

Improvement of Lean Management Using Key Performance Indicators

Case Packaging Area

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<p>Abstract</p> <p>In the modern world of logistics, more and more organizations implement artificial intelligence and new technologies. However, old fashion productions with manual human labor still exist. One example is the packaging area in the warehouse of Logistikas. To show greater results, the company had to consider the possibility to improve lean management and employee performance metrics.</p> <p>These topics became the main goals of the study. The main objective was to understand how the process works, what issues it had and how the discovered imperfections can be developed. Mixed method approach with a pragmatic worldview was chosen for the research. The collaboration allowed broadening the amount of resources used to search for information for the analysis. The data were collected using qualitative and quantitative methods. The key ideas were gained from the literature review, interviews, survey and participant observation. All the data were carefully analyzed.</p> <p>As a result, it became clear that existing KPIs did not provide relevant data and the processes of the packaging area had to be reviewed. Consequently, a new technique of measuring employee performance was introduced and an innovative design of the layout was created. These changes could have a positive influence on the increase of productivity in the packaging area. The presented results and solutions became a starting point for development of the packaging area. Logistikas could then consider how the gained information could be used and what kind of improvements should be made. Not only the warehouse facility in Säynätsälo could benefit from changes, but the whole logistics supply chain between the end customers and the suppliers of spare parts. Implementation of new metrics, reformation of the existing process and development of skilled personnel could become a milestone for long-term continuous improvement.</p>		
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1 Introduction

In the modern world, society muses more and more about technologies of the future, which are coming to the everyday life. Giant companies have already started to implement robots and automation systems into their businesses, which allowed them to push quality and efficiency of production. (Barosz et al., 2020, 1.) However, there are still plenty of tasks, in which Artificial Intelligence will not be able to replace humans in coming decades. For this reason, chief executive officers and managers need to track activity of employees by applying performance indicators, which are suitable for certain production, task or even individual. Humans differ from robots, and what is more important from each other, in their ability to experience emotions and to put changeable effort. This makes it challenging to measure their productivity compared to machines. Consequently, specialists are puzzled when looking for solutions, conducive to business growth and day to day development.

In addition to key performance indicators managers of productions facilities pursue lean management principles, which were invented by Toyota over 80 years ago and worked smoothly for decades. The production system, which was established by Japanese car manufacturing giant, has been proving its reliability and effectiveness in numerous organizations within variety of supply chains. (Rouse, 2019.)

One of the milestones of lean management is continuous improvement, which is based on full employee integration and his or her deep devotion to the work process and its development. For this reason, managers apply scorecards, the main use of which is to provide reliable data that is utilized for further improvement of a production plant. With the help of key performance indicators, companies examine pitfalls, which are not visible from simple observation of workflow and which have negative impact on the overall outcomes of an employee, a department or an organization. A combination of the lean management and competent use of KPIs leads to acceleration of material flow, increase in efficiency of workers and improved quality of the product.

For that period of time, the packing area of warehouse of Logistikas Oy is an example of impossibility of robots' implementation and of making the process fully automated. This department requires constant involvement of the employees due to the variety of items needed to be packed and changes in decision making process depending on task. Workers complete hundreds of titles per day and miscellaneous packages are chosen for units, which pass through packing zone in different amount and volume. These factors influence on performance of each individual as well as reflects on results of the company.

The target of the thesis was to collect all existed data and facts about warehouse of Logistikas Oy in Säynätsalo, provide solution to problems and boost performance of facility and packing area in particular. The goal was to create the conjunction of personal skills of each employee, through implementation of new key performance indicators, and lean management principles, creating value and work flow for smooth and productive processes. The most crucial objective was not only to change environment, but also to guarantee that company will benefit from novel time and cost efficient solutions – basics of logistics.

1.1 Business Framework of Logistikas Oy

Logistikas Oy was founded back in the 1997. From that year Finnish logistics company spread its operational area in 6 cities: Rauma, Nokia, Jyväskylä, Olkiuoto, Suolahti and Pori, having 80 thousand square meters of warehouses in total. Logistikas uses this area to offer partners and customers its third-party services such as inbound and outbound logistics, warehouse storage and lately procurement logistics. (Logistikas as a company, 2020.)

Company achieved turnover around €21 million in 2019. Logistikas possesses 50 fork-lifts and modern and advanced information system with hand-held and truck-mounted terminals, which create conducive conditions for over than 160 employees and stimulate them to bringing value to the customers. (Logistikas as a company, 2020.)

Distribution center of Logistikas in Jyväskylä was opened in 2011 in order to provide local companies with cost-effective storage and handling services. Beside these, well-trained and experienced team operates in in-house logistics, including pre-assembly, windscreen packaging, spare parts, and sealing of production components (2018,10). Warehouse in Säynätsalo takes responsibility for products of the customers and supplies them when demanded, according to the pre-agreed schedule. Moreover, Logistikas is crucial part of the supply chain, being a public warehouse. It allows partners to cover short-term changes in demand without buying or disposing of facilities and concentrate on development of their businesses (Waters, 2003, 290).

1.2 Description of Packaging Area

2 Research Questions and Objectives

Research questions are crucial part of the thesis. Creating those in advance can be rather significant benefit for the period of writhing the project. First of all, they structure the work, clarifying the topic which is raised and directing the author himself. When writer sets the list of coherent questions, he provides himself with an organized plan and simplifies the process of writing. Secondly, research questions also keep the author concentrated on certain steps within the thesis. In this case, attention does not jump from one subtopic to another and remains focused on one specific issue at a time. Thirdly, research questions determinate the boundaries, which are limiting the writer and do not let him spread out of the chosen topic. This is an important factor, because such restrictions prevent the project from extra unnecessary fact and information. Fourthly, properly constituted questions lay the foundation of the thesis. Creation of conceptual framework facilitates a starting point for qualitative and quotative research methods and lead to the last, but not least role of the research questions. The fifth meaning of those is provision of the understanding which data is gathered on each stage, narrowing the range of resources as well as simplifying the working process for the author. (Punch, 2005, 36-37.)

The objective of this study was to provide solution to existed issues of the process especially within packing area and also outside it. Moreover, target of the thesis was to make it as comprehensive, deep and valuable as possible. Three research questions were generated in order to achieve great results, setting boundaries of the work and focusing on the essential parts of the study.

2.1 Research Questions

1. Which KPIs exist and how these can be developed?

The key idea of this research was to gather all available data and analyze it, using existing KPIs of the company. This will give an opportunity to define imperfections of the system and possibilities to make changes or create from zero new tools for the evaluation of productivity. As it was already mentioned above, new scorecard covers wider range of circumstances and reasons, which have an impact on the efficiency of each employee. Moreover, new system of performance measuring is personalized and allows to define strengths and weaknesses of every individual, what leads to increased adaptability to work and make it entirely automatic. The goal of this research question is to introduce developed key performance indicators that in long-term perspective give Logistikas undoubtedly skilled specialists and professionals of their working area.

2. How does the process go nowadays and what issues it has?

Going through this question, author analyzes material flow of goods from receiving area until shipping area, mainly focusing on the stage of packing. The principles hidden behind the decisions about the processes, taken by supervisors, are described in this thesis as well. This research question covers reasons of certain strategies for the packaging area, based on human resource availability, customer's demand, cost and time efficient approach. Combination of author's experience and company's view of the future leads to the determination of existing problematic areas in the production and further development through lean management.

3. What changes for improvement can be introduced with lean management?

The objective of that research question concentrates on future development plan of warehouse layout, material flow and work principles of the packaging area. Author defines issues listed in the research question number 2 and proposes improvements for each aspects specifically and to the whole process in general. In addition, thesis provides developments, which are based not only on the modernization of existed production flow, but also offers techniques and ideas, which have not been considered by company earlier. The target of this research question is to fulfill this project with knowledge, based on relevant resources, experiences and case studies of other companies, which successfully obtained lean management principles, and to fit these to the packaging area of warehouse in Säynätsalo.

2.2 Case: Development of the Packaging Area

This thesis was devoted to the development of the packaging area as well as working environment and conditions. Well-structured and deeply-analyzed research was supported with full focus on a lean management inside the warehouse in Säynätsalo and with proposal of an improvement plan. All information and facts were based on different approaches of research methods and wide range of reliable resources.

