to improve performance of the company.

Then, based on assessing processes and changed philosophy, following tools should be adopted: 5S, Visual Management, Standard work (see point 1.5.).

According to the author, 5S was chosen because it is based on standards, provides better work environment, helps to analyse processes easy and does not require high resources for implementation it in the company. Moreover, 5S is based on simple rules which every enterprise should follow to perform work and processes in a better way no matter if it is office or manufacturing enterprise. Especially 5S is very important in food companies. Some parts are already applied in these firms because of standards. Every food enterprise should have Seiso (clean-up), Seiketsu (to maintain the process) and Shitsuke (to do it as a habit). However, all parts of 5S need to be adopted and used every day as a way without which is impossible to work. It is easy step of lean implementation for SMEs to get good performance without high investments.

Visual management is the next tool of lean which is necessary to adopt in SMEs. It is a simple, clear and cheap way to make work easier and to increase performance, reducing time for searching things. Visual management was applied in the company to identify different areas in the warehouse, to manage deliveries and flow of products.

The next and important tool of lean is standard work. Every company has some standard elements of everyday work. However, these elements should be organised as standard processes. Based on the example of Narva Tes Plus, the author made a conclusion that despite the fact SME follows food standards, not all of them are recorded or written in some way. To implement lean it is necessary to have concrete list of standardized steps which should be followed.

The next and necessary part of lean house is just-in-time approach. Based on concrete example of Narva Tes Plus, which delivers food every day to different FSAs and customers, this lean tool is an important part of the business. This fact shows that the process is connected to all areas starting from purchase to production.

Quality of all process is extremely important for the company. It means that the process is standardized and results or outputs do not change when inputs are the same. It is

difficult to reach the high quality for small-sized enterprises because most of processes are not automated.

The roof of lean house is continuous improvement. Every SME or big enterprise should have this final step of implementation. Everything is changing and continuous improvement is needed to be applied to every action, task or operation.

Developed lean house for SMEs is not universal. It is based on analysis of concrete example of small-sized Estonian food company. It was used as a foundation for lean adoption in Narva Tes Plus. This model also can be applied for Estonian small and medium enterprises in a process of lean implementation. Moreover, some approaches can be added to the model depending on the area of the company.

3.5. Training people

According to Miina (2013), the fourth step of lean implementation is lean house communication and training. After lean house was developed and discussed with the owner, two meetings with all employees of the company were held. The one was done before lean implementation and the other – after, to present first results.

The purpose of the first training-meeting was to explain to all workers what is lean thinking, which methods and tool will be used during implementation and which changes will be made. Training concerned:

- lean thinking in general,
- 5S,
- standard work,
- visual management,
- just-in-time,
- quality of processes and
- continuous improvement.

It is necessary to notice that at the beginning of the training the attitude of employees was negative. Some of them did not want to make any changes in their standard work because all changes are connected with an effort. However, the author tried to explain that with lean

everyday tasks will be easier and lean thinking is not a problem, it is the solution to improve the performance and be successful company.

The second meeting was held already after first implementations. It is necessary to analyse the results, to know the followed direction and probable mistakes. It is important to present the information to employees to show results of changes, in which they are involved every day.

First steps of lean, its implementation and some tools knowledge were acquired by employees. However, deeper training of lean is needed in the future by lean consulting companies. Continuous improvement is necessary in everything, starting from people.

3.6. Lean implementation planning

The process of lean implementation started already in February 2014 with data collection and semi-structured interviews with people. After assessing processes and operations, providing lean knowledge to employees, developing lean house and training people, lean implementation was planed. This step started from choosing the area for adoption of first lean tools. (See point 3.6.1.)

3.6.1. Choosing processes for implementation

First of all, lean implementation was planned starting from choosing operations for changes. According to the author, two areas were selected:

1. production process and
2. storage process.

It is important to start real implementation from the heart of all operations. In this case the main process is the production area. It is the biggest process with the highest number of actions. The analyses and assessment of operations showed that the process has poor quality. There are presented non-value-added tasks. Transport, storage, handling are operations that are identified as non-value-added activities (Dudbridge 2011, p.95). However, it is impossible to eliminate all of these operations. Therefore, this type of activities should be reduced to minimum and the production process is the one where these changes should be done.

The second and also important process for lean adoption is the storage. All processes of the company are connected with the warehouse. After ordering products, raw material is delivered to the storage. Moreover, further from the storage products are transported to central kitchen for production and other food service areas. This process is necessary to be organised in a proper way without delays and extra actions. According to Dudbridge (2011, p.95-97), the storage need to be cleaned and best control measures applied. Stocks should be maintained and counted weekly or daily to ensure that materials are not wasted.

