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Tailoring of internal logistics KPIs for different operational levels in a manufacturing company

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ABSTRACT:

Logistics is one of the most important key factors influencing competitiveness in manufacturing business. Which is why having a right performance management system and indicators are vital for such businesses' logistics department. KPIs are a set of measures that translate a business' strategy into measurable targets and steer the course of actions in operations and planning. The aim of this thesis is to identify how internal logistics KPIs can be tailored and provide a tailored set of performance indicators for BRP Finland Oy internal logistics operations by combining insight from a review of existing literature and a qualitative case study analysis. BRP Finland Oy is a recreational product manufacturing company located in Rovaniemi Finland, just below the arctic circle. Their main products are lynx and skidoo snowmobiles and can-am 6x6 ATVs.

A review of existing KPI frameworks and logistics specific literature was reviewed. Then, interview-based content analysis was conducted across different operational levels of the case company to gain insight into the current processes, set objectives and faced challenges in the internal logistics operations. A list of KPIs was collected from literature review and the interviews to be evaluated based on relevance to logistics, strategic alignment, understandability, diagnostic value, measurability and controllability.

The findings indicated that many of the KPIs in use lacked clarity, were not strategically aligned and were irrelevant for logistics or outside the influence of logistics operations. The evaluation through a developed scoring matrix enabled to prioritize and choose a tailored set of KPIs for the case company, such as sequencing lead time, picking time, and inventory record accuracy. The proposed KPI system that offers a replicable method for logistics performance measurement evaluation, was validated with relevant stakeholders in different operational levels. This thesis contributes both practical implications for logistics performance measurement and theoretical insight into internal logistics KPI development in manufacturing context.

KEYWORDS: Sisälogistiikka, suorituskykymittarit, toiminnan kehitys

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Tiivistelmä:

Logistiikka on valmistavassa teollisuudessa yksi tärkeimmistä kilpailukykyyn vaikuttavista tekijöistä. Tämän vuoksi oikeanlaisen suorituskykyjärjestelmän ja -mittareiden olemassaolo on elintärkeää kyseisen alan yritysten logistiikkaosastoille. KPI-mittarit (Key Performance Indicators) ovat joukko mittareita, jotka kääntävät yrityksen strategian mitattaviksi muuttujiksi, sekä tavoitteiksi, jotka ohjaavat toimintaa ja suunnittelua. Tämän tutkimuksen tavoitteena on selvittää, kuinka sisäisen logistiikan KPI-mittarit voidaan räätälöidä tapauskohtaisesti, sekä tarjota BRP Finland Oy:n sisälogistiikan käyttöön räätälöity KPI-mittaristo, yhdistämällä kirjallisuuskatsauksen ja laadullisen tapaustutkimuksen näkökulmia. BRP Finland Oy on vapaa-ajan laitteita valmistava yritys Rovaniemellä napapiirin tuntumassa. Yrityksen päätuotteita ovat LYNX- ja Ski-doo-moottorikelkat, sekä Can-am 6x6-mönkijät.

Tutkimuksessa tehtiin katsaus olemassa oleviin viitekehyksiin KPI-mittareista, sekä muuhun sisälogistiikkaa käsittelevään kirjallisuuteen. Tämän jälkeen suoritettiin haastatteluihin perustuva sisältöanalyysi kolmella eri tasolla BRP Finland Oy:ssä, jotta saataisiin ymmärrystä sisälogistiikan kohtaamista haasteista, prosesseista ja tavoitteista. Kirjallisuudesta ja haastatteluista kerätyistä KPI-mittareista muodostettiin lista, jonka sisältämät mittarit arvioitiin kuuden eri kriteerin avulla. Kriteerit ovat: merkitys logistiikalle, strateginen linjaus, ymmärrettävyys, mitattavuus, hallittavuus ja diagnostinen arvo.

Tulokset osoittivat, että moni käytössä olevista KPI-mittareista olivat epäselviä, eivät tukeneet strategiaa, eivät olleet sisälogistiikalle olennaisia tai eivät olleet sisälogistiikan vaikutuspiirissä. Luodun pisteytysmatriisin avulla mittareita pystyttiin priorisoimaan ja valitsemaan yritykselle sopiva joukko, johon kuuluivat esimerkiksi sekventoinnin läpimenoaika, keräilyaika ja varastosaldojen tarkkuus. Luotu KPI-mittaristo tarjoaa toistettavan menetelmän logistiikan suorituskyvyn arviointiin ja se arvioitiin keskeisten sidosryhmien kanssa eri organisaatiotasoilla. Tämä tutkimus tarjoaa sekä käytännön sovellettavuutta, että teoreettista näkökulmaa sisälogistiikan suorituskyvyn mittaamiseen.

Avainsanat: Sisälogistiikka, suorituskykymittarit, toiminnan kehitys

Contents

1 Introduction and backround

According to David Parmenter (2010), many companies, big or small, do not have the right measures to work with. A KPI should tell a company what they must do to perform better. So, the aim of the thesis is to develop a set of Key Performance Indicators (KPIs) as a part of a manufacturing company's internal logistics daily operations to support their continuous improvement and decision making. And to find out what kind of information is needed on each organizational level to find development targets in internal logistics. The KPIs will be divided into three different categories, depending on the organizational level they will be used in.

The case company is BRP Finland Oy, with their headquarters based in Rovaniemi. BRP Finland Oy is part of BRP (Bombardier Recreational Products Inc.), which is a Canadian company that manufactures recreational products, ranging from jet skis to ATVs and Snowmobiles. In Rovaniemi, BRP has a factory that produces lynx and ski-doo snowmobiles and can-am 6x6 ATVs. The operations in Rovaniemi headquarters include R&D, procurement, production, internal- and inbound logistics, sales, and marketing, after sales and other administrative support functions. BRP has 12 different manufacturing facilities in 6 different countries.

In the focus of this thesis are the KPIs related to internal logistics, or in other words, the warehouse operations that support the manufacturing line. The main task of that warehouse is to deliver parts and components to the two production lines. Logistics has 3 management levels that are relevant in the KPI development: operator – supervisor/planning – manager. Figure 1 below shows the hierarchy of operational levels in the case company.

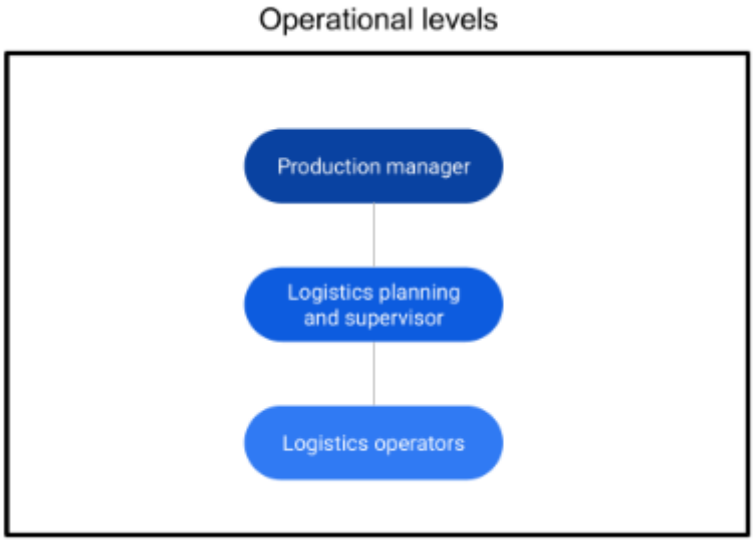

Figure 1 The operational levels included in the study

There are three operational levels (see Figure 1) that the KPIs need to be tailored for in the case company. The first level is the operators (forklift drivers, mizusumashi's and team leaders) that do the physical work of the operations. Their tasks include receiving the goods in the warehouse, put away then collecting and line delivery in two categories. The big parts are delivered in pallets or sequenced carts and smaller parts, like fasteners and bolts, are delivered in small boxes handled by hand. Mizusumashi is a Japanese term meaning the material handlers that deliver small parts for production line in small quantities, making multiple rounds between storage and production (Vilda and Torrents 2020). In this context and case company, mizusumashi is used for small part delivery drivers, that collect and deliver small parts for production. The second operational level includes the supervisor and planning/industrial engineering team for logistics, later referred to as the logistics planning team. Their tasks include providing the correct resources and making sure the operations run smoothly. The third operational level is the manager-level which includes production manager and director who are responsible for all operations in the local plant.

1.1 Research objectives

For the thesis a theoretical foundation needs to be established to be able to understand how internal logistics KPIs are typically developed in manufacturing environment. Widely accepted frameworks for KPIs management, such as the balanced scorecard and SMART criteria need to be reviewed. During the literature review, logistics KPIs will be collected from source materials to create a reference list, and they will be categorized to align with higher level business objectives. Through semi-structured interviews, the case company's current understanding of KPIs, set objectives and operations will be mapped to be able to tailor selection criteria for the case company KPIs.

Based on the first three objectives, selection criteria for a scoring table for KPIs will be formed to be able to choose the correct KPIs for the case company's internal logistics organization in objective four. Once the KPIs have been scored and compared, the chosen KPIs are validated with the key stakeholders in the case company to verify their relevance and alignment. The objectives of this study are:

1. Review literature on logistics KPI development and frameworks in manufacturing context.
2. List different KPIs found in objective 1
3. Analyze the targets and strategy regarding logistics in the case company and identify possible challenges faced in the daily operations through interviews at different operational levels
4. Develop selection criteria and choose fitting KPIs
5. Validate chosen KPIs with stakeholders and implement them as a part of daily operations

1.2 Research Questions

To reach the objective of producing a fitting set of KPIs to the case company's internal logistics, two specific research questions need to be answered through completing the research objectives.

1. How can internal logistics KPIs be tailored to a specific manufacturing company?

2. What different KPIs already exist that measure the efficiency of internal logistics and which of these are the best suited for the case company?

1.3 Research Gap

The case company does not have sufficient KPIs in their daily operations regarding logistics, the focus in development has been more on the production line. In the field of study there are studies on logistics KPIs, but not too many that focus on KPIs for different hierarchical levels in internal logistics. According to my own experience, the manager needs totally different information than a forklift driver to develop efficiency. For example, Karim et al. (2021) proposed ratio-based warehousing productivity performance indicators, but it was a set of general measures for a general warehouse. A warehouse with the task of supporting a production line requires a completely different kind of KPIs, since their key tasks include more than receiving, putaway, picking and shipping. For example, the sequencing of key parts of the manufactured unit mentioned by Boysen et al. (2015), is not considered in Karim et al. (2021) set of logistics KPIs. Therefore, a way of selecting criteria for a tailored set of KPIs needs to be made. The company has sort of a balanced scorecard, but the development process is still ongoing. In open discussions with employees, the KPIs were not understood and did not have value to them other than looking visually nice on the team table. A lot of the KPIs in the field focus on optimizing the use of space and receiving process, but not on the production line feeding. To fill these gaps, this thesis aims to differentiate the KPIs according to the relevant operational levels and study the process flow of the line delivery operations.