Moreover, alliance of lean management principles ideology and key performance indicators led to undertesting how these complement each other and open the opportunity to define weak parts of production. Therefore, it was crucial to combine these questions under one topic, because they also closely dependant: if the whole production is set right, but workers do not put enough effort, it does not give desired results, and other way around, brilliantly-skilled employees with significant outcome cannot show all of their skills in limited working environment.

2.3 Structure of the Thesis

2.3.1 Plan of a research process

Schematic plan of research process was provided, in order to make it easier to understand focus points and ideas for a reader. Main steps were shown in the chart of structure of the thesis, which can be found in figure 2.

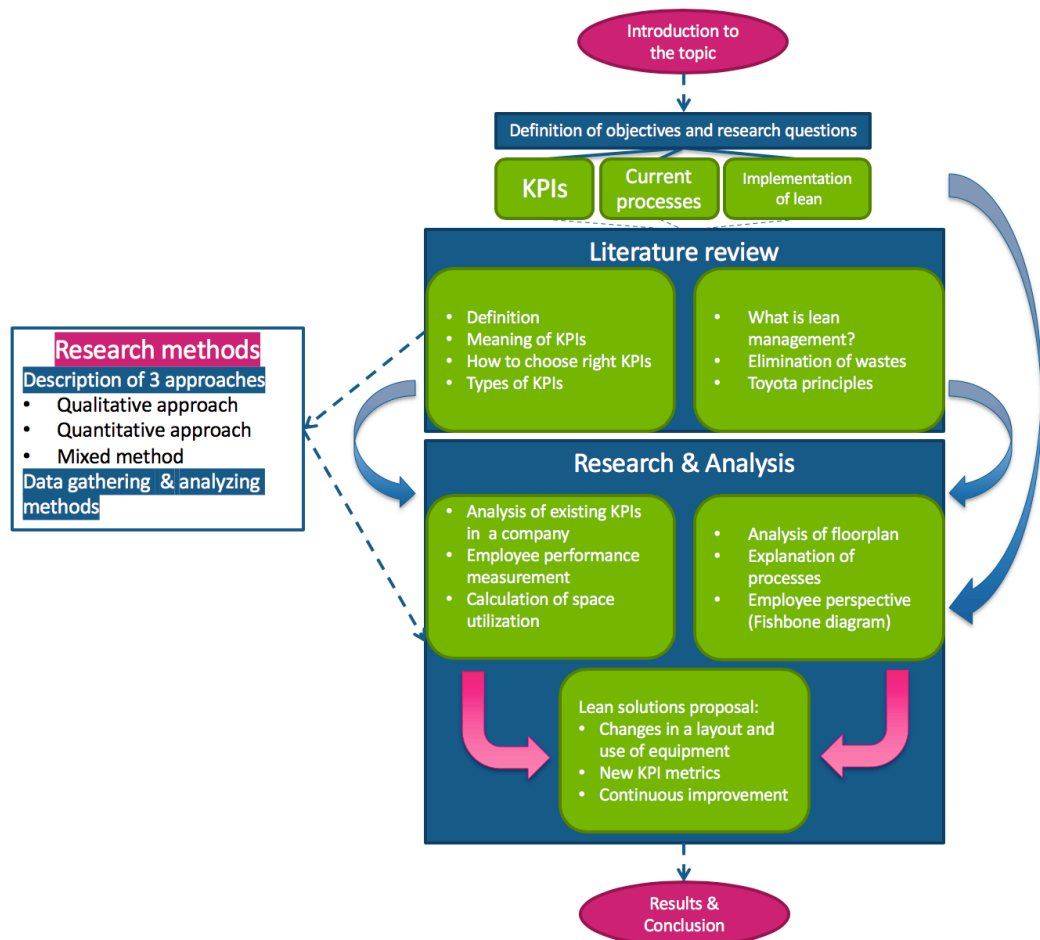


Figure 1. Structure of research process

As it can be seen from figure 1, the thesis is based on three main parts: definition of objectives and research questions, literature review and research & analysis. Such structure provides logical and comprehensive order, forming work with thoughtful text and within minimized amount of pages. In an illustrated above structure,

correlation between parts with arrows and lines, giving the reader an opportunity to understand how each part was linked with each other. In addition, introduction, research methods and conclusion were pointed out. Introduction integrates the reader into the topic, while conclusion provides results of the research. Part of research methods represents basic ideas of different approaches to data gathering and analysis ways.

3 Lean Management

3.1 History of Appearance

Eiji Toyoda, the cousin of the founder of Toyota Motor Company and company's production manager Taiichi Ohno came to conclusion, after visiting Ford's plant in Detroit, that Japanese environment was not suitable for mass production. Subsequently, terms the Toyota Production System (TPS) and lean production appeared. (Womack, Jones, & Roos, 2007, 48-49.) Even though, Toyota described lean concept at the very beginning of development of that ideology, it has different meaning with TPS. Concept of Toyota Production System differs from lean's, despite the fact that these two appeared and proceed the development process at the same period of time.

Combination of words *lean production* was mentioned for the first time just in 1988 in magazine in the article written by John Krafcik. Author compared efficiency performance among the list of various car manufacturers and distinguished two classes of production systems. Krafcik evidenced reliability and successfulness of fragile system, used by Toyota. It was proved that outcomes of fragile production system performed superior levels of efficiency and quality comparing to robust production system. However, due to the fact that word *fragile* has more negative meaning, term *lean* was used instead. (Modig, Åhlström, 2013, 62-63.)

3.2 Definition

Lean thinking is identified as five-step process, including: specification of customer's value, setting the list of actions that create value in the best possible order, control of the smooth flow of activities excluding any interrupting factors, allowance to the customer to pull the product or service when it is needed, continuous improvement and aspiration to the perfection. In addition, lean thinking allows to create an environment where work processes bring more satisfaction by producing instantaneous feedback on attempts of turning *muda* into value. *Muda* is a Japanese word, which means "waste", or any type of actions that consumes energy and resources but does not add any value. (Womack, Jones, 2003, 15.)

Likewise, lean means the manufacturing process where the production flows through steps that add value to the product and cause no any disturbance, where pushing unwanted product onto the customer is replaced by pulling principles based on customer's demand, where every employee and part of productions follows the ideology of constant improvement. (Liker, 2004, 19.)

3.3 Eliminating Waste

Taiichi Ohno was a furious adversary of waste and he defined 7 types of *Muda*, which do not add value to the product (Womack, Jones, 2003, 15). Toyota targeted not to have work-in-progress within production line and liquidate any activities that could influence on flow and hamper it in the process. Everything, what was not efficient enough for the process or did not bring any value to the process, was excluded from the production in order to develop it. (Modig, Åhlström, 2013, 60-61) Toyota introduced seven the most crucial waste activities, which also do not any value to business of the company. These seven types of waste are presented in Table 1:

Table 1. Types of Muda (adapted from Liker, 2004, 42-43)

Type of Waste	Definition of Waste
Muda of Production	It means production of items, which are not required and cause other waste non-value adding activities.
Muda of Waiting	This waste is created when workers or machines spend time on waiting between working steps.
Muda of Transportation	Waste appears from unnecessary movements of materials within the supply chain or between phases.
Muda of Processing	It happens when product is produced with higher quality than customer requires. It causes more complex operations or application of more expensive and precise tools or machines.
Muda of Inventory	It includes surplus of materials, processes or finished part that cause increase in lead time, storage and transportation costs, set-up time, delays and defects.
Muda of Movement	It is defined by activities performed during work time by employees, such as walking, searching, gathering – actions, which do not add value to the product.
Muda of Defects	It implies that worker produces defective product or corrects it. In addition, time is wasted if it is spent on inspection and repairing of already finished parts.

Liker (2004), an author of The Toyota Way, also suggest the eights form of waste to the list defined by Toyota and that waste is created when employer does not listen to creative ideas of employees, loses their talents, skills and kills their motivation for growth and learning.(43.)