However, analysing and assessing all operations it was detected a lot of wastes and disadvantage, such as:

- poor visual management in storage rooms, which gives only 1 grade in assessing the process;
- Not identified products during storage;
- Unwritten standards in available place for it;
- Some non-value-added activities.

Furthermore, assessment of all determinants, which are presented in point 2.4, before lean implementation, showed that high number of problems was in the storage. Therefore, lean adoption was started from the warehouse and the production area.

3.7. Lean implementation execution

Lean implementation execution is the main part of the whole process model. According to the author, lean tools were applied in the production and storage areas. First steps were done in the warehouse with 5S and visual management adoption.

In the description of storage process (point 3.2.2.) was mentioned that there were not visual signs in the delivery area. Moreover, there was not enough space for all products; therefore, some of them were left near the shelf stand on the floor. It caused wastes by blocking the passage for employees. Therefore, the author reorganised this area with workers and expanded the capacity of shelves not to keep products on the floor. Furthermore, visual solution was also applied in this area. Every shelf stand was indicated with special signs for FSA. Moreover, the floor was also marked to ensure that goods cannot be kept there. (See figure 6).

Figure 6. Implementation of visual management in the delivery area
Source: (made by the author)

Furthermore, changes in visual information and classification of products stored on different shelves were also applied in the cold camera. There are three shelf stands in the camera. Every stand was marked with letters from A to C. Every shelf was numbered from 1 to 3 (from the bottom to the top) and goods were classified. (See table 12).

Table 12. Classification of products in the cold camera.

Name	Shelf stand	Number of shelf
Fruits	A	1
Vacuum packed vegetables	A	2
Canned goods	A	3
Eggs	B	1
Sauces	B	2
Confectionary raw material	C	3
Milk products	C	1 and 2

Source: (composed by the author)

This classification is important for the storage to standardize the process and identify all product stored there. This method helps to find necessary products without difficulties and wasting time.

After improving the storage visually, changes in the flow of activities were applied. All steps of operations were analyzed and time for performing non-value-added activities was reduced to the minimum. Moreover, accurate descriptions of all operations and tasks were presented to employees. It is important to standardize the process not only in general and employees' mind, but also on the paper.

In the production area the focus was made on analysis of details of some key activities, to eliminate wastes and improve the performance of main process. Some non-value-added activities were identified and recognized as unnecessary ones because of duplication. The other group of such activities was necessary for completing production process. However, these tasks were also overviewed to reduce time for performing operations. Therefore, the process was modified and improved.

Another part of lean implementation in production area was to adopt 5S, where different steps were done, starting from detecting all unnecessary things (Seiri) to putting in order all material and equipment (Seiton). In this case, Seiso was already implemented by the company based on food safety standards.

Moreover, visual management was also implemented in the process, following the same structure as it was applied in the storage process. Different areas were marked with coloured paperworks, dangerous zones were designated and cards to identify shelves were implemented. According to Dudbidge (2011), food company or factory should be visual because it makes the work easier, and "easier means quicker, and quicker means cheaper".

Furthermore, all standards were printed and presented among workers. It helps to follow all steps and activities in the production. Results of the implementation are described below.

3.8. Results

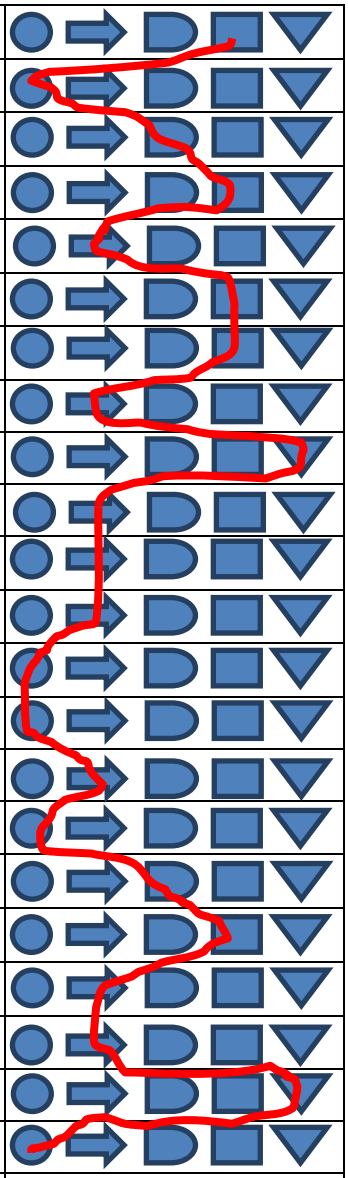
Results of lean implementation in the company were measured after two months in qualitative and quantitative ways. Qualitative measurement was done during the second meeting with employees. Not only quantitative results of first steps of lean implementation