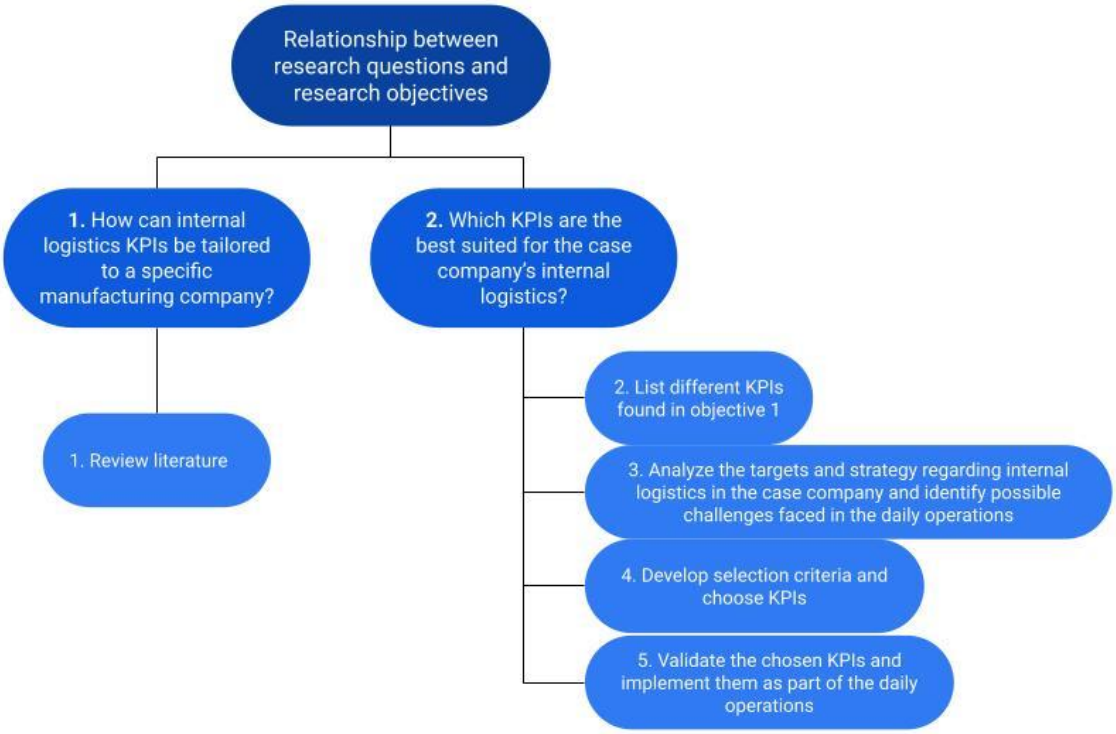

Figure 2 The relationship between research questions and objectives

Figure 2 above shows the relationship between the research objectives and research questions. The answer to research question one is constructed by the insights from completing research objective one. As shown in Figure 2, the research question two requires the objectives from two to five to be completed before being able to construct the answer.

2 Literature review

In this chapter, academic literature will be reviewed to identify and define possible fitting KPIs and to create selection criteria for them. During the literature review, any found KPI from the literature will be listed and presented later to be evaluated with the selection criteria formed afterwards. Two key theories will be explored regarding the selection criteria creation. The SMART (Specific, measurable, achievable, relevant, time bound) (Selvik et al., 2021) and Kaplan and Nortons (1996) balanced scorecard theory.

Various other theories are then explored to form a basic understanding of the context of logistics performance and KPIs. Such as supply chain management, performance management and the objectives of logistics and lean. All theories are explored with the scope of logistics and KPIs in mind. After the chapter research question number one will be answered: *"How can internal logistics KPIs be tailored to a specific manufacturing company?".*

2.1 Supply Chain Management

The supply chain is a key factor that defines how competitive a business can be in the market. It can enable a company to do things in a different way than their competitors. (Hugos, 2024)

Supply chain is a network of material-, service-, money- and information flows, controlled by different organizations in co-operation. According to Hugos (2024) to make the supply chain as efficient as possible, decisions need to be made and balanced in five different areas:

1. Production
2. Inventory
3. Location
4. Transportation

5. Information

When developing supply chain strategies, companies try to achieve a position where their service or cost is at an advantage compared to others in the market. Having neither one of them puts a business in an awkward position. At an optimal situation advantage is gained in both areas, but sometimes that is not possible, for example in a mature market where there are a lot of competitors already. Then it is easier to try to improve service levels to give customers more for their money. (Christopher, 2022). Figure 3 (Christopher, 2022) shows the possible positions for a company in the market regarding value- and cost advantage. Richards (2018) also lists various factors in supply chains and especially in warehousing that usually trade-off between them when making decisions that favor the other:

- Cost and service
- Storage capacity and put-away/picking speed
- Speed and accuracy
- Inventory level and availability
- Efficiency and responsiveness
- Volume purchases and storage cost
- Transportation cost and storage cost

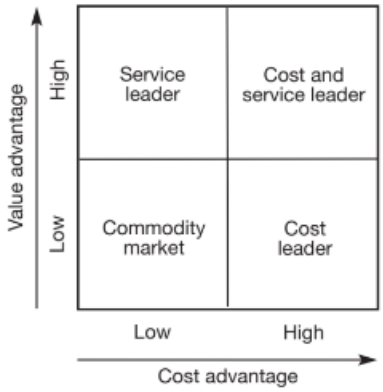

Figure 3. Competitive advantage in logistics matrix (Christopher, 2022, p7).

2.1.1 Boundaries in the supply chain

It is important to recognize where certain processes begin and where they end. In the case of a manufacturing company's supply chain management the supply chain begins from the part suppliers and end with the finished product delivered to the shop that will sell it to the end user (Logistiikan maailma, 2024). But within the supply chain there are areas of operation which are not included in logistics, Baudin (2004) defines logistics as all operations that include delivering goods and services but excludes the making of those goods and services. In the case of this thesis, in a manufacturing plants context, logistics is comprised of shipping, transportation, receiving, storage, internal delivering to production line of materials and material flows. In addition, all information flows, whether it is digital, spoken or written, regarding the processes listed before, and fund flows created by those are included in the scope of logistics. (Baudin, 2024). Figure 4 below shows the information and material flows in supply chain according to Christopher (2022).

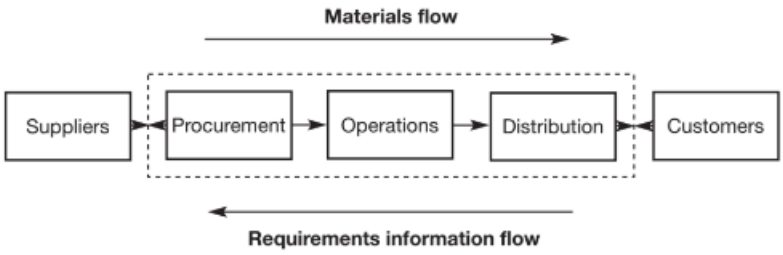

Figure 4. Material and information flow in a supply chain (Christopher, 2022, p91).

An important distinction is between the manufacturing plant and the rest of the world. It is also the border of line between internal (or inhouse) logistics and inbound/outbound logistics (Baudin, 2024). Logistiikan maailma (2024) defines internal logistics as the movement of material- and information flows within the borders of the manufacturing plant. The basic processes in the case company's internal logistics include good receiving, putaway, picking, delivery to production, sequencing and recycling or returnable packaging. Baudin (2004) defines the tasks of bringing in materials and shipping out goods as

logistics responsibilities in manufacturing context. In this thesis the subject is limited to logistics operations happening inside the plant in so-called internal logistics, which includes receiving, warehousing and line delivery operations. Even though lean logistics defines that the goal is to hold zero raw materials and goods, just let them flow through, this is utopia. In other words, the less goods and raw materials can be stored, the leaner the system (Baudin, 2004).

The goal of a warehouse should be to hold each individual shipment for as little time as possible. The purpose is not to hold onto goods but to ensure on-time deliveries for customers varying in demand (Richards, 2018). In the case of this thesis, the customer is the production line. In the past warehouses used to be the only places where stock was held. With the changes in product complexity and customers demand for individualization, the goal of warehouses has become to reduce the held stock and decrease throughput time (Richards, 2018).

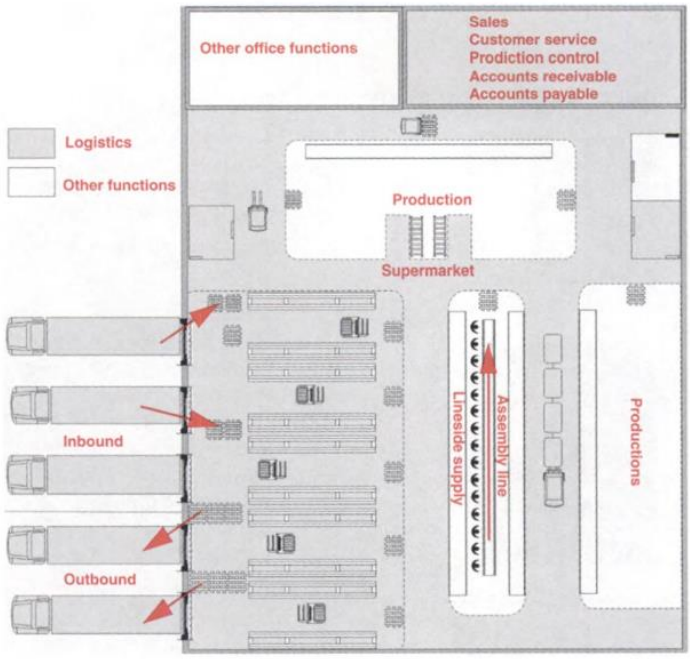

Figure 5. Boundaries between functions (Baudin, 2005, p13).

Figure 5 is a visual example of the boundary between logistics and other functions. Logistics itself is also divided into three different areas: in-house or internal logistics, inbound logistics and outbound logistics. This thesis focuses on internal logistics, which is the gray area within the box in Figure 5.

2.2 Performance measurement and management

This part of the theoretical background investigates theories on categorization of measurable performances and designing and implementing KPIs, such as the Balanced scorecard approach, performance prism and SMART criteria.

Due to the customers' rising demand for individualization and quality, logistics has risen to be one of the key factors in gaining competitive advantage in the automotive and recreational vehicle business (Dörnhöfer et al., 2016). To be able to develop such a key factor, its results and efficiency must be measured regularly (Hatry, 2006). Measuring the right factors in a right way, guides the decision makers to make the right decisions, because only what is measured, can be improved (Dörnhöfer et al., 2016). Parmenter (2015) states that it is important to have the right measures instead of measuring all things possible, because having excess amount of KPIs will cause lack of focus that will lead to under achieving. Using the wrong KPIs or the right KPIs inefficiently will cause dysfunctional behaviour in the business that will show up as under achieving (Parmenter, 2015). Parmenter (2015) further adds that the communication and reporting frequency of a KPI is decided based on its significance. The most crucial KPIs can be reported daily, and some only once a month.

Even though performance measurement systems in logistics should include the whole process from the supplier to the production line (Dörnhöfer et al., 2016), this thesis focuses on the part of measuring efficiency in the in-house logistics. In-house logistics in manufacturing context, comprises of material-, information and fund flows and it covers the processes from unloading the truck that is bringing the goods, to the part of delivering the goods to the assembly line (Baudin, 2004). Baudin (2004) also argues that the

most important thing is to focus on and measure quality and responsiveness performance of a logistics organization in a manufacturing company, before addressing costs and productivity. This is because having inefficiency of, for example, one operator in logistics costs much less than having production stops because of the poor quality of the logistics service.

The whole logistics operations cannot be measured with one indicator, a tailored set of those indicators are put together to form a balanced scorecard. The scorecard gives us an overview of the most important factors and processes in logistics. The scorecard is balanced with two extremes, the big and small indicators. A small indicator measures the efficiency of a single process or workflow, for example, delivery time of a singe forklift operator. A big indicator measures big entities like the revenue of the company. A well-made balanced scorecard includes both indicators and they are followed by different people depending on their operational level. (Logistiikan maailma, 2024). According to Parmenter (2015) the indicators used to measure the business' performance should be made to align daily operations with strategic objectives.

Parmenter (2015) divided the measurable metrics into four different categories. The key result indicators, result indicators, performance indicators and the key performance indicators. The key result indicators (KRI) provide insight into how well the business has performed in a specific area and they give a high-level view of the past results. Result indicators (RI) show what actions or tasks have been completed and give insight into the achieved outcomes. Performance indicators (PI) suggest what actions to take to improve or maintain performance in specific areas of the business. Key performance indicators (KPIs), which is usually a term used to picture all the indicators mentioned, identifies specific areas or actions, if developed, will lead to improvements in performance. KRIs and RIs tell more about what has happened, while PIs and KPIs guide on what should be done to achieve better results. Measuring a certain factor makes it possible to improve, but how much operational performance can be developed is addressed by McGinnis et

al. (2002) by comparing similar warehouses and environments and their indicators to create a benchmark of the best performing warehouses.

2.2.1 Balanced scorecard

All measures used in business are a translation from the company's vision and strategy. Vision and strategy can be translated into four different categories called the traditional balanced scorecard. In the financial perspective the focus is on shareholders and answering the question that are we creating value to them. Customer perspective seeks answers to how customers perceive the company. Internal business process perspective measures the things the company must excel at. Innovation and learning perspective measures that is the company improving its ability to improve, innovate and learn. The key is the balance between these categories and making sure that improved performance in one category does not affect the others negatively. (Kaplan and Norton, 1996).