3.4 Principles of The Toyota Way

Originally, *The Toyota Way* is the document, which was published by Toyota for its employees and, consequently, is not available in public access. This publication contained core values of corporation and was translated in different languages in order to convey knowledge to multinational group of workers. Company promoted five values, which were divided into two key subgroup (see Figure 3).

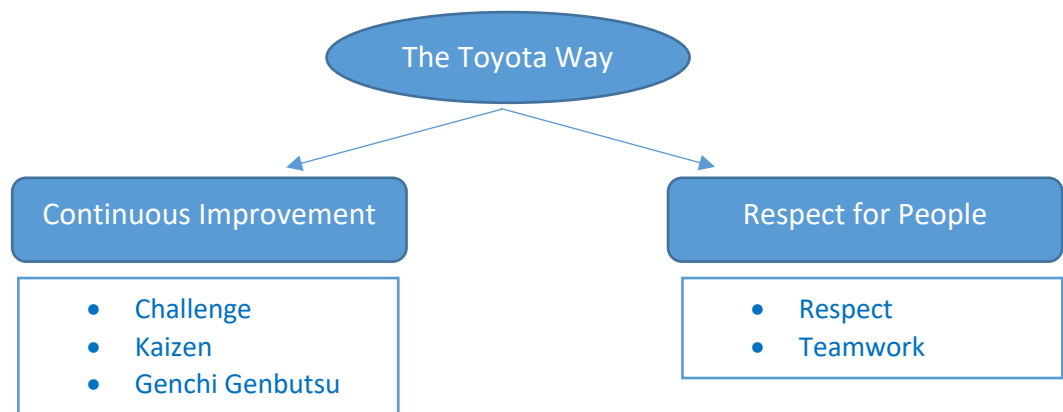


Figure 2. Division of Toyota principles (adapted from Modig, Åhlström, 2013, 65)

Interpretation of these values was introduced by Jeffrey K. Liker in his book *The Toyota Way*, in which he shares his experiences and knowledge, Toyota's 5 basic values into fourteen principles. (Modig, Åhlström, 2013, 65)

3.4.1 Section 1: Philosophy

Long-term decisions of short-term benefits

According to Liker (2004), at the time, while rival with Toyota car manufacturers keep forgetting about social impact within their strategies, society is one of the most crucial bricks of basement of Japanese giant's philosophy alongside its contribution into own employees and customers. In order to reach that goal, Toyota strives for the excellence in its product line by encouraging each employee to leave a footprint in the company's history. Employees of Toyota receive the support, which motivates them

to obtain more and more knowledge that reflects on creation of technologies for long-term run and on the customers' satisfactory level. (85.)

Japanese car manufacturer is also responsible for its suppliers and partners around the world, feeling itself as a citizen of the planet. Toyota makes sure that each participant of the global supply chain has stability in a business, receives mutual benefits and support the vision of long-term development. Toyota claims that company takes full responsibility for their actions, which can lead either to achievements or to mistakes. Japanese manufacturer promotes the philosophy of self-reliance among the employees trusting their knowledge and desire to learn skills, which impact on the process of value-adding. Toyota's business framework is built around right short and long-term decisions, which are based on bringing satisfaction to customers, trusting employees and having a positive impact on the society. (ibid., 90-92.)

3.4.2 Section 2: Process

Continuous process flow

Flow defines a process, within which raw materials become a finished product of highest quality in shortest time and with minimum cost. In addition, flow that is ideally proceeds through the process, also gives the most comprehensive understanding of it.

At Toyota's productions huge batches of materials and goods are not in favor because these are the reasons of the bottlenecks. Instead, company prefers to keep working processes close to each other and to work in fewer orders, avoiding any interruptions within the production line. Moreover, if Toyota makes a decision to use buffer zones, it is still targeted to improve the overall results and develop the flow in areas where movement of only one piece at a time is not possible. In order to dispose of wastes caused by overproduction, which induces material waiting time in the mass production system, Japanese manufacturer reorganized departments from groups united by one process into working cells combined by a product.

It is crucial to create the flow of the process and explain it to employees, which add value to the company by their work, as follow a combination of these two factors provides outstanding results in quality and efficiency. Furthermore, the flow links operations and contributes to generation of teamwork, instant feedback on issues, control and as the most beneficial it challenges employees to think and develop themselves. (Liker, 2004, 102-104.)

The flow efficiency is identified with the idea of value-adding activities. Whenever something happens to the product or it moves forward in the process, a flow unit, defined as material, information or people, receives value. On the other hand a product does not receive a value, being processed through wasteful activities. (Modig, Åhlström, 2013, 27-28.)

In order to understand which activities bring value it is necessary to create value stream map. This map shows all actions needed to produce, design or move certain product, and each action is referred to one out of three categories: what really brings value to the customer, what has no value but is necessary on the certain stage of production and cannot be eliminated right now, and those which so not add any value and have to be eliminated immediately. (Womack, Jones, 2003, 37.)

As soon as value and value stream are specified, company can create flow, using three steps. At first, it is necessary to concentrate on the product and keep an eye on it from very beginning till the end. Secondly, a company needs to forget about any existing limitations to set a lean environment by removing useless for the flow equipment and materials. Thirdly, a manager needs to rethink an ongoing processes in order to get rid of steps which slow down and stop the process. (Womack, Jones, 2003, 52.)

Usage of pull system

Pull system means that customer receives an item based on the needs. In other words, in Toyota, pull describes the perfect just-in-time process, where customer gets what he or she wants, at preferable time and in demanded amount. Ideal pull

system reflects in 100% on-demand order and with zero level of inventory. (Womack, Jones, 2003, 67.)

However, even Japanese manufacturer cannot reach system with zero inventory. Therefore, inventory buffers are used, where material replenishment is based on customers' demand. Kanban was created in order to visualize a working process. This system allows all employees to follow up the process and recognize potential bottlenecks. Typically, Kanban boards or cards are used, both help workers to track an ongoing process in a visual way. It is easier to see planned, being done and done tasks or activities. (Radigan, n.d..)

Even though, the Kanban or pull system is more efficient rather than scheduling it still holds some inventory level and creates buffer zones. Consequently, the aim is to minimize these and to target to the most ideal flow of an item as possible. Inventory is a waste and Kanban is actually creating it. Therefore, the aim of thinking employees is to decrease the amount of Kanban and buffer zones.

Each part of the pull system should communicate with each other and clarify what is needed, when it is needed and what is the required amount, so each item becomes value-added and meaningfully flows within the process. The goal is to create a system, in which every employee has a clear vision of the production, adds value to the product demanded by a customer and understands his or her importance to develop an organization with minimized inventory level. Just-in-time (JIT) was created to identify the principle of having the right amount of product at the right time, minimizing resources that are needed. In order to see the whole picture and understand the process, an employee should ask himself 3 questions: What is needed to satisfy a customer, when certain actions have to be taken to finish task just when it is needed and how many products can be produced within existing limitations. Following this way, an employee will be able to reach maximum output with minimum wastes, supported by JIT principle. (Modig, Åhlström, 2013, 60.)

Distribution of the workload

Building the lean production, it is not enough just to eliminate wastes or muda. Elimination of muri and smoothness of mura are also crucial. Three components create ideal environment for each other. When only wastes elimination can lead to worse efficiency of employees and production, muri and mura handling balances the whole system by leveling product volume and increasing requirements from available resources. Figure 4 bellow represents correlation between Muda, Mura and Muri.