were presented to workers, but also their opinions, feelings about all changes were asked. The discussion showed that more than 70% of employees involved into the implementation process are satisfied with changes. This is because one goal of lean adoption was to make everyday work tasks easier for people of the company. Moreover, the performance of storage process became faster because of reducing time of some activities which does not add value. Visually changed environment, implementation of 5S and standardized work helped to improve quality of the process. Changes are presented in the figure 7 below.

Figure 7. Implementation of visual management in the warehouse before and after
Source: (made by the author)

Furthermore, elimination and reorganization of some non-value-added activities changed the production area. Some of tasks were eliminated from the process. The others, which were connected with vegetables, were reorganised in another process for better work performance. The result is presented in the flow chart below.

Table 13. Flow chart for production process after eliminating non-value-added activities

	Description of activities					
1	Check the forecast of a menu two days before					
2	Make an order for storage					
3	Wait for products					
4	Call from storage					
5	Go to take products from storage					
6	Check documents and products					
7	Inform storekeeper					
8	Move products to central kitchen storage					
9	Storage of products					
10	Take products from kitchen storage					
11	Move products to different shops					
12	Take peeled and sliced vegetables to cold shop / central kitchen					
13	Prepare raw material for cooking in different shops					
14	Prepare semi-finished products					
15	Move semi-finished products to hot shop					
16	Prepare finished products					
17	Wait for products to be ready					
18	Check readiness					
19	Put food into thermos containers with documents					
20	Move containers to delivery area					
21	Storage					
22	Confirm the readiness of products for delivery					
	Totals	5	8	2	5	2

Source: (composed by the author)

To measure results of lean implementation in quantitative way, the author compared assessment grades before and after adoption of first lean tools. (See table 14.)

Table 14. Assessment of determinants before lean implementation and after

Determinants	BEFORE		AFTER	
	Description	Grade	Description	Grade
Implementation of 5S	Implemented partly	1	4S implementation	2
Visual management	Poor implementation (difficult to read)	1	Implemented, visually recognised	2
Use of standards	Unwritten standards	1	Defined standards on paper	2
Level of stocks	Less than 1 month	3	Less than 1 month	3
Delivery	Optimised routes	2	Optimised routes	2
Lean knowledge	Not familiar with lean term	0	Low level	1
Storage	Some products are not identified	1	Products are identified	2
Continuous improvement	Not implemented	0	Rarely used	1

Source: (composed by the author)

Moreover, the diagram below helps to see changes and improvements visually after first steps of lean implementation in Narva Tes Plus.

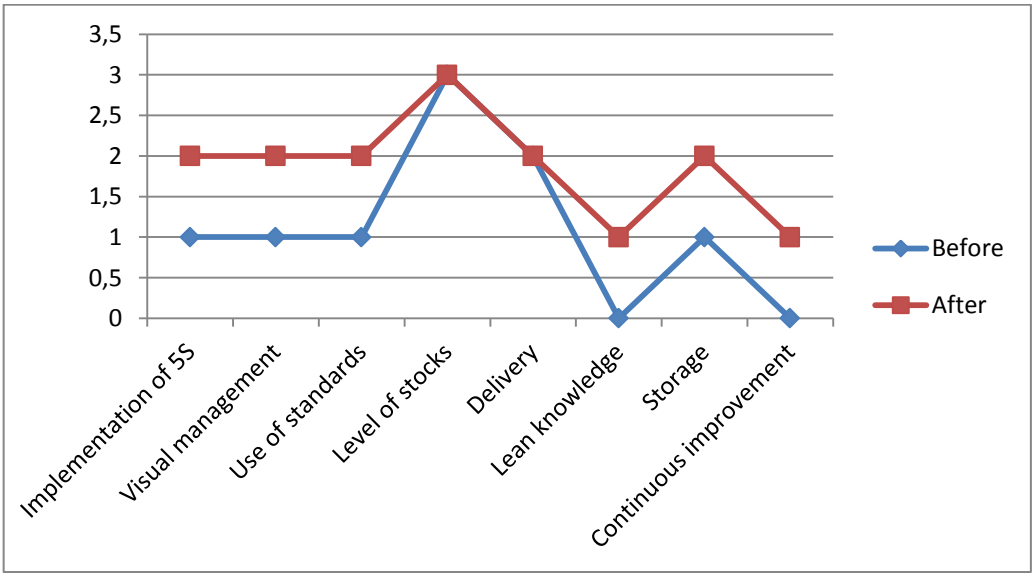


Figure 8. Graphics of situations before and after lean implementation

Source: (composed by the author)