The organization's strategy needs to be broken down from corporate level objectives to manager level and then further down to operator level objectives. And balanced scorecards metrics and critical success factors are a translation from those objectives and strategy. This means that the metrics also need to be broken down into more detailed metrics while moving down the organizational structure, this enables people on all different levels to focus their efforts on correct matters to improve the overall results. (Kaplan and Norton, 1996)

Although the undeniable popularity of the balanced scorecard, Neely (2002) points out that its weaknesses are not giving enough attention to stakeholders. Neely (2002) states that employees and suppliers are not considered in the balanced scorecards four perspectives.

2.2.2 Performance prism measurement system

The performance prism measurement system (PPMS) was developed by Kennerley and Neely (2002) to have a measurement system that puts the stakeholders in the center rather than just shareholders. Kennerley and Neely (2002) argue that the PPMS is a more complex system to be able to address the issues in other existing measurement systems. Kaplan and Norton's (1996) BSC includes four different perspectives as mentioned before, but PPMS identifies five different perspectives, and their relationships listed below:

1. Stakeholder satisfaction
- What do the stakeholders require from the organization? Who are the stakeholders?
2. Strategies
- Which strategies are fulfilling the stakeholders' needs?
3. Processes
- Which processes are needed for the existing strategies?
4. Capabilities
- What capabilities must the organization have to be able to execute the processes?
5. Stakeholder contribution
- What does the organization require from the stakeholders?

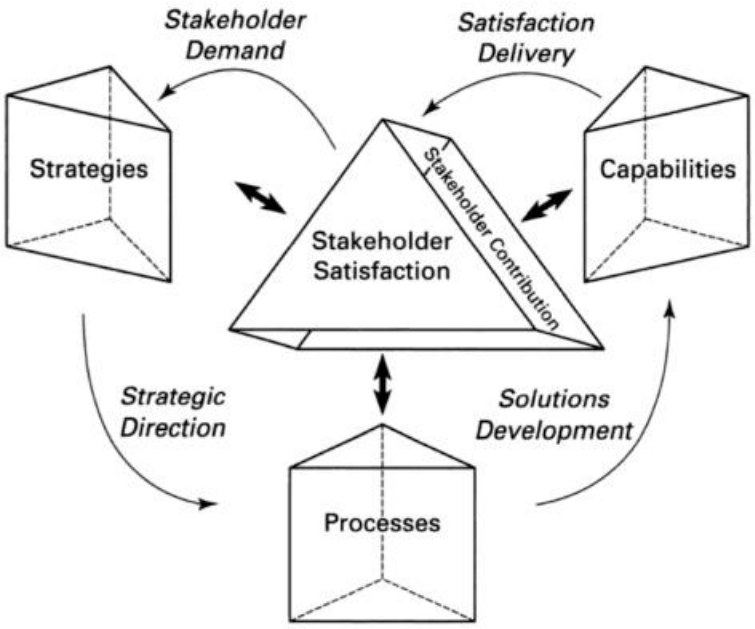

Figure 6. The relationship between the facets to deliver stakeholder value (Kennerley and Neely, 2002, p153)

These categories can be divided into two sections, internal and external measures, for producing a balanced picture of the situation in the company. These measures can be seen in Figure 6, which pictures the PPMS system. The external measures are the pyramids mentioning stakeholders and the smaller three pyramids picturing strategies, processes and capabilities mean internal measures. For a business to be able to efficiently implement the PPMS to their operations, Youngbantao and Rompho (2015) found out that the business must recognize what kind of an organizational culture they are working in.

2.3 Logistics KPIs and selection criteria

This chapter focuses on the needs of KPIs specified in logistics area and the selection criteria to evaluate the KPIs for the chosen purpose. First an overview of the subject is made, followed by a review of the objectives and goals of internal logistics and material handling, and their relationship to measurable metrics. Then a deep dive into the selection criteria and how to choose them.

2.3.1 KPIs

As Baudin (2004) mentioned, quality and responsiveness of the logistics service is financially more profitable than sacrificing quality for efficiency. Because not getting the job done properly, even in changing situations, is more costly than, for example, one or two operators too many in a warehouse. Which means that when selecting suitable KPIs for logistics operations, the selection criteria should also put more weight on the quality and responsiveness of the logistics service than efficiency. To support this, Stephens and Meyers (2013) claim that in the logistics operations context, concentrating solely on the direct labor cost is a fallacy which many people misunderstand, because with direct labor cost, more costly effects can be avoided. And because productivity is measured by output divided by input. So, increasing productivity is done by increasing the amount of output while keeping the same level of input, or decreasing the amount of input while keeping the same level of output. Karim et al. (2021) divided productivity measures into partial productivity and total productivity. Since in warehouse operations multiple inputs are present, for example labor, money and capital, partial productivity can be measured by comparing one of these inputs to one of the possible outputs of the warehouse. Total productivity is measured by comparing all the inputs to all the outputs. Figure 7 illustrates the theoretical inputs and outputs and shows the warehouse processes between them.

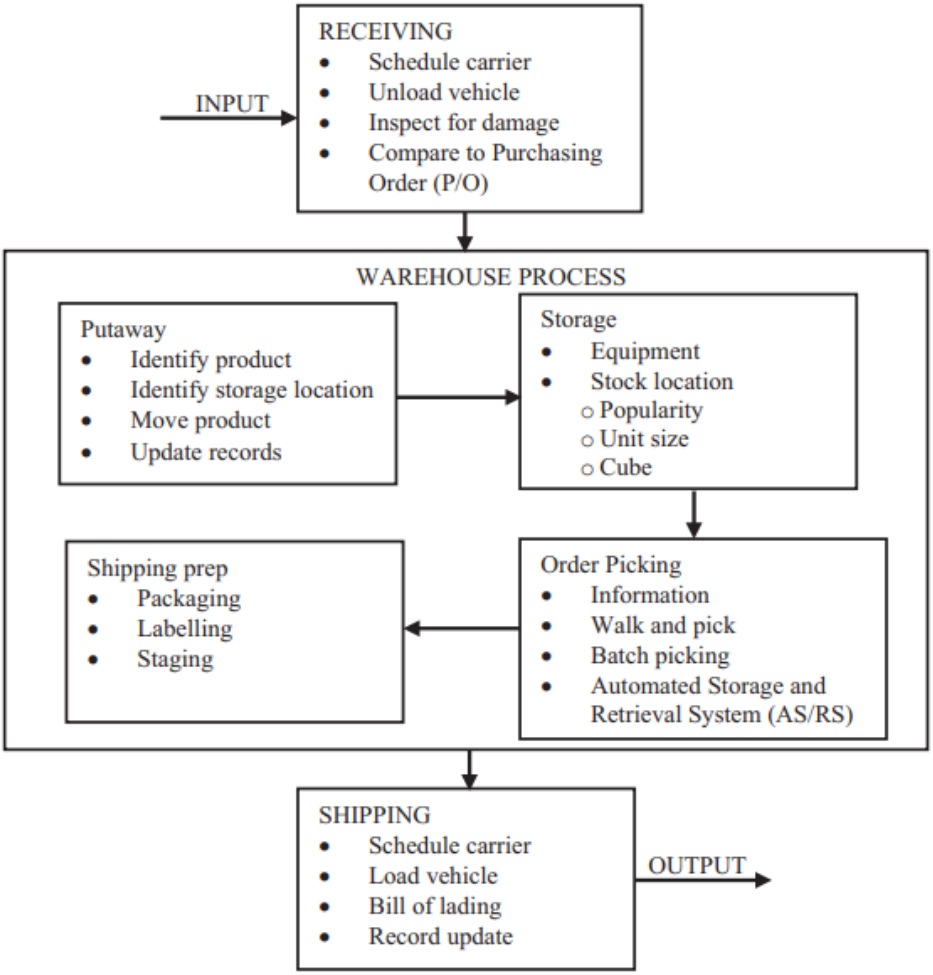

Figure 7. Karim et al. (2021, p3) illustrated the logistics processes from input to output

According to Bachár and Makyšová (2019), logistics indicators need to be evaluated for achieving the set goals to be possible. They also state that an operational logistics indicator evaluation system can act as a protective mechanism against increasing issues in the logistics chain. Bachár and Makyšová (2019) list three main variables that can be used as indicators for achieved savings in logistics: time, financial units, and cost units. For example, if time can be saved in a process it can lead to shorter lead times and improved service quality, or lower need of resources and therefore financial savings.

According to McGinnis et al. (2002), a common mistake in logistics KPIs is that they are single factor metrics. Single factor productivity metrics are measurements of the

relationship between two factors, input and output. For example, two of the most common metrics in logistics are ratio pallets per hour (input is hour of work and output is pallets moved) and capacity (input is pallet places and output is pallets stored). Single factor metrics are required for detailed analysis of warehouse operations and performance but using them as key performance indicators contains issues. However, if a single factor has a noticeable drop, it is impossible to know where the problem is without further knowledge of the operating environment and potential changes happened in it. McGinnis et al. (2002) conclude their insight into single factor metrics, that they are effortless to read and understand but more information is required if the warehouse's performance is really wanted to be evaluated.

2.3.2 Logistics objectives

Kaplan and Norton (1996) define objectives as an answer to question "*What the company needs to do to accomplish its strategy*" and the key metrics are determined based on those objectives. Internal logistics objectives can be divided into the main objective and smaller sub-objectives. In the context of a logistics unit for a production line, the main objective should always be to reduce CPU (cost per unit) for production, followed by the sub-objectives. All the lower-level goals or objectives must support the main objective (Stephens and Meyers 2013).

Wild (2012) claims that one of the most important objectives of a logistics organization is always to maintain and improve inventory record accuracy. Inventory record accuracy aims to keep the records in the same quantities as the reality regarding good in stock is. A poor inventory record accuracy means that the actual amount of goods in stock is not known. In a manufacturing business' context, this can lead to stockouts at the production line and therefore partially finished products needing retrofit or a complete line stop. Poor inventory accuracy has also an impact on the objectives of reducing inventory and better availability of materials. To gain overall efficiency, the inventory levels must be kept low, and to make it possible to keep low inventory levels, the data and information about the inventory must be accurate. Wild (2012) also argues that a big issue in keeping

the inventory accuracy on a good level is that a lot of people have grown used to so called firefighting, or in other words, fixing problems quick and dirty. And inventory records are the place where they often have a negative effect. Well managed inventory records are always beneficial in the long run, even though it takes more effort to focus on the root causes when problems occur. According to Brooks and Wilson (2007), inventory record accuracy (IRA) is measured by dividing the amount of total accurate records with the number of total records checked (times 100 %) to get the value of inventory accuracy in %.

2.3.3 KPI evaluation and selection criteria

According to Kaplan and Norton (1996) the criteria for choosing the right metrics are dependent on the set objectives. Then the objectives depend on the business strategy set by the corporation. Correctly set metrics measure the progress towards set objectives, therefore, to define selection criteria for the metrics, the business strategy and objectives supporting it must be considered.

Choosing a correct KPI also depends on the operating level. Managers need different information to make decisions, the so-called team level, or front row operations. According to Parmenter (2010) for operations developments sake, it is crucial to empower front-line operators. This is done through communicating the critical success factors from top to bottom. Once the front-line operators know the critical success factors and upper level KPIs, their input can be used to develop a KPI relevant to their level of operations.

Ishak et al. (2019) state that SMART-criteria is a popular method for evaluating fitting KPIs. SMART stands for Specific, measurable, attainable, relevant and time-bound. Utilizing this criterion means that each KPI considered needs to be given a score in each of the SMART criteria. The score cannot be given blindly on theoretical basis, but the

evaluator needs to have knowledge of the possible KPIs operating environment and take evaluation context into consideration (Bjerke and Renger, 2016).

2.4 Lean manufacturing

The base thinking model in lean philosophy is value. The aim is to add value to the product or service which the customer is ready to pay for. (Logistiikan maailma, 2024). Even though Lean is often mentioned in the context of manufacturing and lean manufacturing, it is not limited to manufacturing but applies to the whole organization (Kilpatrick, 2003). Kilpatrick (2003) defines lean as a structured methodology, focused on the continuous improvement of processes by identifying and eliminating non-value adding activities, enabling smooth product flow that is driven by customer demand. With the goal of achieving operational excellence. In manufacturing context, Rose et al. (2011, p1) defines lean as "*a production system that focusing on continuous flow within supply chain by eliminating all wastes and performing continuous improvement towards product perfection".* They also state that lean manufacturing is a relevant topic in all industries and the tools and culture and be applied to gain competitive advantage in the market, regardless of the size of the company.