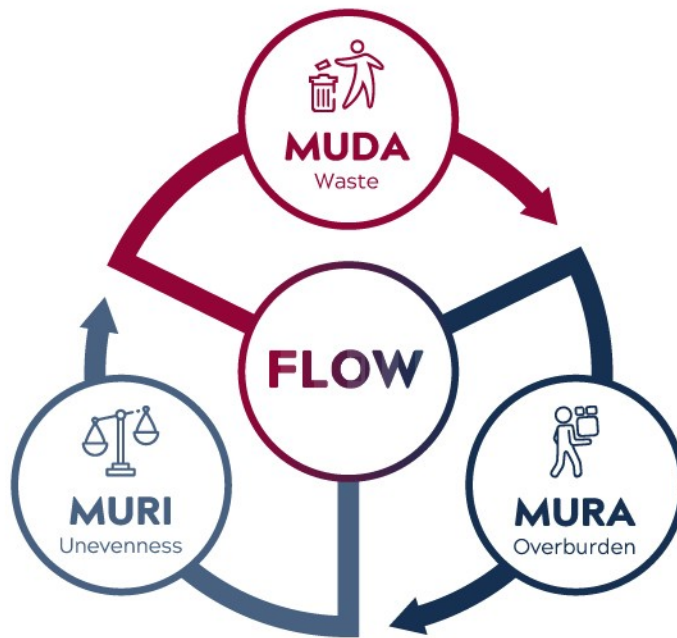


Figure 3. Correlation between Muda, Mura and Muri (adapted from Muda, Mura, Muri Workshop, 2019)

Muri means overburdening staff or working equipment. Getting the maximum out of resources brings negative results in employees' performance, decrease of safety level and poor quality, while equipment malfunctions or causes defects.

Mura means disbalance in working progress. It happens when there are too many employees and it causes lack of work and stagnation. On the other, there can be more work than available personnel. Unevenness in working process requires increase of necessary equipment or materials, and also right use of skilled employees on the right places.

Muda, mura and muri depend on each other and as soon as one of these is eliminated the other two will be affected too. To understand how it works here is a simple example of transportation of goods on trucks, which is presented in figure 5.

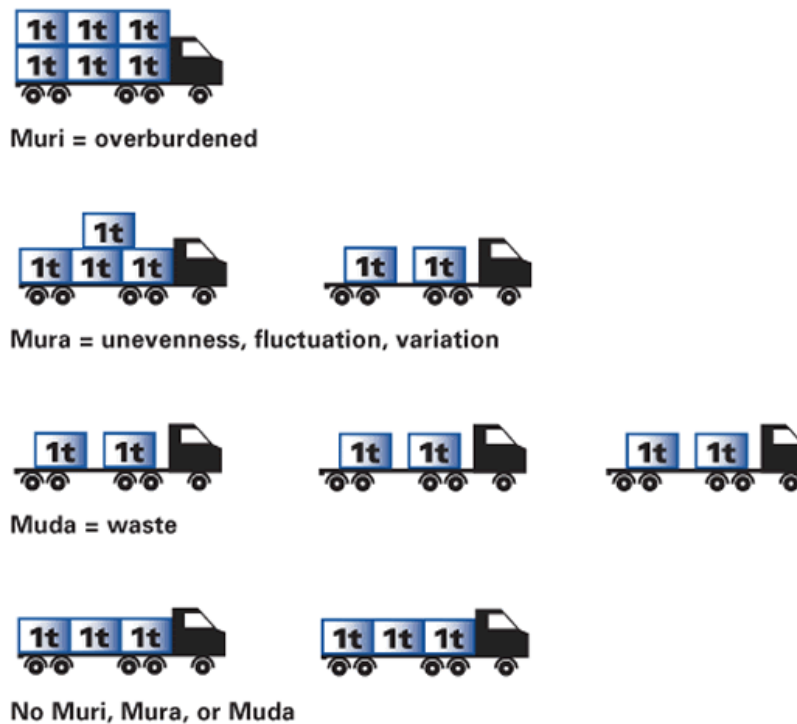


Figure 4. Examples of Muri, Mura and Muda (adapted from Do, 2017)



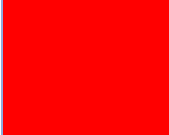
In the first case, when truck is overloaded it creates muri. Overburdening the capacity of the vehicle leads to breakdown and damages. Consequently, poor quality. In the second example, two trucks are used, however the workload is uneven. Such mura causes unbalanced costs per transportation, lack or excess of materials delivered. These factors lead to waiting time – muda, or overburdening of truck or receiving part – muri. In third row just muda is expressed, when extra equipment is used in the situation when it is not necessary. Ideal solution is to divide the workload between two trucks, balancing responsibilities and avoiding any type of waste. (Do, 2017)

Fix problems for better quality

Quality is essential in lean management for bringing value to the customer. In order to support a right level of quality it is important to identify and fix defects on early stages. Another term brought into the world by Toyota company is Jidoka, what means automation with human intelligence. In other words, intelligent employee stops machine as soon as defect is detected and fixes it on place, preventing from upcoming issues. (Modig, Åhlström, 2013, 57.)

In companies like Toyota, when machine has a breakdown, some flags or lights, supported with alarm signal, are used. This system is needed to bring problem to the surface and called Andon. However, it is pointless to spent money on this signaling system, if employees are not taught to speak out loud about issues. It is crucial to explain to a personnel about their responsibilities of keeping value on a proper level, it is core component of customer's satisfaction. (Liker, 2004, 142.) Table 2 shows Andon in action.

Table 2. Example of Andon (adapted from Andon, n.d.)

Color-Code	Condition	Action
	Everything runs smoothly	Keep running the process
	Some issue appeared	Problem cannot be defined immediately and checking time is needed
	Production line was stopped	The assistance of supervisor is necessary to fix the problem

Ideology of Toyota of doing things right means to bring to the customer a product of superior quality without any defects. For this reason, the company ensures quality checks from the very first steps. All employees are responsible for stopping the

process immediately when problem occurs in order to analyze, fix it and prevent from it in the future, so customer never receives faulty product. (Modig, Åhlström, 2013, 61.)

Standardization of tasks

It is useless to try to implement lean management and idea of continuous improvement if process always switches from one thing to another. That is why standardized production is vital. In addition, it is necessary to find a balance between specific guidelines and generalized methods. The first help to direct people and show them right way of doing tasks, while the second one leaves space for flexibility and creativity. Workers should not be pushed to follow certain rules and work by the book, because it may cause negative feelings from them and tension with management. More often humans prefer to hear advices and learn from examples or show others the better way of handling the task. These activities empower personal growth and collective thinking, uniting team. (Liker, 2004, 155,160.)

In addition, when an employee tries to juggle with variety of activities during the day, it influences on the quality and causes restarts of process from the beginning every time. Humans are unable to handle many activities at the same time and switch from one to another. People can usually lose their focus and secondary needs are created. Afterwards, company has to fulfill these needs with extra resources and extra costs. Moreover, starting new tasks over and over again requires mental set-up time. The smaller group of different activities person does, the less time is required to concentrate. As more tasks human needs to process, the more difficult to focus on these. As a result throughput time increases and quality level decreases. (Modig, Åhlström, 2013, 45-49.)

Visual control (5S)

Visual control means a communication tool which allows to see failures or standard deviation just at a glance. It happens that defects, failures or problems are hidden until the moment when they cause dramatic consequences and its late to fix them. It

is important to prevent such things beforehand. Responsible workers, which are willing to work well, can easily say what equipment they need and where it is, they know the best way of doing tasks and prepare workspace for this. By following just-in-time principle in all aspects of working process, work employee support flow of activities. (Liker, 2004, 166.)

For smooth flow of production, Toyota invented tool, which simplified work of its employees. It is called 5S and means system for organizing workspace for more efficient, effective and safe environment. It is just about keeping work area clean and with all equipment on the places, so worker can perform well and without risk of an injury. (What is 5S?, 2020.) Moreover, using this lean tool, an employee is empowered to take care of working space, constantly reducing wastes and improving environment and techniques. Implementing 5s technology there is possibility to decrease amount of space used for current processes. Colors and labels are used to define certain areas and equipment, as well as special kits, needed for performance of a task, improve efficiency of employees. (Lean Thinking And Methods – 5S, 2019.)



Figure 5. 5S Process (adapted from 5S Cycle Floor Sign, n.d.)