According to initial objectives of lean implementation in Narva Tes Plus, adoption of fist steps is considered as successful with positive results, which show improvements in

company's performance. Despite the fact that only some tools were implemented, the road for lean thinking has started for the company. Moreover, this real example of lean adoption, became a foundation for construction of lean implementation process model for Estonian SMEs. The model is presented in point 3.9.

3.9. Lean implementation process model for SMEs

Based on all steps of lean implementation in Narva Tes Plus, the author composed the model for lean adoption for Estonian small and medium enterprises.

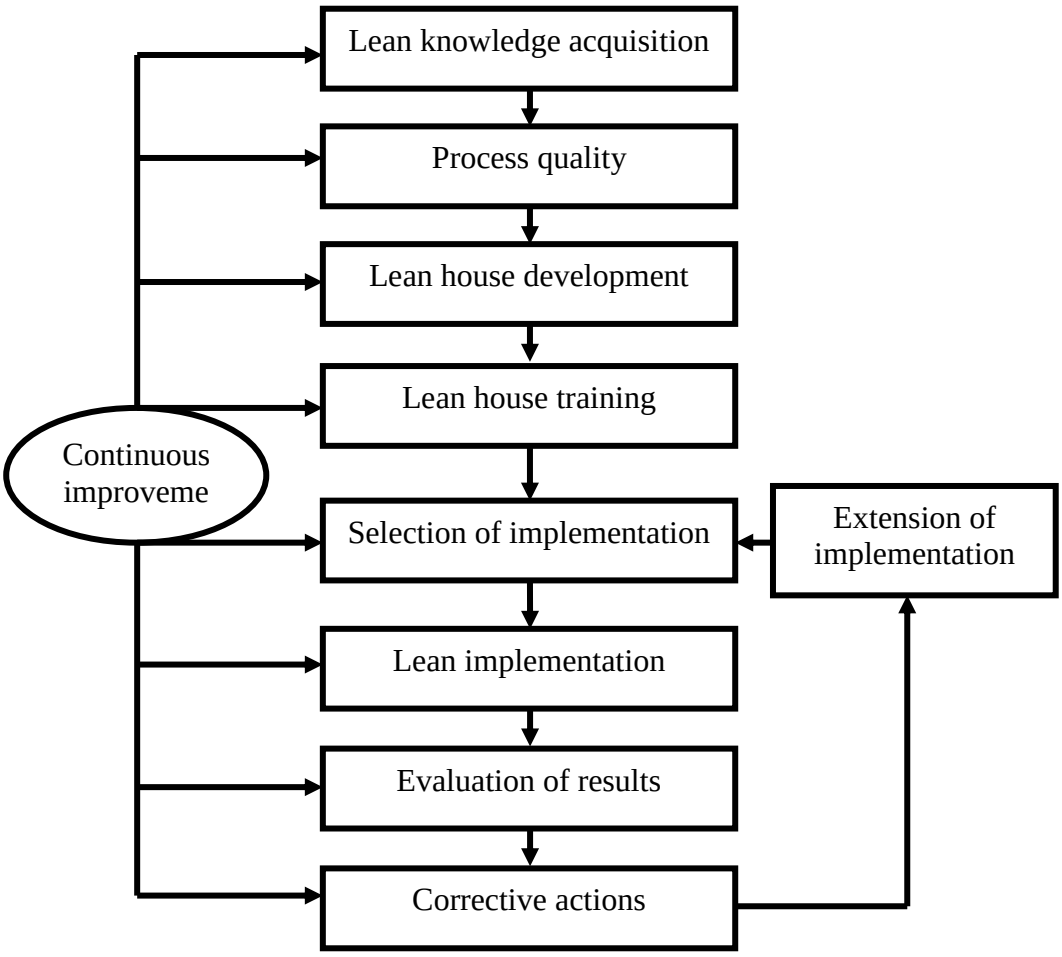


Figure 9. Lean implementation process model for Estonian SMEs
Source: (constructed by the author)

According to the author, the first step in implementation process is lean knowledge acquisition. This is the foundation of the model, especially for Estonian SMEs, which are not familiar with lean thinking term. It is necessary to provide information about concept and benefits of lean, why the company requires it and how lean can change and improve working environment and general situation of the enterprise.