In lean, the goal is to eliminate *muda*, or different kinds of waste that do not add value to the product or service. According to Rose et al. (2011) waste is everything else, but the time, space and materials and equipment required in making the desired product or service. Baudin (2002) sums up these wastes as seven different *mudas:*

- Overproduction
- Excess inventory
- Overprocessing
- Waiting
- Transportation
- Motion
- Production of defectives

Logistiikan maailma (2024) adds three critical points of waste to this list with 1. Not utilizing the cerebral capacity and competence of humans, 2. Overloading machines or people, and 3. Dispersion. And claiming that not utilizing cerebral capacity and competence of humans is the worst waste possible.

2.4.1 Lean logistics

Lean can be implemented in logistics functions and even have effects on logistics through eliminating waste elsewhere. According to Rose et al. (2011) applying lean manufacturing strategies in production can improve the situation in logistics through reducing inventory levels and lead time that enhances the inventory turnover rate. According to Logistiikan Maailma (2024) lean can be used as an opposite to agile in logistics or supply chain context.

2.4.2 Value stream mapping

According to Garcia (2004) when fitting lean principles to warehousing and logistics, it all begins with mapping the current processes and defining which of them add value and which don’t, with a method called value stream mapping (VSM). Garcia also states that the most important points of potential improvement that can be identified with VSM are the amount of material handling, the time and amount of travelling done, and time lost in searching for the goods. Logistiikan maailma (2024) continues this process with eliminating those processes identified that do not add value or transforming them to flow smoothly.

3 Research methods

Academic literature related to the topic was reviewed to identify and define possible fitting KPIs and then to create selection criteria. The selection criteria will focus on two key theories on KPI selection. The KPIs chosen must be SMART (Specific, measurable, achievable, relevant, and time-bound) for making possible the evaluation of quality of the indicators (Selvik et al., 2021). The second theory was the Kaplan and Nortons (1996) balanced scorecard to ensure multiple perspectives and balance of performance.

In literature reviews' conclusion an answer was found to research question one. To be able to tailor a set of KPIs to a manufacturing company, a set of selection criteria must be created for evaluating individual KPIs. The selection criteria table will be one of the key elements of this thesis. To be able to create the criteria, information is needed about the case company's strategy and objectives, then an understanding of the operating environment within the company and the challenges it is facing in day-to-day operations need to be understood to draw cause and effect relationships between operations and set targets and objectives.

Qualitative approach utilizes interviews of people from different operational levels mentioned to gain insight from within the company. All the interviewees work in logistics or in a position relevant to logistics. The interviews will focus on current KPI usage and the needs and objectives these KPIs are trying to fulfill. Since the scope is rather wide the interviews need to include sample questions and open-ended questions formed along the way because it is necessary to be able to specify the questions and answers to gain as accurate information as possible. This way of gathering information is done by a process described by Kallinen and Kinnunen (2021) as semi-structured qualitative interview. A semi-structured interview is prepared with questions, but the way of answering is left for the interviewee to decide, and follow-up questions can be asked to specify answers. Since the writer of this thesis is currently working in the case company, continuous interviews are done to map the current processes and methods for the overall picture, the semi-structured interviews are used only to gain insight into the KPIs and challenges.

Since Kaplan and Norton (1996) state that the metrics used in the indicators are a translation of the company's strategy and objectives, these matters will be discussed in the interviews. The open-ended questions will explore the following subjects:

- Existing logistics processes and KPIs, their effectiveness
- Current challenges in measuring logistics performance
- Goals and objectives set to logistics

On top of that, pre-structured sample questions are as follows:

- What goals have been given to the organization, and what about logistics?
- List all the KPIs that are currently in use in the organization, which of them are for logistics?
- Does these KPIs measure relevant variables to the set goals and objectives?
- Where is performance measurement in logistics at a good level and where can it be improved?
- What are the three most important initiatives for the organization which, if nothing else was addressed, must be dealt with over the next three years?
- What are the three most important tasks of logistics organization that should be executed if nothing else was done? And what are the three most important development initiatives that need to be prioritized during the next three years?

The data from the interviews will be transcribed and organized. Key themes and concepts will be identified from the results. The themes and concepts identified will then be categorized to form understanding which KPIs align best with the internal logistics goals and objectives. The interview insights will be verified with some of the interview participants to validate results.

The data from the semi-structured interviews will be analyzed with content analysis. Krippendorf (2018) describes content analysis as qualitative research method to

categorize interview responses into predefined themes. According to Kleinheksel et al. (2020) in content analysis three levels of information need to be identified from the data source to be able to categorize the themes of the interview responses. Three different levels are used in coding the responses. First level is the answer, which is the code, from where a theme is identified regarding the subject and those themes are put under bigger categories. After coding and categorizing, the amount of time a theme appears is counted. From these possible patterns will be identified. The coding and categorization is done in Microsoft Excel. Content analysis allows the researcher to identify consistent patterns and trends from a diverse set of responses and data with a structured categorization.

The quantitative data regarding logistics metrics will be extracted from the ERP. It must be organized and cleaned to ensure it is accurate and includes no errors. Current performance levels can be then calculated from the said data and further made visual with data visualization tools. Focus areas can be found if similar trends are highlighted in qualitative and quantitative data.

The first results of the KPIs will be analyzed and from this analysis a few development targets will be identified. Westfalia (2024) lists 9 of the most common challenges in warehousing. From these our hypothesis is that the KPIs will highlight inaccurate inventory, redundant activities, and poor space utilization in the case company. So, it is expected that the development targets will be some of these. After the analysis, it can be discussed that were the results expected and what are the measures recommended based on the results of the KPIs.

3.1 Qualitative data and content analysis

This chapter will explain the process of gathering data and the way of analyzing it. The first part will go through in detail the way the qualitative data was acquired, and it will be followed with the details that will affect the content analysis and at the end the results of the content analysis will be presented.

3.1.1 Semi-structured interviews

A set of semi-structured interviews, as described above, were conducted in the case company. A sample of nine participants was interviewed to gain insight into the current processes and challenges in the internal logistics organization. The sample consisted of the logistics organization, pictured in Figure 1, running from manager level to logistics operator team leaders who work closest to daily operations. Manager level will be described as level 3 and operator level as level 1. The total number of participants to the interview by level of organization is as follows:

- Level 3 – 1 participant
- Level 2 – 4 participants
- Level 1 – 4 participants

Each participant was interviewed individually and the interview lasted between 30-45 minutes. The key themes regarding the concept of the interviews were given to the participants beforehand, so they could have more time to prepare, but the pre-formed questions were not given until in the interview. The interviews were conducted verbally in Finnish. The answers were recorded by writing during the interview and later translated to English for the analysis and presentation. At the beginning of each session, the meaning and the target of the interview to gain data for this thesis and insight into logistics challenges were described. It was made clear that there are pre-formed questions,

but follow-up questions can be made to clarify some of the answers. Also, if the participants wanted to share more of their thoughts regarding the theme, they could do so without question. To ensure confidentiality, the names of the participants are not shared, only the roles are described regarding the level of organization they represent.

Since the answers were recorded in Finnish and translated to English for presentation, minor interpretation errors may occur caused by the translation. While this study provides valuable insights through interviews, the findings are based on a sample of eight employees working in logistics or partly in logistics in the case company, therefore it may not capture the full complexity of internal logistics challenges in all manufacturing settings.

3.1.2 Content analysis

As mentioned in the previous sections of this chapter, content analysis requires the definition of themes that the responses will be categorized into to enable the consistency of the analysis. The themes will be then categorized even further with subcodes to enhance the possibilities to analyze the data.

Since Kaplan and Norton (1996) identify the most important factor in defining the right KPIs to be the set objectives of the organization, this must be considered in the themes and subcodes. Regarding the set objectives, the metrics need to be relevant and measure the right things to get the organization closer to its goals. Some of the interview questions were meant to indirectly find out if the operators understood the KPIs in use and if the key tasks of the logistics organization were clear. In the literature review it was discussed that often in logistics the objectives need to be prioritized if the goal is to enhance the service level or cut costs.

Preliminary review of the responses and the experience through the interviews brought up a theme of space utilization and labor efficiency. Many the interviews mentioned warehouse contents and capacity. Also, other challenges were mentioned in the

responses and this thesis' aim is to identify existing logistics challenges, so this will be considered in the subcodes of the themes.

Regarding the previous paragraphs, and a preliminary overview of the interview responses, predefined themes are in five different categories, that each have from three to five subcodes. The predefined themes listed and subcodes to be used in the content analysis shown in Figure 8.

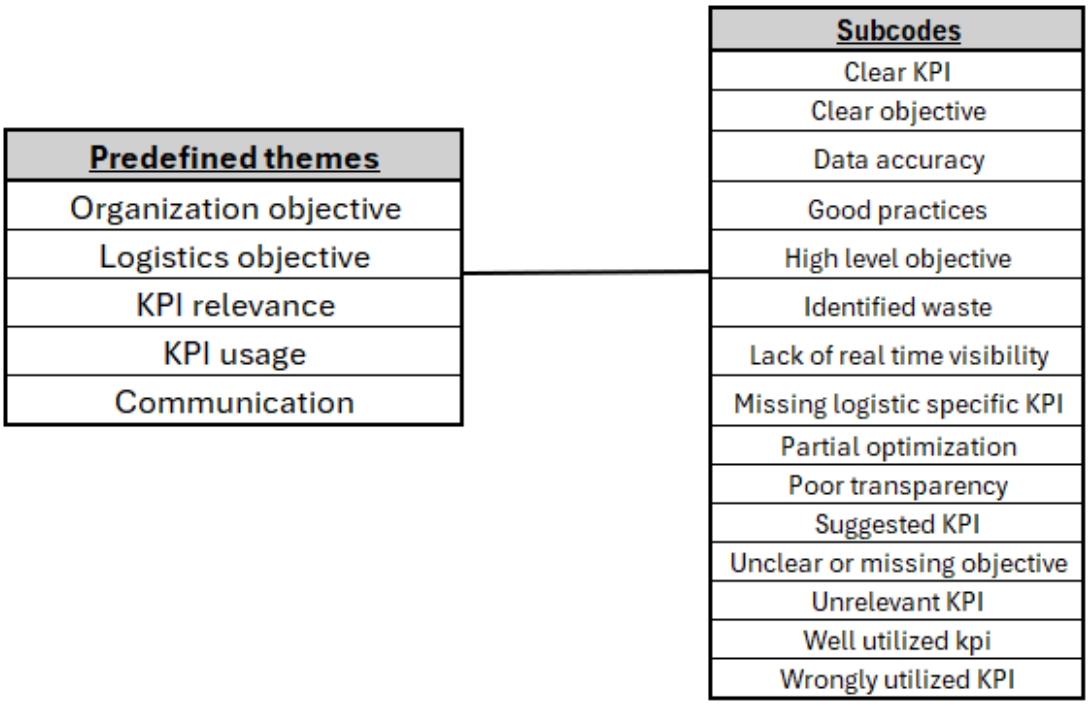

Figure 8. Content analysis' predefined themes and the subcodes

The interview responses were imported into Excel, where each response quote was assigned to one of the five BSC categories. Additionally, each quote was manually coded by a theme and subtheme for quantification and interpretation. The results of the content analysis were summarized by frequency of themes and subthemes. The frequencies and patterns. presented later in this chapter, were identified using pivot tables and graphs of the generated data.

3.2 Current processes, KPIs and state of internal logistics in the case company

In this section the current processes and ways of operating in the case company's internal logistics will be described. The KPIs in use, their objectives and reporting will be explained along with the description of the organization in question.

3.2.1 Current internal logistics processes and organization

The case company manufactures snowmobiles in Northern Finland. It operated in small-batch production with two different brands on the main production line, Lynx and Ski-doo. The production schedule is planned a year in advance to optimize the number of ready units in stock due to seasonal demand. The logistics and production operate under the same manager. Logistics organization pictured in Figure 1. The logistics operations center is located right next to the production line under the same roof, employing around 40-50 operators, depending on the production volume, which is dependent on the market. The main tasks of the warehouse and internal logistics are receiving the goods, storage, inventory accuracy and supplying the production line through electronic and physical pull control of goods.