Figure 6 shows the circulation process of 5Ss and their dependence in continuous improvement. The first S refers to Sort. This step is about removal of unnecessary

materials or equipment from the area, where these are not required at certain moment. Secondly, setting items in order allows to take them quickly from the correct place, where they are supposed to be. That means that area is organized in a way that every employee knows materials placement and can retrieve them fast. Usually, floor paintings, signs and labels are used, when setting items in order, what enables more effective picking and movement. Shine pillar is about cleaning a workspace. It benefits in quick response to or prevention from failures and in decreased level of production loss. As soon as three previously described responsibilities are implemented and defined, it is necessary to Standardize these tasks, continuously improving environment. Usage of check list, schedules and visual boards can increase employees involvement into these activities, simultaneously preventing workspace from accumulation of unrequired materials and from possible failures. The last step is the most important. Without pillar of Sustain, all previously achieved results will not matter, if these do not become a habit for each employee. As soon as goals of Sort, Set in order, Shine and Standardize are reached, they need to be followed up with special performance reviews, in order to analyze and improve the whole 5S process in future. (Lean Thinking And Methods – 5S, 2019.)

Technology that serves employees

Toyota company continuously implements new value added technologies in order to improve the process and assist employees. Japanese manufacturer carefully tests and evaluates new devices to make sure that device is worth to be integrated into the system. It is important to adjust new technology into the process without stoppages of the production and strong interference into employees traditional way of working.

As soon as the process was led manually several times and standardized, so everyone understands it, a company can implement new technologies, but with the aim of supporting employees not to take their working places. (Liker, 2004, 175, 181-182.)

3.4.3 Section 3: People and Partners

Growing up leaders with the philosophy of the company

In Toyota leaders and CEOs are not outsourced, but they are grown up inside the company, because it values more personnel, which understands the Toyota culture and production processes on each level. Leaders of Toyota should also teach every employee the philosophy of the company, creating environment, where everyone learns within the organization from each other.

It is crucial for manager to be fully involved and informed about the ongoing processes, and it is not as much about giving tasks as about spreading the culture. As soon as employees understand the philosophy and are not forced to work, their commitment to the company increases and with this quality level rises too. In addition, Toyota teaches its people to see the company from customers' perspective in order to understand their need and bring more value to the company. (Liker, 2004, 186.)

Development of personalities and skills

In Toyota teamwork is an important element of the company. For this reason it is important to organize where these teams can bring the most value. A self-sufficient individuals, which are usually responsible for detailed work, unite in teams in order motivate and learn from each other, complementing knowledge of others and solving problems together. For this reason, Toyota chooses the most excellent individuals, which are able to manage teams, inspire them and move towards common targets. The company searches for employees which are ready to give themselves to a working process, while company builds its ideology on challenge and respect for workers, keeping in mind its humanity system.

An organization should let its employees their importance in the team, creating safe environment, where workers feel themselves comfortable and trusted. Measurements of progress, feedbacks and constant challenges motivate employee to perform

better. In addition, rewarding system, even symbolic and not expensive, forms an adequate atmosphere of competition. (Liker, 2004, 200,211.)

Workers, which exist in lean environment, have to be able to face challenges, solve problems and be creative to introduce innovative solutions for future development. At the same time, management should be set in a ways that company's goals are clear for each employee, nothing distracts or interrupts workers from the process, and at the end comprehensive feedback and rewards are provided to motivate people towards further achievements. (Modig, Åhlström, 2013, 59,65.)

Suppliers as partners

The eleventh principle is about getting along with suppliers and creation of transparent supply chain, where each cares about mutual not individual benefits. A company should grow their suppliers and respect them, building long-term relationships. (Liker, 2004, 215.)

3.4.4 Section 4: Problem Solving

Liker (2004) makes a summary of all previously described principles and ideology of continuous improvement in section 4. Author of *The Toyota Way* described his vision of learning organization with repeated solution of problems, which are the root causes of stagnation. All of these ideas were spread among principles 12, 13 and 14, key points of which can be found in table 3. (230.)

Table 3. Section 4: Principles 12,13,14 (adapted from Intrieri, 2018)

12. Understanding the big picture	<ul style="list-style-type: none"> • Start from understanding a company in general and only then develop it. • Importance of employees with skills of creativity and critical thinking for the development of a company. • Manager has to find the most efficient way to gather feedbacks from employees and execute them straight away
13. Make decisions slowly, but implementation rapidly	<ul style="list-style-type: none"> • Diversification of ideas is a key to solve problems • Nemawashi is crucial tool for effective data collection and future development of the company • Collect as many ideas as possible, choose the best ones and implement them immediately
14. Become continuously learning organization	<ul style="list-style-type: none"> • Employees should use tools for continuous improvement, eliminate wastes and improve a working environment • Management has to take care of its team, because experienced professionals are always better candidates without understanding of company's philosophy • Prioritization of standardization over starting process every time from scratch

3.5 Data Analyzing Methods for Lean Management

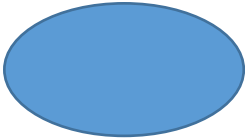



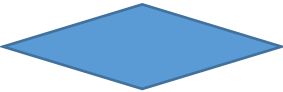
Value Stream Mapping

VSM is a tool of lean management that is used to identify activities, which add value to the end product for a customer. This technique usually consists of two steps. On the first stage it is necessary to define all types of activities, which are happening within a production line. Doing this, it will be easy to see imperfections of processes, simultaneously pointing out all of the wastes, which occur has to be eliminated. As soon as a company understands, what has to improved, it comes to the second stage of value stream mapping. Here the future state map is created. It means that company creates a map for an organization in a way how it wants to see an ideal solution. This perfect process does not have wastes and runs smoothly. (Voehl et al., 2014, 133.)

Value stream map can be structured using a flowchart. The flowchart is graphical tool, which illustrates every step of the process. Geometrical symbols are used to

represent each stage, its meaning and problem. All elements from a sequential order, connecting with line or arrows. Flowchart is used when studying the process, to identify problematic parts or when developing a project to current issues. (Flowchart Symbols, n.d.) All symbols are defined in table 4.

Table 4. Flowchart Symbols (adapted from Flowchart Symbols, n.d.)

Symbol	Name	Function
	Start/End	An oval represents starting or ending point
	Arrows	Line connects shapes and shows relations between them
	Input/ Output	Parallelogram represents input or output
	Process	Rectangle represents a process
	Decision	Diamond represents a decision

Cause-and-effect diagram

This type of diagram is also called fishbone or Ishikawa diagram. It is used to identify many various root causes, which affect results and performance. This diagram looks like fish, where the head is main problem, which is about to be solved, and body represents skeleton with 6 branches of critical points, which influence the whole process. Moreover, each branch contains variety of smaller problems, which are actually root causes of the whole process malfunctioning. (Voehl et al., 2014, 353.) Example of fishbone diagram is presented in figure 7.

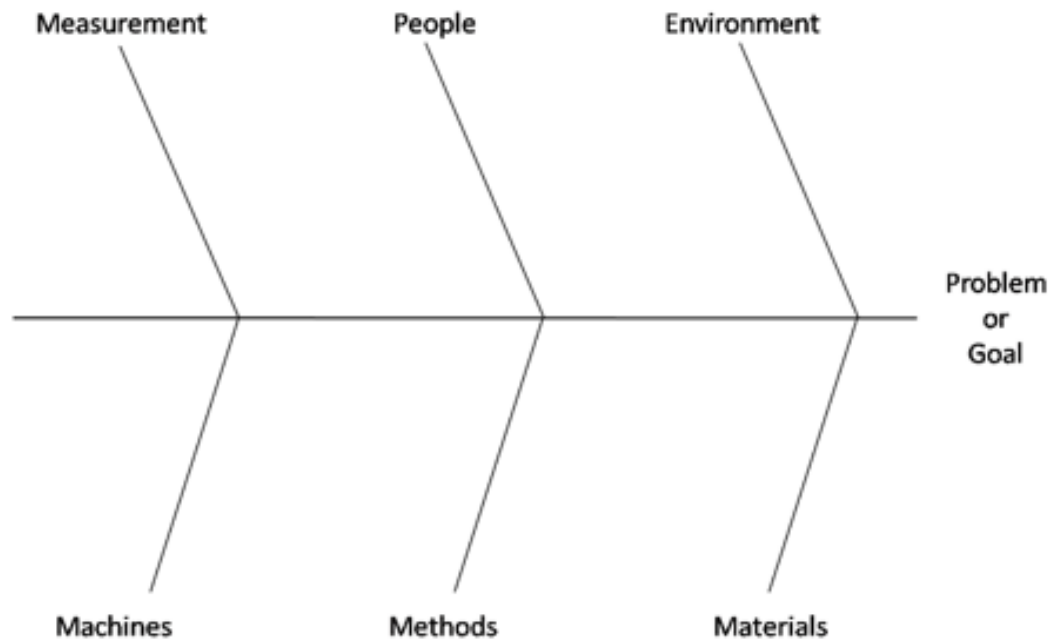


Figure 6. Fishbone Diagram (adapted from McNeese, 2019)

ABC analysis

ABC analysis is a tool, which helps to sort inventory in a right order. It is clear that not all items have the same value and, moreover, some are used more frequently than others. As a result, usage frequency and various pricing reflect on value of each item. Thereby, it is important to structure inventory in the most efficient and cost-effective way. ABC represents three groups of items, where A is the most important and the most valuable, B group has less meaning in terms of usage and cost-effectiveness than A, and C has the lowest impact on value for the company. (Baker, n.d..)