The second step of the model is measuring process quality. Any firm is engaged in many tasks every day. It is necessary to organise the flow of process or processes in the same and standard way providing high results and performance. Usually, owners of small and medium enterprises do not pay attention on this step because of lack of time. However, standardisation of operations, especially visually on the paper, will save time and eliminate some non-value-added activities.

The third step in the implementation is lean house development. The author constructed own house model for SMEs, which is described in point 3.4. The model is based on main principles and tools of lean, which implementation is simple, does not require high investments and efficient. These factors are very important for SMEs, because lack of financial support and time are main barriers for any changes. Moreover, without knowing from where to start and which tool to choose, owners of small companies can face difficulties in lean adoption. The model in not universal. Therefore, the lean house, which is proposed by the author, can be the foundation for developing appropriate lean house depending on the field of Estonian SME. The wholly model can be used in implementation or some tools can be added.

The next step after developing lean house is lean house training. This part is very important in the process. People are those who make changes in the company. Based on this, it is necessary to train them tools and to provide all information about lean implementation. Employees should understand why and how changes are made.

After all these steps planning of lean implementation is needed. Based on the example of Narva Tes Plus, during this step processes of changes were selected. The choice begins from analyses of all operations and working environment of the company.

Furthermore, real lean implementation execution is being held. It is very important after small period to measure results of first steps to know the followed direction and after to evaluate changes and the situation, to make corrective actions and to extend implementation area. Lean thinking adoption requires time. It is difficult for SMEs to start the implementation

in all processes. First of all, the foundation for lean should be based, the direction needs to be chosen and after, step by step, to implement lean in the whole company, to start being lean enterprise with lean philosophy.

The final and necessary step in the implementation model is continuous improvement. It should be in every task operation and action. Nothing is stable, environment, market and competitors are changing. Therefore, to improve situation it is important to continue developments. Only this way will bring successful lean implementation.

CONCLUSION

Lean thinking principles were developed for Toyota Production System (TPS) to eliminate wastes and improve performance of the company. After long way of changes successful results were gained. Further, companies from all over the world started to implement lean through automotive manufactures. Nowadays, lean principles are implemented in all sectors and in different sized companies. Using lean tools the firm can increase profitability, improve the productivity and have an advantage in the market.

However, lean term is still not familiar for majority enterprises. Moreover, many companies have fear in front of lean implementation due to lack of information and knowledge about lean thinking and philosophy. It concerns small and medium enterprises which have bigger difficulties in lean adoption than companies like Toyota. As an example, lean technique is not widespread among Estonian SMEs. Local companies have smaller labour productivity than the EU average. This fact makes Estonian enterprises less competitive in foreign market. In this environment lean thinking implementation is an opportunity for improving productivity and empowerment of companies. However, problems which are caused by lack of training, financial support, poor employee participation and management involvement stops companies from implementing lean. Moreover, the absence of concrete process model how to adopt lean and its tools also becomes a big barrier for SMEs. Therefore, the author decided to take general model by Miina (2013), which was developed during the research of Estonian manufacturing companies, to improve it and to complete for small and medium sized enterprises. The development process was based on lean implementation in local small-sized company Narva Tes Plus.

Therefore, the main aim of this thesis was to find the way how to adopt lean in the small company and to develop implementation model for Estonian SMEs. For this purpose, single-case study method was chosen and applied for the organization from food and beverage sector.

First of all, the research was based on data collection and analyses. The procedure included observation of all processes and documents of the company, conducting semi-

structured interviews with the owner and employees. Data was assessed with content analysis and operations were measured with flow process charts. This technique helped to detect non-value-added activities and weak places in the organization. Moreover, to assess processes before and after implementation, the author used grades from 0 to 3, where grade 0 means that the determinant is not applied. Grade 1 means 25-50% of all possible activities, grade 2 means that the determinant is applied on a medium level (50-75%). Grade 3 means that the determinant is applied and used in the company on a high level (75-100%).

Lean implementation included several steps such as: assessment and description of all processes, lean knowledge acquisition and lean house development, training people, lean implementation planning, execution and results.