The parts arrive in the plant in two possible ways, by truck to the receiving area, or by a dedicated trailer to sequencing docks. In the receiving area the goods are separated into pallet parts and small parts. The categorization is done depending on the set parameter in the ERP system regarding the parts packaging. If the physical packaging is wrong, the parts are repacked into packaging suitable for production. The small parts are packed into boxes that are processed by hand and are taken into small parts processing area where the parts are labelled and separated by part numbers. From there they are stored in small parts racking areas on flow-through shelves. The pallet parts are labelled and stored in pallet racks. The dedicated trailers have already labelled pallet parts that are loaded in the correct order regarding the production schedule, which makes them push controlled (Logistiikan Maailma, 2025). They are not stored in the warehouse at any

moment to save space and include only the largest parts needed in production, such as the engine and the track of the snowmobile.

The production line calls the small parts by placing a part-specific call card, or kanban card, on a mailbox, which is checked by the mizusumashi while at the same time delivering supplements for the orders done previously. The pallets are called through an electronic system, where the production places the order, a forklift collects the pallet form the racking and delivers it for the tugger train to drive into production with other parts.

Some parts are sequenced before line-delivery in pre-determined categories, then delivered with the tugger train to production when called. According to Logistiikan Maailma (2025), push control is when the requirement is determined beforehand and pushed to production and pull control is when the requirement is called from production. In sequencing the sequencing cart is filled with the correct parts in the correct production order which is known before the production calls for those parts so in theory it is a mix of those two, since the production schedule is known beforehand. Sequencing the most critical parts enables smaller batch sizes, reduces mistakes and saves space in production. It also prevents the need to handle returning parts from production.

The flow back from production in small parts is the waste (carton boxes and other packaging) which are collected by the mizusumashi during the delivery round. But other than that, no parts are returned since all the small parts the production needs are always available in production. In pallet parts, when the batch ends, the left-over parts are returned to the warehouse, counted and put away for future requirements. In sequenced parts that issue is prevented as mentioned before. The returning flow creates a notable workload for logistics operations, but according to the interviews conducted, the space is limited for sequencing and the benefit of sequencing all the parts going to production has not been proven profitable in the case company. These processes are shown in Figure 9, where the small parts movements are pictured in green and pallet parts in orange.

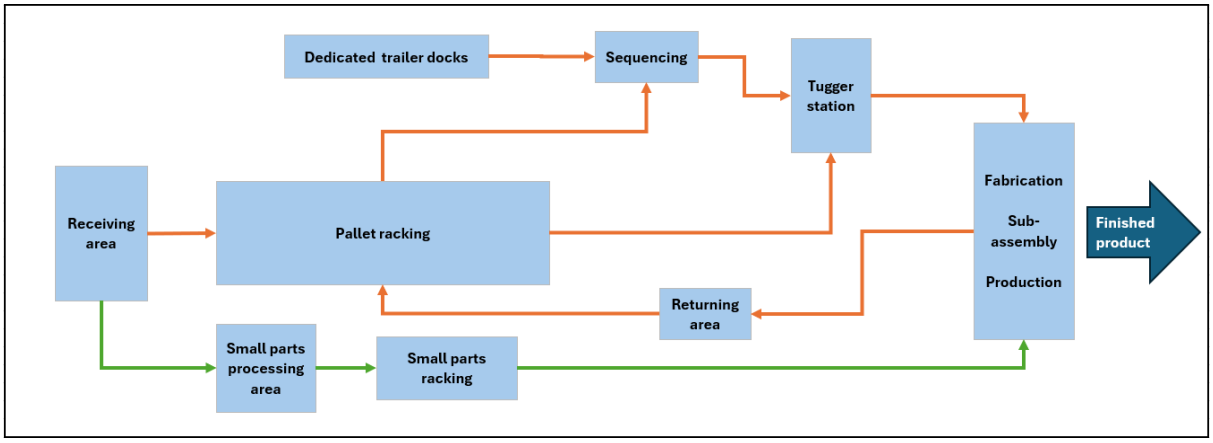

Figure 9. Internal logistics process in the case company

3.2.2 Current KPIs and performance management system

According to the responses and conversations conducted in the interviews, BRP utilizes a set of LEAN tools and methods. When it comes to setting targets and KPIs they are relying on the Balanced Scorecard method as a part of their management system shown in Figure 10. On the highest level in corporation strategy and targets are set in five categories. Health and safety, Quality, Productivity, Finance, and People. The company operates in multiple production sites ranging from Rovaniemi plant in the arctic circle to Queretaro Mexico. The main categories, or perspectives as Kaplan and Norton (1996) address them, are the same in each production site. Although this thesis focuses and gains its insight from Rovaniemi plant, it is important to acknowledge the global operating environment of the corporation.

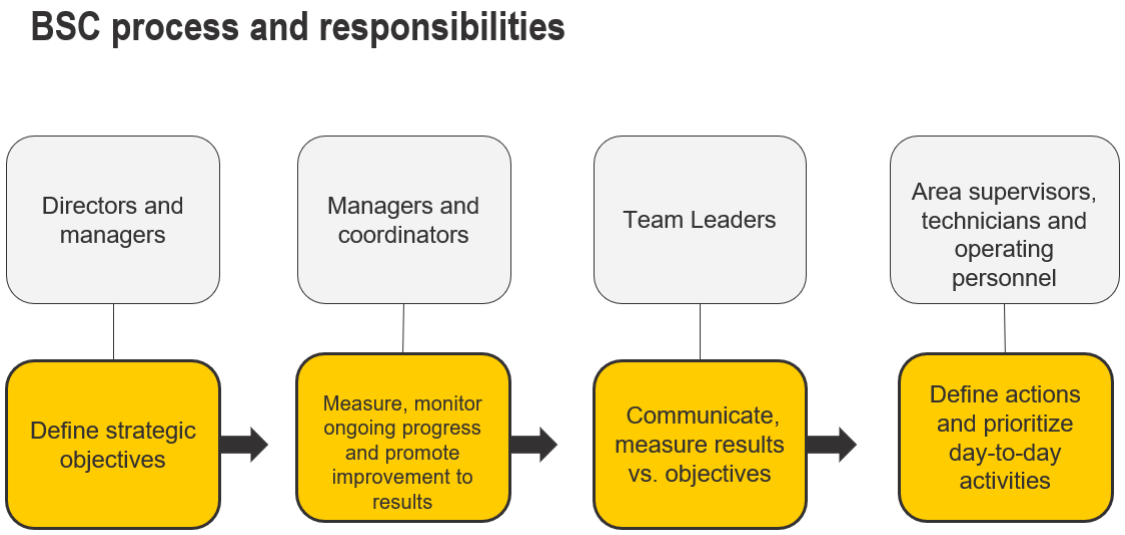

Figure 10. The case company BSC management process

In the case company strategy is begun with four pillars that set the base for operations. They are Growth, Customer X, Employee X and Lean. The corporation sets objectives regarding the pillars, then each site then refines them into objectives more specific to them. The site director is responsible for reporting the Level 1 KPIs. Level 1 and 2 KPIs are standardized for each site and level 3, which is the focus of this thesis, is individual set of KPIs per site that supports level 2 and 1 and the set objectives. The strategy pillars and KPIs of the case company's BSC are shown in Figure 11. It also shows the linkages between each BSC categories' different level KPIs and responsible organization levels of the KPIs.

Strategy:		Growth	Customer X	Employee X	Lean	
		"More accurate description of what the strategy holds in each pillar"				
Objectives:		1-3 set objectives per each pillar				
BSC Category	H&S	Quality	Productivity	Finance	People	
Level 1	Frequency rate	RFT	Schedule attainment	Direct HC vs FCST	Turnover (direct)	
Site director	Recordables	PDI	Line efficiency	Overtime	Officevibe	
Level 2	Residual risk	FPY	Labor efficiency	CPU	eNPS	
Managers		PDI cost				
Level 3						
Team leaders						

Figure 11. BSC hierarchy in the case company with some example KPIs in use

Even though the site director is responsible for reporting the Level 1 KPIs, each BSC category has a manager appointed to be responsible for the results of that category level 1

and 2 KPIs. Level 3, which is the team level, manages those levels KPIs and reports them to the responsible manager.

3.3 Analysis

The analysis chapter of research method will go through the following. The predefined themes mentioned will be compiled into statistics and presented. Patterns and unique insights will be identified for a conclusion to be formed of the current challenges internal logistics and its performance measuring system in the case company. With the challenges identified and the objectives given to the logistics organization that were mentioned in the interview, they will be analyzed together to form the basis of the selection criteria for selecting the right KPIs for the organization. At the end of this chapter, research objective number three will be completed.

As stated before, nine employees were interviewed from different organizational levels. A total of 119 quotes were identified from the interview to form the data for the content analysis. The recorded response quotes are divided between themes as seen in Tableau 1. A sample about answers in logistics objectives themes with the subcode “Unclear or missing objective” of the content analysis in Figure 12.

Interviewee	Response quote	Theme	Subcode
A	The logistics objectives are not consistent. We are demanded better service level but at the same time less direct labor.	Logistics objectives	Unclear or missing objective
C	More clear objectives for logistics would enable better development of operations	Logistics objectives	Unclear or missing objective
C	Some objectives only mentioned verbally	Logistics objectives	Unclear or missing objective
E	Reducing the amount of parts delivered or the contents of the snowmobile is not logistics objective	Logistics objectives	Unclear or missing objective
E	Im glad that logistics has set their own objectives and KPIs, even though upper level management has not set any objectives to them	Logistics objectives	Unclear or missing objective
G	There is not enough communicated and set objectives	Logistics objectives	Unclear or missing objective
G	Operators are not informed of any objectives	Logistics objectives	Unclear or missing objective
I	Clear objectives are not set	Logistics objectives	Unclear or missing objective

Figure 12. A sample from the content analysis

Theme	Quotes	Interviewees
Communication	5	4/9
KPI relevance	48	9/9
KPI usage	15	6/9
Logistics objectives	31	9/9
Organization objective	20	6/9

Tableau 1. Distribution of quotes into themes

3.3.1 Communication

Communication or communication related quotes were mentioned 5 times during the interviews. Most of these answers were related to poor transparency regarding KPI reporting, one interviewee highlighting that “Some important KPIs are kept within too small circle and not shared”. Another not so KPI related matter regarding communication was a subtheme partial optimization. Which was identified when the quote mentioned that teams develop their own area and do not consider other departments.

Key insight from communications theme was that implemented KPIs need more transparency. Even if a KPI is designed for operator level, other organizational levels should have access to it as well. This is to be considered during the KPI implementation phase.

3.3.2 KPI relevance

KPI relevance was the most frequently brought up theme. Which is a good signal since the whole point of the interviews was to gain insight into the case company’s KPIs and faced challenges. All the interviewed employees mentioned KPI relevance at least twice during the interviews.

When discussing KPIs that direct the case company’s logistics operations, 7 out of the 9 interviewees highlighted KPIs that are not directly related to logistics. The KPIs brought up were productions KPIs. For example, productivity is measured with production line efficiency which measures how many units are produced compared to the theoretical maximum, which needs a more specific metric for logistics, which many noticed as a gap. Although they measure relevant things, there exist an opportunity to create a logistics specific KPI that measures logistics relevant metrics that still affect that higher level production KPI mentioned but through metrics logistics can affect. This highlights the importance of cause-and-effect relationship between metrics to have the correct KPIs at each level of operations.

Six out of nine of the interviewees claimed that productivity in logistics is measured inadequately. Hour per unit KPI shows more about the high-level picture, but alone on the hours per unit KPI it is not possible to measure if the operator productivity has gone up or down since the hours per unit is affected by multiple metrics on top of the productivity, such as batch size in production and the contents and complexity of the production schedule and production units. In addition, a few of the interviewees pointed out that even though hours per unit KPI is discussed a lot, they don't understand it or the variables behind it. This issue was also brought up regarding some other production related productivity KPIs, such as the line efficiency KPI. Even though hours per unit can be managed as a financial KPI because it determines the direct labor budget, one interviewee pointed out that "*Hours per unit KPI is overrepresented and other costs are not taken into account*", which suggests that there might exist partial optimization to keep hours per unit on a good level. The logistics organization needs a productivity KPI that is minimally affected by variables outside their own influence.

Eight quotes from the interviews highlighted an issue about not understanding current measured metrics or indicators. For example, one stated that "We measure small part putaway but the KPI does not tell us why the numbers are the way they are". This is a challenge in single factor metrics as pointed out in the literature review. With single factor measures more information is needed from the operating environment to gain insight what the situation is.