In order to divide all items into these three groups, simple calculations should be done:

1. Find inventory value of each item by multiplying its annual volume consumption by its price per piece.
2. Calculate total inventory level by finding sum of all items.

3. Sorting items in the table from the highest to lowest meaning.
4. Find the percentage value of each item from total inventory level.
5. Find cumulative sum of each item in order and then group in three categories: A below 80%, B 81-95% and C 96-100%.

Now it is visible, which items have the most impact on the business of a company and which can be handled with less care. (Baker, n.d..)

4 Key Performance Indicators

Implementation of Key Performance Indicators (KPIs) enables to define the effectiveness of each task of an employee, tracking activities of personnel. In addition, evaluation system sets the list of requirements, supported by indicators. Beside an access to measure performance of every individual, it is possible to create standards for the whole company or certain group of people. There are a lot of organizations, which have inappropriate performance measuring system that are incorrectly interpreted as KPIs. (Arif, 2015, 1451.)

4.1 Definition

What is the definition of Key Performance Indicators? It is a list of evaluation criteria based on parts of the company, which are vital and critical for existing situation and future development. David Parmenter (2010), author of Key Performance Indicators, defined and introduced 7 characteristics of KPIs:

1. Measurements are not expressed in financial terms
2. Constant measurements
3. Full involvement and control by top management
4. Definition of clear actions
5. Presence of a leader, that can take actions
6. Considerable influence on development
7. Empowering and motivational effect (6.)

4.2 Choosing an Appropriate KPIs

Key Performance Indicators are necessary to track activities and study performance development of every individual as well as the whole company, and afterwards changes of strategy and rewards for employees follows. KPIs should not be too spread, but organized in well-structured formula. It is much more easier to implement evaluation criteria, which are understandable for everyone and have no difficulties to be measured. There is possibility to increase efficiency of employees by visualizing their activity and showing up-to-date information about their results. (Belaychuk, n.d..)

4.2.1 Employees performance

The KPI should define the overall strategy of the company, showing which vision values and mission it has. Such system reflects internal processes of the organization showing, where is the real focus of the company and in which direction does it move. With definition of clear factors that influence on the development of the company, it is easier to set the list of targets, methods to achieve it and shows how the whole process is proceeded on the way to success. The mission is something that company can never achieve, but it drives each employee in a name of a life-time goal. The vision defines company in future. It means that organization certain goals to be achieved within specific time limits and assuming the ideal situation. Values represent company's ideology, what it stands for and in what believes. The strategy defines the way how organization is going to fulfil its ambitions, and it is what differs company from competitors. (Parmenter, 2010, 37-39.)

It is also necessary to track employees performance in order to support balance between financial part of the company and its results. A management has to see if the most essential asset of the company – employees, pays off to the company and worth investments. The goal of measurements of every individual is not to downsize the importance of each, but to set the average level and increase common involvement. KPIs help to measure a profitability of employees and in case of insignificant results, management can investigate the root causes and reasons for bottlenecks in a

workflow. In the table presented some of possible formulas, which can be used to measure the profitability of each employee. (KPIs for measuring employee performance, 2020.) Table 5 includes 3 formulas that can be applied, when measuring employee performance.

Table 5. Employee performance KPIs (adapted from KPIs for measuring employee performance, 2020)

Revenue per employee	Billable percentage per employee	Average task completion rate
= revenue/number of employees	= (total weekly billable hours logged/total weekly hours logged) X 100	= total time to complete the same task/number of times performed
This rate shows how much money does each employee makes for the company in order to understand if cost of workforce does not exceed it.	This formula also can be expressed as utilization rate and shows employees engagement based on relation of profitable hours to actually paid hours	Target of this rate is not to represent employees overall efficiency, but to define which steps of the process are differed between employees.

The right metrics are vital for development process of a facility. Defining appropriate tools to measure employees' effectiveness and efficiency can also increase the level of their engagement into working environment. When worker is more dedicated into a working activities, overall productivity of the company increases, with minimized costs and more importantly – higher customer satisfaction and less safety incidents. (Wishart, 2020.)

4.2.2 Equipment measurements

Warehouse space utilization

In order to make warehouse lean, highly efficient and cost-effective it is also necessary to take care of space utilization. This factor is important to measure to see what amount of space is used out of its maximum capacity. If organization strives to have a warehouse with outstanding results, it needs to create such layout, where space will be utilized in the most efficient way. (Space Utilization, 2019.)

There is a common mistake to calculate total square footage of warehouse, when managers want to optimize warehouse space. It is not right to approach wholistic calculations, since there are areas, which cannot be used for storage. Consequently, these places should be subtracted and multiplied by clear height of a warehouse. Here clear height means distance from a ground to level to the highest point, which can be actually used, keeping in mind a lighting or fire systems, for example.

The next step is to calculate inventory cube size. This measurement is about volume that any existing inventory takes and can be calculated by simply multiplying height, width and length of area (racks, for example). Afterwards, a company needs to understand the percentage of storage inside warehouse. In order to calculate it, it is necessary to calculate total vertical capacity of storage place in pallet racks and then to multiply by the amount of racks in the warehouse to get a number called storage cube size. The average percentage for it is between 22% and 27%. Racking system should not take too much space to leave space for movement of personnel, and it should not be less than 22%, meaning that space is not fully utilized.

The last step is to compare an inventory cube size to storage cube size. As soon as it was done, management can estimate if the number is appropriate or something can be improved. Development plan can include rethinking of layout, amount of racks, flow of materials or anything else what can make space utilization efficient. (Saha, 2020.)

Return on Innovation Investment

Many companies, interested in future development, make innovation investments and spend on research and development on average 3,5% of revenue. Obviously, it is

expected that new technologies and equipment can pay themselves off and generate more financial assets afterwards. Calculating return on innovation investments allows to compare results not only inside this specific area, but also with investments in marketing or salaries, for example.

There are several variations how it is possible to calculate ROI. However, the most common formula looks like this:

$$\text{«ROI2} = [(Net\ profit\ from\ new\ products\ and\ services) - (Innovation\ costs\ for\ these\ products\ and\ services)] / (Innovation\ costs\ for\ these\ products\ and\ services)\text{»}$$

For example, if final result is 25%, then it means that it will take 4 years to reach breakeven point, where investments start to make profit already. (Marr, 2012, chapter 48.)

There is a range of Key Performance Indicators in industries worldwide and each of these can be useful and bring positive outcomes for the company. The most important factor is that KPIs should inspire an action towards future development. In order to achieve it, company has to understand an objective for measurements, to explain why these are important for the business. (Klipfolio, 2019.)

4.3 Data Analyzing Methods for KPIs

SWOT analysis

SWOT analysis is a tool which is used to define a strategy for the company with understanding of its capabilities and possible obstacles on the way to their goal. SWOT decodes as Strengths, Weaknesses, Opportunities and Threats. (Voehl et al., 2014, 373.) Detailed explanation of these 4 features can be found in table 6.