First step of measuring the work in the company showed that there are four processes: purchase, storage, delivery and production. The quality of all these processes was assessed and described in the paper. According to the author, two areas of the company: production and storage, had many disadvantages. There were detected non-value-added activities, unwritten standards and poor visual management. Therefore, further in planning of implementation, these two processes were chosen as starting point of lean adoption.

The second step of lean knowledge acquisition involved interviews with people directly connected with analyzed processes. It was noticed that employees were not familiar with lean thinking and its principles. Therefore, information about lean was introduced based on simple examples and showing how some activities can be changed to improve working environment.

The next step was based on developing general lean house for Estonian SMEs. It was also used as a foundation for lean adoption in Narva Tes Plus. The model of this lean house has five levels. First level is mapping of processes. The second - is changing management in the organization. The third - is adoption of 5S, Visual Management and Standard work. The next level is the implementation of just-in-time approach and quality of processes. The final level or roof of the house is continuous improvement.

After lean house development, two meetings were held to train employees some lean methods and tools, to explain that lean thinking is applied as the solution of performance improvement.

After all these steps, lean tools were implemented in the warehouse and the production area. Results, which were measured after two months of implementation, showed that more

than 70% of employees involved into the implementation process are satisfied with changes. Moreover, the performance of storage and production processes became faster because of reducing time of some activities which does not add value. Visually changed environment, implementation of 5S and standardized work helped to improve quality of processes. The whole this adoption of lean in Narva Tes Plus became a foundation for construction of lean implementation process model for Estonian SMEs.

According to the author, developed model can be the basis for small and medium Estonian enterprises in lean implementation process. Steps of the model are: lean knowledge acquisition, process quality, lean house development, lean house training, selection of implementation area, lean implementation execution, evaluation of results, corrective actions, extension of implementation area and continuous improvement.

Answering the research question how to implement lean in Estonian SMEs, the step by step model was constructed based on concrete example of Narva Tes Plus. In the future, lean thinking approach and its implementation process can be studied more deeply to continue further development.

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KOKKUVÕTE

Eesti turu põhilise osa moodustavad väikese ja keskmise suurusega ettevõtted (VKE). Sellegipoolest on kohalike ettevõtete tööviljakus madalam Euroopa Liidu keskmisest. See teeb aga Eesti ettevõtted vähem konkurentsivõimeliseks. Seega kulusäästliku mõtlemise rakendamine on võimalus ettevõtete tootluse ja võimestamise parandamiseks.

Kuna väikese ja keskmise suurusega ettevõtete ees tekivad kulusäästliku mõtlemise adapteerimisel suuremad takistused kui suurtel ettevõtetel, on selle magistritöö eesmärgiks luua kulusäästliku mõtlemise rakendamise mudel Eesti VKE-de jaoks. Selle eesmärgi tarvis põhineb uurimistöö Eesti toidu- ja joogitööstuses tegutseva väikese ettevõtte ühe juhtumi uuringumeetodil. Aluseks võttis autor Miina (2013) rakendamisprotsessi mudeli. Mudelit on parandatud ja täiendatud Eesti VKE-de jaoks.

Magistritöö andmete kogumine hõlmas ka kõigi ettevõtte protsesside ja dokumentide jälgimist, poolstruktureeritud intervjuusid omaniku ja töötajatega. Edasi olid andmed hinnatud sisuanalüüsi meetodil. Tegevused olid mõõdetud protsesside plokk-skeemide abil. Selline meetod aitas kindlaks määrata väärtuseta tegevusi ja nõrku kohti organisatsioonis.