To tackle these problems, 7 out of the 9 interviewees suggested new KPIs, even though none of the questions asked to do so. The case company utilizes a KPI of h/unit, which measures the average direct labor hours used to make one unit on the production line. The hours per unit KPI defines the number of operators for warehouse operations at the beginning of each season. A few of the interviewed pointed out that warehouse operations include a lot of tasks that are not strictly related to production volume or even production, but still these tasks are included in the hours per unit KPI and budget. Therefore, it was suggested to divide the hours per unit KPI into two KPIs. Hours per unit and

another KPI to measure the amount of labor is used in other work to gain a more realistic picture of the productivity and tasks in internal logistics.

A total of 8 different new KPIs were suggested. These KPIs will be scored with the selection criteria table later. All Suggested KPIs listed below in Tableau 2.

Suggested KPI	BSC category
€/unit	Financial
Other direct labor	Productivity
Warehouse content	Financial
Inventory turnover	Financial
Logistics productivity	Productivity
IRA	Quality
Inventory coverage	Financial
Space utilization efficiency	Productivity

Tableau 2. Suggested KPIs from the interviews

As conclusion from KPI relevance the operator level needs more logistics specific KPIs, currently the KPIs utilized are too production focused and measure too high-level objectives for them to be beneficial for the operators. Although they did notice this absence of logistics specific KPIs, since as listed above, many suggested new more relevant KPIs. And to support these findings, on manager and planning level the given objectives did focus mostly on production and not logistics.

3.3.3 KPI usage

From the 15 quotes categorized for KPI usage most often a mention of wrongly utilized KPI was brought up. Six out of the 15 quotes addressed this issue, for example one of the participants stated, "*Unexpected situations are not commented or taken into account in the KPIs*". Which implies that the KPIs in use are followed purely on their values or graphs but the factors affecting the changes are not made transparent or communicated through the organization. This argument was supported with a quote "*Even if some other department causes delays in the supply stream and our actions mitigate that*

impact, that positive action is not mentioned or notified in the KPI". This suggests that the current KPI system does not account for changes in the operating environment enough, and that the actions taken or development done within the operations, negative or positive, are not reflected or commented in the performance indicators. Which can lead to crucial factors going unnoticed in the decision making, since the KPIs can present a misleading picture of the current performance. Tableau 3 shows the distribution of subcodes in theme "KPI usage".

Two of the interviewees mentioned transparency among the KPIs and action-triggering KPIs as good practices. The quotes focused only on individual well operated KPIs, but this implies that there exists internal awareness of what works or could work, but those practices need to be replicated to the whole KPI system. Regarding the theme KPI usage, one interviewee contributed six (40 %) of the quotes. Which dealt with two different subcodes. These insights perhaps reflect a broader team-level frustration or gaps in the current KPI system.

Subcode	Response quotes
Data accuracy	1
Good practices	2
High level objective	1
Missing logistic specific KPI	2
Suggested KPI	2
Well utilized kpi	1
Wrongly utilized KPI	6

Tableau 3. Subcode distribution in KPI usage theme

One question in the interviews directly sought to find out if the KPIs in use are known throughout the logistics organization. The interviewees listed a total of 17 different metrics that are being tracked. On average one interviewee identified six different performance metrics, with deviation from 0 to 10. Most well-known KPI was the warehouse capacity, which was mentioned by six different people. The average number of interviewees naming a certain KPI was a bit over three. And as mentioned with the total

amount of 17 different metrics, the deviation is quite high. This implies that the organization has quite a few metrics, but they are being tracked on different levels without other knowing. This can be fixed with one performance metric matrix that will be implemented throughout the logistics organization. Transparency is needed for each level for operators being able to know what is expected of them.

As conclusion the content analysis of the response quotes revealed recurring themes regarding KPI usage. A significant number of the quotes highlighted the KPIs being utilized wrong, particularly in cases where internal logistics is held responsible for the KPI results, but the outcome is influenced by actions of other departments. For example, delays or unexpected issues in external logistics may affect negatively in internal logistics KPIs but the explanation is left out. In addition, there were gaps in KPI coverage, with several responses highlighting the absence of logistics-specific or team-level KPIs. As well as the failure to convert productions objectives and KPIs into metrics logistics can affect more directly. Despite these gaps, good practices were identified in KPI transparency but were found to be implemented only partially. These findings highlight the importance of designing and implementing the right KPIs to ensure they provide real insight into operational performance and support the decision making in internal logistics.

3.3.4 Logistics objectives and organization objectives

The interview data suggests a mixed picture regarding the clarity and communication of organizational- and logistics objectives. The high level, or Level 3, objectives were clearly understood, with multiple interviewees highlighting especially safety and quality objectives as well communicated. The Tableau 4 below shows the distribution of response subcodes in the themes logistics objectives and organization objectives.

Subcode	Response quotes
Clear objective	13
High level objective	6
Identified waste	7
Missing logistic specific KPI	2
Partial optimization	1
Poor transparency	2
Suggested KPI	2
Unclear or missing objective	16
Unrelevant KPI	1
Wrongly utilized KPI	1

Tableau 4. Subcodes in logistics objectives and organization objectives themes

A clear pattern in the responses is that logistics specific objectives are often unclear, poorly communicated or missing entirely. Multiple interviewees responded that logistic objectives are derived directly from a KPI, that is already poorly understood, rather than explicitly stated. This causes confusion and misalignment. Some of the interviewees responded that the objectives are short-term focused and lack strategic depth. This implies that KPIs are set before objectives and objectives are derived from the KPIs, whereas the process should be the other way around, where objectives determine the KPIs.

A key insight from the responses in the objectives theme was one interviewee claiming *"Our finance measures measure only how good we executed our plans. Not actual success."* which implies that some of the current KPIs do not reflect true performance but the ability to execute the set plan, even if the performance would be higher. These KPIs should be reviewed if they could be set to measure the outcome quality and not the execution by plan.

The content analysis implies that the case company requires better structured and cascaded objectives for the internal logistics organization, that are supported with relevant KPIs with strong transparency. Strengthening these factors could enable the internal

logistics organization to operate with greater clarity and alignment with organizational strategy.

3.3.5 Analysis summary

Content analysis highlighted patterns in responses regarding the relevance of set objectives for logistics and their relevance regarding the implemented KPIs. Multiple respondents mentioned missing KPIs that could support existing objectives better, such as logistics productivity metrics and cost-efficiency indicators. Also, others identified issues regarding KPIs currently in use, since they do not reflect true performance, especially when most of the implemented KPIs measure plan execution success and not outcome quality. In addition, KPIs of a certain team are affected outside of their own influence, but it is not taken into consideration when reporting the results of the said KPI.

A dominant pattern in the responses was that the logistics-specific objectives are often unclear, badly communicated or missing entirely. Multiple interviewees identified that the set goals and objectives are derived from the KPIs and not the other way around as it should. Inconsistent objectives may lead to partial optimization, misalignment and poor measurability.

Despite these shortcomings, good practices were also identified. For example, the warehouse capacity KPI was identified as a strong success factor, because of its transparency, reporting frequency and clear signals when actions are needed. This is a good practice that can be implemented in the processes of other future KPIs. Logistics-specific KPIs and objectives were found insufficient, but on the contrary, production KPIs were well communicated and understood. Although some excess KPIs that were not understood were also found there.

The content analysis provided valuable insight into the current challenges, processes and KPIs in the case company. From these insights requirements for future KPIs can be

identified which can be translated into KPI selection criteria that will be discussed in chapter 5.

4 Results and findings

In this chapter the results of the literature review and content analysis are presented. Research objective two is addressed with a list of all KPIs found in the literature review and during the interviews in the case company. For the research objective four, the selection criteria are formed from the insights of the content analysis and backed up with literature review findings in chapter 4.3. After that, the research objectives four and five are completed in chapter 4.4 by presenting the KPIs implemented for the case company.

4.1 Existing KPIs

In this chapter all the KPIs regarding internal logistics and warehousing found in the literature review and case company interviews are listed with their sources. Then the KPIs are categorized according to Kaplan and Nortons (1996) balanced scorecard methods four perspectives to enable finding balance between metrics. The chapter will finalize the research objective number two.

From the literature review 25 KPIs were found. The interviews added 18 KPIs already existing in the case company and eight suggested KPIs that the interviewees thought to be useful. Duplicates were removed from the list of KPIs, and they were categorized to BSC perspectives that are currently utilized in the case company. Some found KPIs were removed from the list since they were too vague, for example “Logistics productivity” was found as a suggested KPI in the literature review and in the content analysis. But the KPI needs to be more specific, logistics productivity needs to be measured but it does not specify how to measure it. The final number of different KPIs that will be reviewed with the selection criteria will be 40, listed in Tableau 5. Their distribution by BSC category visualized below in Figure 13.

KPI	Source	BSC category	Notes
Inventory record accuracy	Logistiikan maailma	Quality	
Storage level / Capacity	Logistiikan maailma	Financial	
Amount of overstock and obsolete	Logistiikan maailma	Financial	
Inventory sufficiency	Logistiikan maailma	Productivity	
Inventory turnover	Logistiikan maailma	Financial	
Delivery time	Logistiikan maailma	Productivity	
Delivery certainty	Logistiikan maailma	Quality	
Putaway time	Logistiikan maailma	Productivity	
Warehouse service ability	Logistiikan maailma	Quality	More specific
Warehouse service level	Logistiikan maailma	Quality	More specific
Orders delivered during the same day	Logistiikan maailma	Productivity	
% of orders delivered by 12:00	Logistiikan maailma	Productivity	
Delivery mistakes (frequency)	Logistiikan maailma	Quality	
Warehouse average storage level	Logistiikan maailma	Financial	
Committed capital	Logistiikan maailma	Financial	
Lead time	Frank C. Garcia	Productivity	
Picking time	Frank C. Garcia	Productivity	
Touches / movements amount	Frank C. Garcia	Productivity	
Cost per Unit	Stephens and Meyers	Financial	
Material handling and production ratio	Stephens and Meyers	Productivity	
Direct labor	Stephens and Meyers	People	
Pallets per hour	McGinnis et al.	Productivity	
Material availability	Tony Wild	Quality	
Other direct labor	Interviews: Suggested KPIs	Productivity	
Inventory turnover	Interviews: Suggested KPIs	Financial	
Inventory coverage	Interviews: Suggested KPIs	Financial	
Space utilization efficiency	Interviews: Suggested KPIs	Productivity	Parts stored per m2
RFT	Interviews: Existing KPIs	Quality	
STP	Interviews: Existing KPIs	Quality	Production KPI
Hours / unit	Interviews: Existing KPIs	Productivity	Production KPI
Near miss reporting	Interviews: Existing KPIs	Health and safety	
Small part deliveries	Interviews: Existing KPIs	Productivity	
PDI	Interviews: Existing KPIs	Quality	Production KPI
Overtime	Interviews: Existing KPIs	People	
People turnover	Interviews: Existing KPIs	People	
Production schedule attainment	Interviews: Existing KPIs	Productivity	Production KPI
FPY (first pass yield)	Interviews: Existing KPIs	Quality	Production KPI
Officevibe	Interviews: Existing KPIs	People	
Scrappings	Interviews: Existing KPIs	Quality	

Tableau 5. List of existing KPIs identified in literature review and interviews

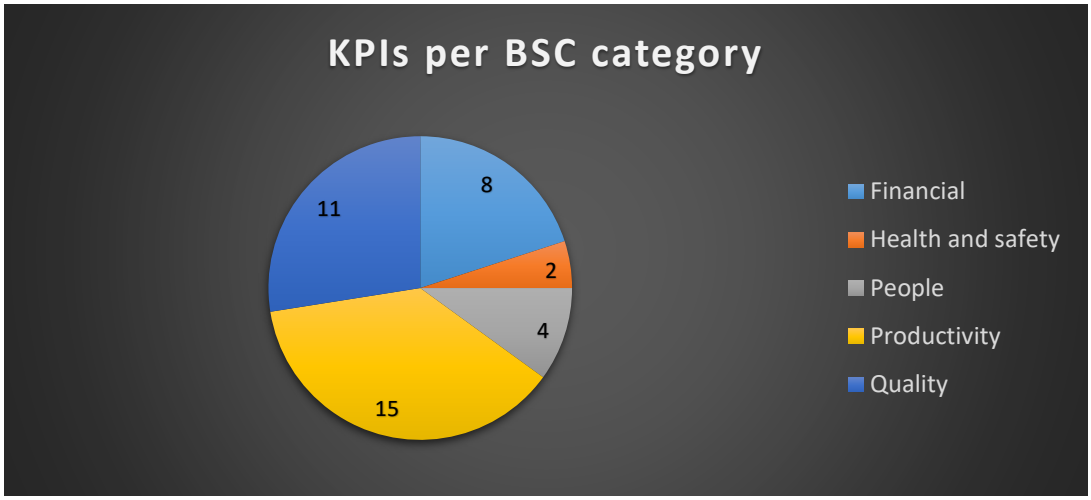

Figure 13. Distribution of found KPIs by balanced scorecard category

Most of the KPIs are under the productivity category, which is supported by the content analysis since most of the shortcomings regarding KPIs were found in productivity measuring. Whereas the well understood and utilized KPIs were in Health and safety category. This may imply that H&S KPIs are well understood because there aren't too many of them and the subject is well understood. In the case of logistics productivity, it is not clear enough how to measure it. In literature review it was found that productivity is measured with the relationship of inputs and outputs, and since the output is material movement, the concept is harder to grasp for operators. Which is why in this case study, the productivity measures should be focused more than others since they have the most misalignment according to the content analysis.