Table 6. SWOT Table (Adapted from Voehl et al., 2014)

<i>Strengths</i> are defined as advantages of company of the process	<i>Weaknesses</i> are something that stops development
<i>Opportunities</i> are the chances to achieve better results in future	<i>Threats</i> can be problematic points, which may occur on the way to a goal

SWOT analysis is widely used in many spheres of everyday life and in a variety of industries. It can be very useful just in case when company or a person can objectively define advantages and disadvantages in order to clearly see the whole picture and to take all positive and negative aspects into consideration. Being honest towards own abilities allows to create proper development plan and set the right strategy for the future. (Voehl et al., 2014, 375-376.)

5 Research Methods

Research approaches are the processes of structuring and organizing work in the way of narrowing the wide range of material collection opportunities into specified methods of information collection and analyses (Creswell, 2014,3).

In simpler meaning, research is a way of learning the world round, that each human does every day just by questioning himself or herself and searching answers after. In order to have outstanding results, person should ask right questions, which divide on 2 types. (Dörnyei, 2007, 15.)

There are three way of research approach existing: qualitative, quantitative and mixed method. Differences between these three methods can be found in figure 8.

Qualitative Approaches	Quantitative Approaches	Mixed Methods Approaches
<ul style="list-style-type: none"> • Constructivist/ transformative knowledge claims • Phenomenology, grounded theory, ethnography, case study, and narrative 	<ul style="list-style-type: none"> • Postpositivist knowledge claims • Surveys and experiments 	<ul style="list-style-type: none"> • Pragmatic knowledge claims • Sequential, concurrent, and transformative
<ul style="list-style-type: none"> • Open-ended questions, emerging approaches, text or image data 	<ul style="list-style-type: none"> • Closed-ended questions, predetermined approaches, numeric data 	<ul style="list-style-type: none"> • Both open- and closed-ended questions, both emerging and predetermined approaches, and both quantitative and qualitative data and analysis
<ul style="list-style-type: none"> • Positions him- or herself • Collects participant meanings • Focuses on a single concept or phenomenon • Brings personal values into the study • Studies the context or setting of participants • Validates the accuracy of findings • Makes interpretations of the data • Creates an agenda for change or reform • Collaborates with the participants 	<ul style="list-style-type: none"> • Tests or verifies theories or explanations • Identifies variables to study • Relates variables in questions or hypotheses • Uses standards of validity and reliability • Observes and measures information numerically • Uses unbiased approaches • Employs statistical procedures 	<ul style="list-style-type: none"> • Collects both quantitative and qualitative data • Develops a rationale for mixing • Integrates the data at different stages of inquiry • Presents visual pictures of the procedures in the study • Employs the practices of both qualitative and quantitative research

Figure 7. Qualitative, Quantitative and Mixed Methods Approaches (adapted from Creswell, 2014, 18)

5.1 Qualitative Research

This research method is when data based on words, not on numbers. This type includes variety of ways of searching information and data which are presented in non-numerical form. (Punch, 2014, 3.) Qualitative approach discovers the dependence of social issues from humans and group of individuals, as well as relation between these two factors. The research's process penetrates through the verity of procedures and questions, supported by data, which relies on personal choice of the writer and then is analyzed growing from narrow focused topics to global themes, and afterwards data is filtered and sorted by own vision of the researcher. (Creswell, 2014,4.)

Quite often it is not clear exactly which data have to be collected at the first stage of studying the project case. Moreover, due to constant flow of new data acquired and analysed, previously observed and studied information is supplemented with new adjustments and can change the direction of research. Consequently, it may lead to newly emerging questions and doubts related to appearing complexity of the whole

process. Despite the attempts of investigators to build organized system from qualitative approach, it still remains uncertain and floating in veracity of collected data. That is why the author have to be ready to perform as a lawyer, providing logical chain of arguments, which can support all of the foundlings and make conclusions sound evidential in order to convince readers in the correctness of the project's result. (Walliman, 2011, 130-131.) Nevertheless, it remains challenging for the analyst to from one subjective opinion or outcome from qualitative research. The reason for this that applying such research method the only right answer does not exist, because it depends on the way of interpretation of gained data and particular vision of the researcher. Hence, result can be represented from different sides, not only relying on one single fact, but all of analysis have to be credible and data-relevant. Subjectivity is considered not as an disadvantage and preconception, but as a part of important context, reflecting all of the obtained knowledge and experiences. (Braun & Clarke, 2013, 20-21.)

Qualitative approach refers to constructivist worldview, meaning that research is based on participators' opinions. It enables to broaden data collection and cultural range and check how it changes after a period of time. Examination of participants' activity in the environment is a crucial part of information gathering process. Nevertheless, qualitative approach can be seen from a transformative worldview, where the target of author is to distinguish cases of oppression through personal interviews and with an implementation of narrative approach. (Creswell, 2014,19.)

5.2 Quantitative Research

This research method is based on numbers. As well is qualitative research it contains variations of information gathering procedure, but in this case all the data is in numerical form. (Punch, 2014, 4.) Quantitative approach studies connection between variables in order to test justice of the theory. Moreover, variables are measured with the help of the instruments providing reliable data, which can be analyzed through implementation of statistical manipulation. Using quantitative approach researcher writes well-structured form of thesis or project (Creswell, 2014,3.)

When choosing the type of analysis it is important to review all measurement levels existing due to their difference in granted amount of cases, which can be compared examined, explored and explained. This research method may consists from numerical data providing surveys as well as inspecting evidence of all kinds, which induces further calculations. This statistical counting is done on the special software, what enables access to relevant results that have to be implemented and obtained in the research process. It is vital to choose appropriate statistical tests out of numerous variety of these, which will also provide a wide range of cases, since the last ones can influence on accuracy of the results. (Walliman, 2011, 113-114.) The biggest advantage of this approach that it involve big number of survey participants, which answer to the questionnaires with limited variety of choices, allowing to direct partakers in certain framework and still letting them to make a decision based on their views. (Leavy, 2017, 19.)

Quantitative approach refers to postpositivist worldview, meaning that researcher tests the theory through data collection and afterwards making a conclusion of hypothesis justice. Data is retrieved from tools , which measure ratio gathered on the stage of an experimental design. Later that data is analysed through processes of statistical calculations and tests of hypothesis. (Creswell, 2014,19.)

5.3 Mixed Method Research

Mixed approach consists out of both previously mentioned research methods: quantitative and qualitative, implementing numerical as well as non-numerical data, forming specific concept, based on philosophical discourse and theories. The advantage of using the alliance of quantitative and qualitative approaches is having sterling report, filled with different data. (Creswell, 2014,4.)

When using survey first it can give an advantage of analyzing statistical data and then, based on that information, move to ask focus group about specifics topics or foundlings, made from questionnaire. Therefore, directing participants to the certain issue can help in better understanding of numbers and data gathered from survey.

Focus group brings benefit of providing answers, grounded not only on its behavioral specifications, but also on motivation, context and experience, and reliability of results increases, when participants share their knowledge in language of their choice. Integrating two methods into one wholistic system author can make the project circumstantial by covering abundance, environment and personal experience in the area of the research. (Leavy, 2017, 19-20.)

Mixed methods approach is based on pragmatic worldview, using data of quantitative and qualitative methods simultaneously. Such combination provides more coherent vision of an issue with a diversification of collected data. This approaches narrows from general topic and wide range of data, resulted in quantitative questionnaires, to detailed participants' opinions through open-ended questions. (Creswell, 2014,19.)

5.4 Philosophical Worldviews

Term *worldview* was proposed by Guba (1990) and he defined it as “basic set of beliefs that guide action” (17.) It also means the way of understanding the world and nature of raised topic chosen by the author for research. Worldviews are set according to personal experience of the writer, direction of the research and supervisor's advices that leads to choice of methods approaches. There are four main worldviews and differences between them are shown in figure 9.

Postpositivism	Constructivism
<ul style="list-style-type: none"> • Determination • Reductionism • Empirical observation and measurement • Theory verification 	<ul style="list-style-type: none"> • Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Transformative	Pragmatism
<ul style="list-style-type: none"> • Political • Power and justice oriented • Collaborative • Change-oriented 	<ul style="list-style-type: none"> • Consequences of actions • Problem-centered • Pluralistic • Real-world practice oriented

Figure 8. Four Worldviews (adapted from Creswell, 2014, 6)

For this thesis the postpositivist, constructivist and transformative worldview were less suitable by their aims and ideologies, however, the pragmatic one suited the best so it was described precisely.