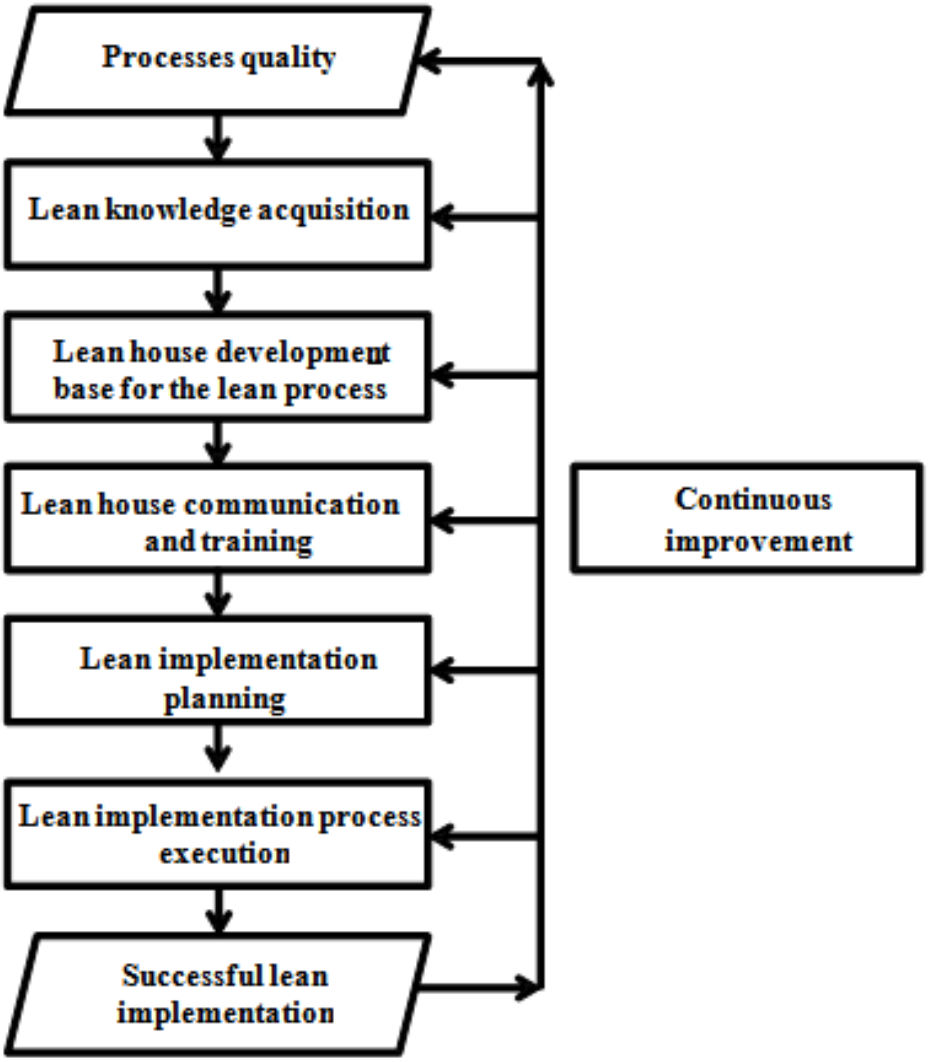
Kulusäästliku mõtlemise rakendamine hõlmas mitut etappi: kõigi protsesside hindamine ja kirjeldamine, kulusäästliku teadmise saamine ja kulusäästliku maja loomine, inimeste koolitamine, kulusäästliku mõtlemise rakendamise planeerimine, elluviimine ning tulemused. Peale selle oli adapteerimisprotsessi aluseks loodud spetsiaalse kulusäästliku maja mudel VKE-de jaoks.

Kõiki nende etappide alusel on loodud protsessi mudelil järgmised etapid: kulusäästliku teadmise saamine, protsessi kvaliteet, kulusäästliku maja loomine, kulusäästliku maja koolitus, rakendusala valik, kulusäästliku mõtlemise rakendamise elluviimine, tulemuste hindamine, parandustegevused, rakendusala laiendamine ning pidev täiustamine.

Vastates magistritöö küsimusele, kuidas rakendada kulusäästliku mõtlemine Eesti VKE-des, oli loodud samm-sammult mudel konkreetse firma näitel. Tulevikus võib kulusäästlikku mõtlemist ning selle rakendamise protsessi uurida sügavamalt edasiseks arendamiseks.