As reviewed in the literature in chapter 2, productivity can be measured partially or totally (Karim et al. 2021). Since in the case company, the internal logistics has multiple outputs, this needs to be considered in the KPIs. Below is the illustration of inputs / processes / outputs of the case company in Figure 14.

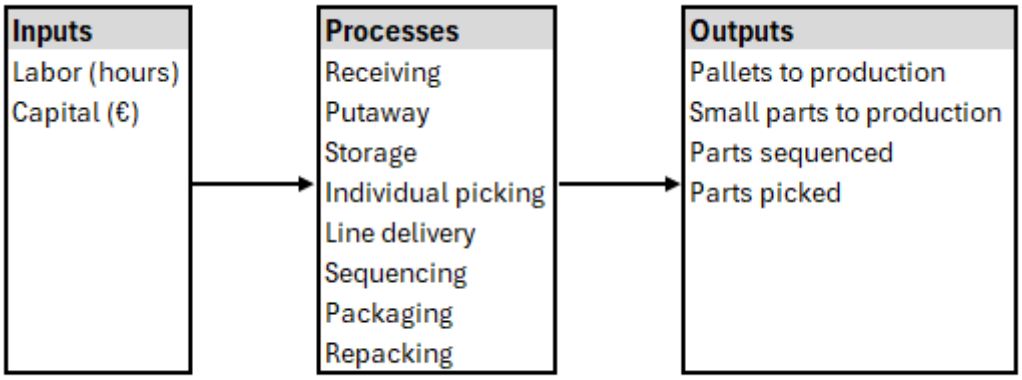

Figure 14. Inputs and outputs of the case company warehouse

From the discussion held after the content analysis interviews in the case company, it can be concluded that Service level of the warehouse can be measured with the number of parts sequenced and individually picked. It would be worth discussing if labor can be measured with € to be able to use only one sort of input in measuring the total productivity. Warehouse productivity can be measured with labor hours (input) compared to pallets to production, and small parts to production (output). Sequencing productivity can be reviewed with labor hours (input) and the number of parts sequenced (output). Therefore, the following KPIs, shown in Tableau 6, can be added to the list of KPIs to be scored with the upcoming selection criteria:

KPI	Source	BSC category	Notes
Sequencing service level	Interviews	Quality	The amount of part categories sequenced
Picking service level	Interviews	Quality	The number of units that parts are picked individually for
Total productivity	Interviews	Productivity	All outputs / all inputs
Sequencing productivity	Interviews	Productivity	Parts sequenced per labor hour
Delivery productivity	Interviews	Productivity	Parts delivered per labor hour

Tableau 6. Additional KPIs for evaluation

4.2 KPI selection criteria

In this section, the goal is to translate both theoretical insights from the literature review and case-specific findings from the content analysis into a set of criteria for evaluating KPIs for internal logistics of the case company.

The content analysis of the interview responses revealed recurring themes that helped to form the selection criteria. A recurring pattern was in relevance to operational realities, highlighting the need for KPIs to reflect more logistics specific performance. Interviewees pointed out how external departments' actions affect KPIs that are supposed to reflect logistics performance, indicating that the KPIs should be within control of the measured function, in this case, internal logistics. Several responses highlighted existing KPIs lacking diagnostic value, meaning opportunities of development are hard to identify. A strong pattern in the responses was identified for the lack of strategic alignment in current objectives and KPIs. These findings have been used to complement theoretical insights, ensuring selected KPIs are theoretically sound and fulfill practical expectations.

Based on the content analysis and its summary, combined with the insights from the literature review, the following criterion should be considered in the KPI selection scorecard.

1. Relevance to logistics.
   The KPI should reflect the responsibilities, activities and set objectives of the logistics organization.
2. Alignment with organizational goals.
   The KPI should support the high-level strategic objectives.
3. Controllability
   The KPI should be primarily influenced by internal logistics operations
4. Understandability
   The KPI should be easy to understand at the level it is measured. The people on that level need to have a clear picture of what they can do to perform better.

5. Data availability and accuracy

   The data for the KPI should be measurable and available without compromising efficiency. Idyllically automated.

6. Diagnostic value

   The KPI should be able to point out possible sources of waste and inefficiencies.

The literature review includes some of the mentioned criteria but in other forms. For example, alignment with the case company's objectives, which also was a frequent pattern in content analysis of the interviews, is specifically mentioned by Kaplan and Norton (1996), since it is a key part of their BSC theory.

KPI relevance was the most quoted theme in the interviews and, as mentioned in the analysis, it was seen insufficient regarding logistics by every interviewee. The KPIs were more relevant to production organization and focused on too high-level metrics to be able to be utilized properly in logistics operations. This could be compared to the SMART criteria S (specific), since the goal in that criteria is for the KPI to be specific for the organization and operating environment, or in other words, be relevant to the utilizing sector. Using only the term specific, would be generally good, but in a way too vague. KPI relevance is a more tailored option for the case. Therefore, KPI relevance is an important criterion for choosing the right KPIs.

T from the SMART categories, representing time-bound, will not be overlooked in this case, even though it won't be included in the selection criteria. It will be considered during KPI implementation, where data and reporting frequency are considered, therefore time-bound will not be used as a selection criterion, but a matter to be considered in management process.

Criteria	Source	Explanation
Relevance to logistics	Interviews and literature	Reflects the actual performance of logistics
Strategic alignment	Interviews and literature	Supports set objectives
Understandability	Interviews	KPI is easy to understand
Diagnostic value	Interviews	KPI pinpoints opportunities for development
Measurable	Interviews and literature	Availeable and accurate data
Controllability	Interviews and literature	The KPI is primarily influenced by logistics and the actions are attainable

Tableau 7. The selection criteria for the scoring matrix

The selection criteria presented above in Tableau 7, will be utilized with a non-weighted scoring method. A non-weighted scoring method was chosen since the literature review and content analysis already considered the importance of the criterion. Another key factor is to keep the process simple, understandable and easy to replicate. It ensures consistency in criterion importance. All the KPIs listed in section 4.1 will be scored in each criterion.

4.3 KPI selection, validation and implementation

To ensure successful implementation of the tailored set of KPIs, a four-step process will be applied to the scored KPIs. According to Parmenter (2015) to implement winning KPIs, it is crucial to focus on a small number of KPIs with high impact. Therefore, a scoring threshold is put in use, to avoid having too many KPIs. Which means that the ten top scoring KPIs are checked if they have at least 80 % of the maximum score. If those conditions are met, the KPIs are put forward. Below in Tableau 8 are the KPIs that scored over 80 %.

KPI	BSC category	Relevance	Alignment	Understandability	Diagnostic value	Measurability	Controllability	% of maximum score
Delivery mistakes (frequency)	Quality	10	10	10	10	8	10	97 %
Delivery time	Productivity	10	10	10	9	10	8	95 %
Picking time	Productivity	9	9	9	10	9	10	93 %
Touches / movements amount	Productivity	10	9	10	9	8	8	90 %
Overstock and obsolete	Financial	8	10	10	9	10	6	88 %
Putaway time	Productivity	10	8	8	9	10	8	88 %
Near miss reporting	Health and safety	10	9	9	9	8	8	88 %
Delivery productivity	Productivity	10	9	8	8	8	9	87 %
Pallets per hour	Productivity	10	8	9	7	9	8	85 %
Sequencing productivity	Productivity	10	8	8	8	8	9	85 %
Inventory record accuracy	Quality	10	9	7	10	7	7	83 %
Storage level / Capacity	Financial	10	7	9	8	10	6	83 %
Delivery certainty	Quality	10	10	7	8	7	8	83 %
Warehouse service level	Quality	10	9	6	7	7	10	82 %
Lead time	Productivity	8	10	7	10	9	5	82 %

Tableau 8. Over 80 % scoring KPIs

The first step gave us 15 different KPIs. With scores ranging from 82 % to 97 %. These KPIs include some metrics that are already utilized in the case company, such as storage level/capacity, but also new ones which are not yet considered in daily operations, for example picking time and movements amount.

As mentioned in the literature review, according to Kaplan and Norton (1996) performance must be measured across multiple perspectives to maintain balance and ensure strategic alignment. The 15 KPIs filtered in the previous step are divided in the case company's utilized BSC categories in Figure 15.

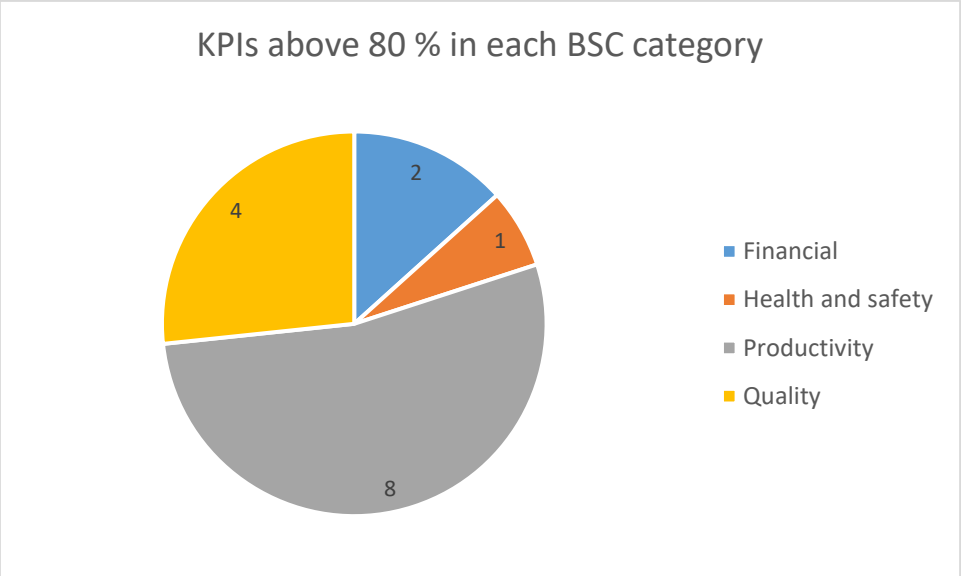

Figure 15. KPI distribution

As seen from Figure 15, BSC category "people" did not have any KPI that got over 80 % of the possible maximum score. Below listed all that category KPIs considered in the ranking. Four different KPIs were in that category, shown on Tableau 9. As mentioned in chapter 3.2.2., all of them were already utilized in the case company in levels 1 or 2. People turnover and Officevibe results are followed and reported in a bigger picture and therefore out of the scope of this thesis. That is why the remaining two KPIs, direct labor and overtime, which are most relevant to logistics of the four, are taken into consideration to have a more balanced set of KPIs.

KPI	BSC category	Relevance	Alignment	Understandability	Diagnostic value	Measurability	Controllability	% of maximum score
Overtime	People	8	7	9	7	10	7	80 %
Direct labor	People	9	7	8	6	8	7	75 %
People turnover	People	8	9	4	5	10	7	72 %
Officevibe	People	5	10	4	4	5	5	55 %

Tableau 9. BSC category People KPIs with their scores

The third step is to verify the KPIs are distinct from each other. In a small number of KPIs it is increasingly important to ensure they measure different things and different perspectives as Kaplan and Norton (1996) stated. In the previous steps the KPIs were categorized into the BSC categories utilized in the case company. Similarities can be noticed from the KPIs. For example, delivery productivity can be measured as pallets per hour of labor, which are both listed. Delivery productivity itself is a vague term and therefore it can be cut from the list. Sequencing productivity itself is also a vague term and needs to be specified. The input in the sequencing process is labor hours and output is a sequenced parts. Therefore, it could be measured with sequenced parts per labor hour. A key insight was the absence of total lead time KPI from logistics operations. As the key processes were putaway, sequencing and delivery, the total of these are the lead time. All these KPIs are in the top 80 % list, except the sequencing lead time, which is to be added to the list. Even though the productivity KPIs represent over 40 % of the considered KPIs, they are not overlapping each other, if they are divided into correct operational levels. For example, as stated above, lead time is a sum of the lower level KPIs and therefore can be reported to the manager level, while keeping the lower level KPIs at the team level.