Using pragmatic philosophy, researches do not put all their attention into certain methods, they define issues of the research, look broadly and apply every possible approach for better understanding of the case. (Rossman & Wilson, 1985, 631.) Pragmatic approach as well as mixed method unites both qualitative and quantitative researches, avoiding the only one right decision and dividing it into variety of data collection and analysis. The mix of approaches in pragmatic worldview guarantees better comprehension of examining case study.

Usage of pragmatic worldview was preferred in the thesis because it also allowed to rationalize work by mixing qualitative and quantitative approaches and giving an understanding how and what to research. In summary, pragmatism provides wide variation of choices in research methods, in gathering and analyzing data, in views and opinions on the case. (Creswell, 2014, 11.)

5.5 Data Gathering Methods

5.5.1 Interviews

Theoretical Part

Interviews are the major and the most frequently used method for collection of qualitative data. This data is retrieved from an interaction between the researcher and variable amount of participants starting from one. Interviews can be performed in a wide range of forms, including face-to-face meetings and even by email or through social medias. All interviews are divided primarily into three subgroups: unstructured, semi-constructed and occasionally constructed.

Unstructured interviews are not based on concrete questions, prepared in advance, or implicate possible answers as an outcome. Such type of conversation is targeted to relax and make an interlocutor to feel comfortable, creating natural and pleasant atmosphere. Usually, an interviewer starts with general question in order to state and identify the topic of the discussion for the participants. Thus, it allows questioner to keep in the head the main points and issues to be covered.

Semi-structured interviews are lead with a list of pre-determined questions, which form the structure of it. These, prepared in advance, subtopics of the discussion help researched to follow the plan and simultaneously guarantee the coverage of research objectives. Nevertheless, semi-structured interviews still remain flexible, because interviewer has an opportunity to ask questions in random order, linking previously gained answers and converting them into a new topic. A combination of unstructured and semi-constructed interviews provide open-ended questions without specific direction. That gives the participant an opportunity to reveal more thoughts on the topic.

The process and the structure of the interview are essential, because poor data collection leads to pointless results. It is beneficial to use an audio-recorder or video-recorder during interviews for qualitative research. The reasons for these are an

opportunity to follow all of the actions that happen during interview and an inability to write down all of the ideas and phrases, while listening to the participant. It is essential to please the interlocutor with an calm atmosphere, where interview cannot be disturbed by external factors or internal, which were not foreseen in advance such as lack of necessary equipment. The researcher have to take care of taking an interview at appropriate time that it is not stopped earlier than it was planned due to participants or interviewer time limits. (Schneider et al., 2013, 128-129.)

Practical Part

The research includes data, which gathered during interview with a management of a warehouse. The meeting was arranged, where were raised questions regarding processes inside of the packaging area. There were 2 representatives on the side of the company: a manager and a supervisor of Logistikas facility in Jyväskylä. Combination of personal from different levels of management allowed to collect more information from different point of view on the same subjects of matter. In addition, the researcher was able to ask questions and to have short discussions about the process during the work, what enabled to gain more necessary information.

Questions to the interview were prepared according to three main research questions. In addition, information gathering process from a variety of resources brought more ideas to the topic, what allowed to form comprehensive and at the same time diversified questions. Semi-structured type of interviewing was chosen, because in that case, meeting became flexible and besides discussion of main topics, there was freedom to ask questions, which appeared only during the interview.

Topics and questions, which were raised during interviews and meetings, can be found in Appendix 1. Questions were based on 4 topics:

- 1) Buffer zone
- 2) Space Utilization
- 3) Employee performance
- 4) Communication

Appendix 2 contains table with answers and results of interviews.

5.5.2 Questionnaires

Theoretical Part

This type of data gathering for the research is used widely in the variety of social sciences and in an environment. Well-organized survey covers a range of aspects based on an experienced of tested participants, moreover, instruments, used in the survey, measure personal characteristics, preferences, temperament, abilities and opinions. These existing instruments are valuable in the research, because they are reasonable and dependable. Some of statistical analysis would be difficult to run without the use of certain instruments, which provide data at ratio levels as well as at the interval. (Marczyk et al., 2005, 116.)

Close-ended questionnaires are used to provide statistics when doing quantitative researches. This type of survey is the most suitable for computer analysis and generation of numbers as outcomes.

Open-ended questionnaires are widely used in qualitative research. They do not have several options to choose from, but allow the participant to share an opinion in a blank section. It is more complicate to retrieve and analyze data from this type of questionnaires due to the lack of standard answers.

Combination of both questionnaires provides the researcher with an opportunity to distinguish the relevance of close-ended questions according to answers as well as learning participants' preferences and desires from open-ended questions. A lot of surveys start with short questions with options to choose, introducing the topic to the participant, and then asking for deeper thoughts through more complex questions. (Dawson, 2009, 31.)

Practical Part

Beside interviewing the management of the company, a survey was made for employees of the packaging area of the warehouse. With the permission of employers, each worker was provided with an Internet link to the questionnaire. The survey could have been taken both in English and Finnish, so people had a choice in which language it was easier for them to participate. Moreover, the questionnaire had just 10 questions, majority of which were multiple-choice. These facts influenced on employees' willingness to take part in the survey in positive way, what enabled to collect answers from 11 participants. In addition, it became valuable for the research that employees with different amount of experience in the company participated. There were people with 2-4 years of career, as well as just 2-4 weeks, what allowed to collect wide range of perspectives.

This survey was a combination of open and close-ended questions. Nevertheless, main set of questions had definite answers, simplifying answering process for participants and data collection process for the researcher.

Questions and results of the survey can be seen in Appendix 3.

5.5.3 Observations

In general, observation research divides into two categories: direct and participant. In the first type researcher examines case from a side often using technologies that allow not to interact with examinee.

Participant observation is defined as integration of the researcher into the process and involvement into examined environment. Such participation can take month or even years, in order to gain trust of a community and to gather more information about certain place, culture or a group of people. (Dawson, 2009, 32-33.)

5.5.4 Documents, historical and secondary data

Research may include documents about a company, using both internal and external sources of information. As a rule, when an organization provides such type of data, it is often limited and restricted to be used in public.

In addition, it can be secondary data gathering , which can be found on websites, in books or journals and in governmental records. It is important for author to retrieve information only from up-to-date and reliable resources. It is important to choose trustworthy source of information in order to provide relevant information, which can add value to the research. (Muhammad Sajjad, 2016, 273-275.)

5.6 Data Analyzing Methods

Variety of analyzing tools were used in this thesis for better understanding of all aspects related to working environment in the packaging area. Diversifications of methods, which were used enabled tan an opportunity to observe the problem from range of points of view. Due to this fact, the research became more comprehensive and detailed.

It was necessary to implement tools, which would help to analyze data collected from both types of research approaches: qualitative and quantitative. For example, ABC analysis was done for understanding the consumption of carton boxes during working process. That allowed to see what kind of improvements could be done in future. Variety of schemes and graphs increase the level of visual perception of data. Flowcharts and fishbone diagram included a big amount of information and data collected during personal observation, interviews and survey, however, at the same time these figure looked readable and detailed.

In addition, few formulas were used to calculate measurable data, where numbers play significant role in development of the process. Information, which could not be measured, was analyzed with the use of such tools as SWOT analysis, defining weak and strong part of certain area, equipment or employee.

6 Data Analysis and Results

7 Conclusion

8 Discussion

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Appendices

Appendix 1. Questions and topics of interview

Appendix 2. Results of interviews

Appendix 3. Survey results

Appendix 4. Examples of possible new system for inbound area

Possible new equipment was presented on these photos bellow. These are just examples, not an actual suggestion for the company. Figure 32 shows how flow-through racking system works, and figure 33 represents roller conveyor.



Figure 9. Flow-through pallet racking (adapted from Gravity Flow Pallet Racking, n.d.)



Figure 10. Roller conveyor (adapted from Gravity roller conveyor, n.d)