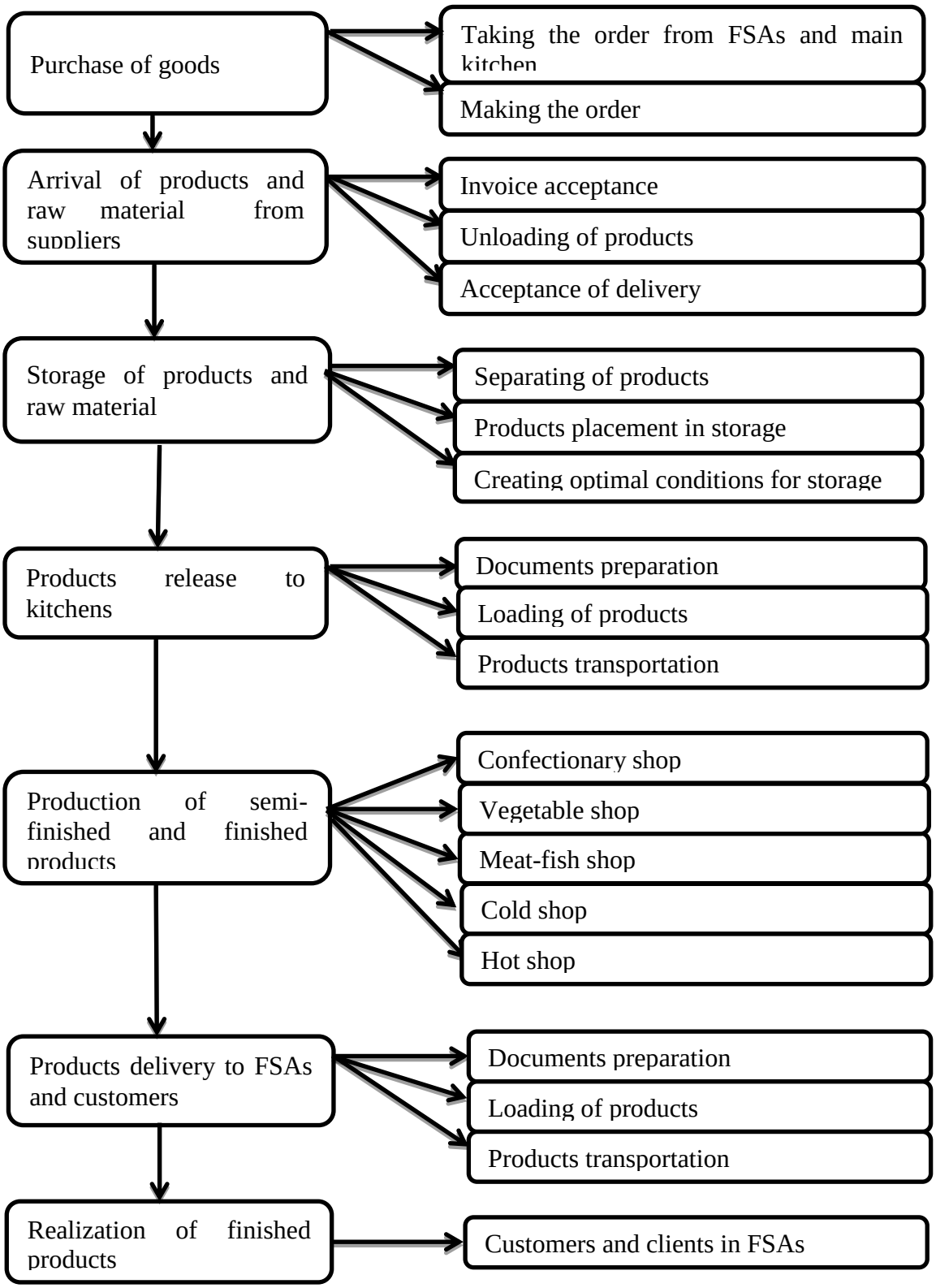
APPENDICES

Appendix 1. Lean implementation process model.



Source: (Miina 2013, p.35)

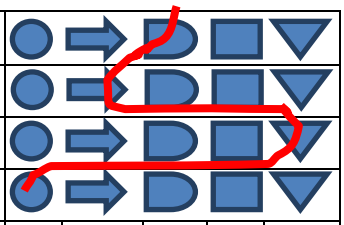
Appendix 2. Products flow scheme.



Source: (constructed by the author)

Appendix 3. Flow chart for production process before lean implementation.

	Description of activities	Operation	Transport	Delay	Control	Storage
1	Check the forecast of a menu two days before					
2	Make an order for storage					
3	Wait for products					
4	Call from storage					
5	Go to take products from storage					
6	Check documents and quantity of products					
7	Check quality of products					
8	Inform storekeeper					
9	Move products to central kitchen storage					
10	Storage of products					
11	Take products from kitchen storage					
12	Move products to different shops					
13	Check quality of products					
14	Go to take vegetables from main storage					
15	Move vegetables to vegetable shop					
16	Check quality of vegetables					
17	Prepare peeled and sliced vegetables					
18	Wait for processing					
19	Move vegetables to cold shop and central kitchen					
20	Prepare raw material for cooking in different shops					
21	Prepare semi-finished products					
22	Move semi-finished products to hot shop					
23	Prepare finished products					
24	Wait for products to be ready					
25	Check readiness					
26	Put food into special wares					
27	Put wares into thermos containers					
28	Wait for all containers to be ready					

29	Wait for documents					
30	Move containers to delivery area					
31	Storage					
32	Confirm the readiness of products for delivery					
	Totals	7	10	5	8	2

Source: (composed by the author)