Pallets per hour delivered to production line and warehouse total lead time, and its subcategories are somewhat similar, but they are more complimentary rather than overlapping. Faster warehouse lead times often result in higher pallet delivery rates, and vice versa. If the lead time is observed to be long, but pallets per hour is high, this could indicate ordering queuing issues. But if pallets per hour is low but lead time is short, it could indicate that the process is lean but underutilized. With the complimentary utilization of pallets per hour and lead time, the movements amount KPI can be discarded as a key performance metric and considered as an analytic tool if the need arises. At this point there are a total of 15 KPIs left plus the ones already utilized in the case company in levels 1 and 2.

The fourth step is to increase commitment to the chosen KPIs and ensure relevance to the logistics organization, the KPIs are validated with relevant stakeholders before implementation. The relevant stakeholders include Manager, Operations leader and a Team leader from the logistics organization. In figure 16 is shown the proposed KPI structure to be validated with stakeholders. The existing KPIs, of the case company, is marked yellow. The stakeholders stated that the old KPIs need to be kept operative, since they are standardized in every production plant.

Team level	Manager level	Director
Productivity		
Putaway time	Warehouse lead time	Hours per unit
Sequencing time		
Delivery time		
Pallets per hour		
Picking time		
Quality		
Delivery mistakes	Warehouse service level	RFT
IRA		
Delivery certainty		
Financial		
Overstock and obsolete	Storage level	CPU
Health and safety		
Near miss reporting	Residual risk	Frequency rate
People		
Overtime	Direct labor	Turnover

Figure 16. Proposed KPI structure

As result of the fourth step, reporting frequencies of the KPIs were agreed upon. And some metrics are reported on the same KPI, for example overstock and obsolete are integrated into the capacity KPI to show how much they take up space out of all the parts.

4.4 Initial results and insights

In the logistics operations financial category, two KPIs were chosen and validated. They were obsolescence and capacity. They are both presented on the same KPI. The metrics are followed and updated weekly from standard data from the case company's ERP system. The aim is to provide clear picture of how much space is lost due to obsolete inventory. The KPI is utilized both in team- and manager level. An illustration of the KPI in Figure 17 with made up values to protect the case company data.

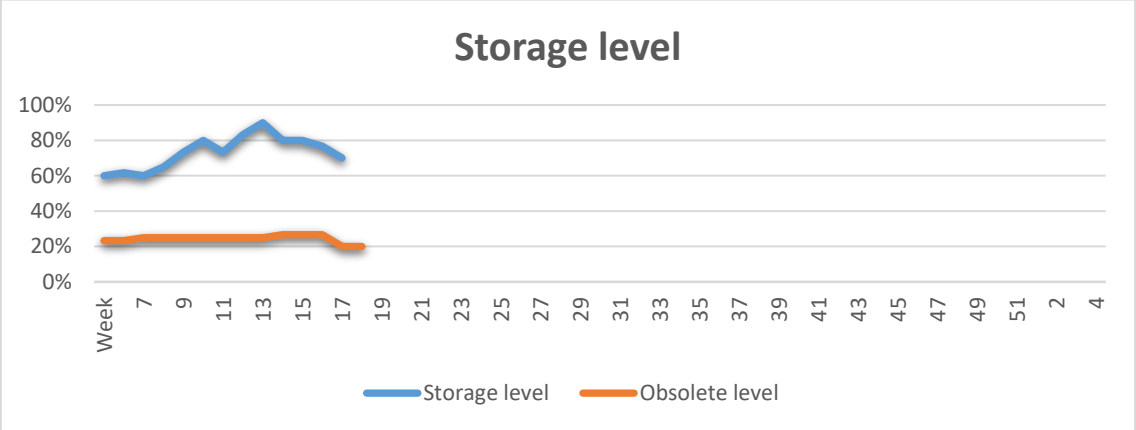

Figure 17. Capacity with obsolesence metric

In H&S, the chosen KPI was near miss reporting. Near miss reporting follows the amount of safety observations and near miss cases in individual teams 1-4 and their cumulative amount. The data is updated weekly from the H&S reporting program and the information is used by the supervisor to ensure safe operations in his/her area of responsibility. In Figure 18, the illustration of the H&S KPI with made up contents is shown.

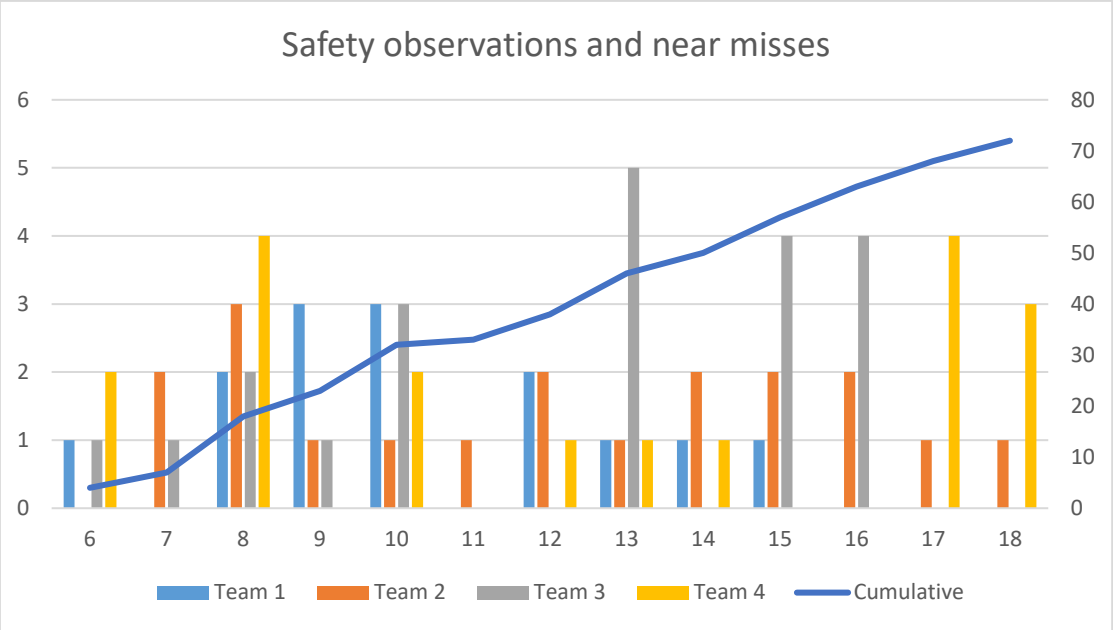

Figure 18. H&S team level KPI

The first two categories and their KPIs are reported on a weekly basis. They provide valuable information and give clear signals when actions are required. The last three categories, People, Quality and Productivity KPIs are reported once a month at maximum. The upper level KPIs that they relate to are reported quarterly. These KPIs are best utilized monthly since the operating environment can have variations on daily and weekly level. And since these KPIs are developed to give signals on longer term trends and developments they are no use to following weekly, unless specific analysis is required to solve possible challenges.

In Figure 19, the productivity metrics of the standard line delivery process are integrated into one. The picking time represents the amount of time it takes to collect one type of part as dedicated amount when doing an individual picking. A process where the order is picked individually and delivered somewhere else than production. Picking efficiency KPI shown in Figure 20. As mentioned earlier they are reported monthly, therefore the x-axis represents months. In the WH lead time KPI on the left is the time scale of the lead times and on the right the scale for the pallets per hour. Having all the metrics on two indicator enables a lot of information to be presented at once.

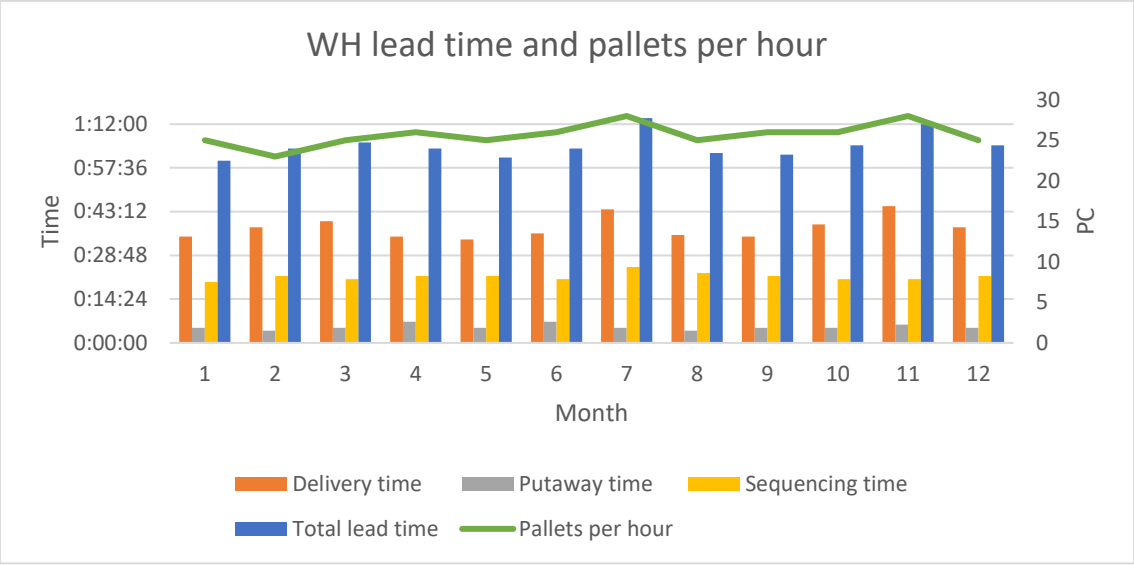

Figure 19. Warehouse productivity metrics

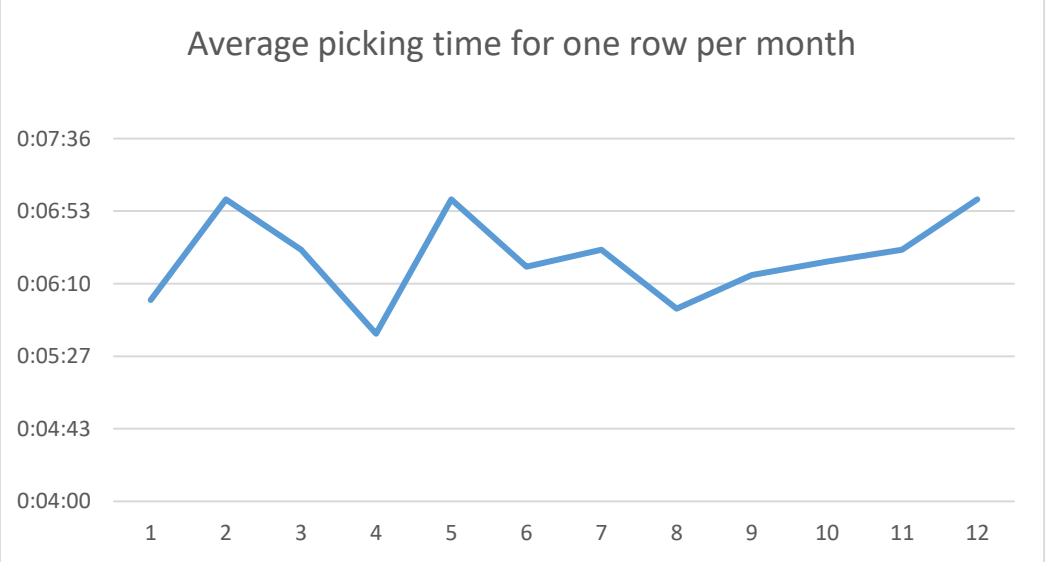

Figure 20. Picking efficiency

Two KPIs were chosen for people category. Direct labor and overtime. Since they are measured with the same unit (hours) and are compilatory, they are presented in the same indicator. Monthly hours and overtime on top of them with the cumulative value of total hours are all on the same indicator. People category KPI illustrated in figure 21 below.

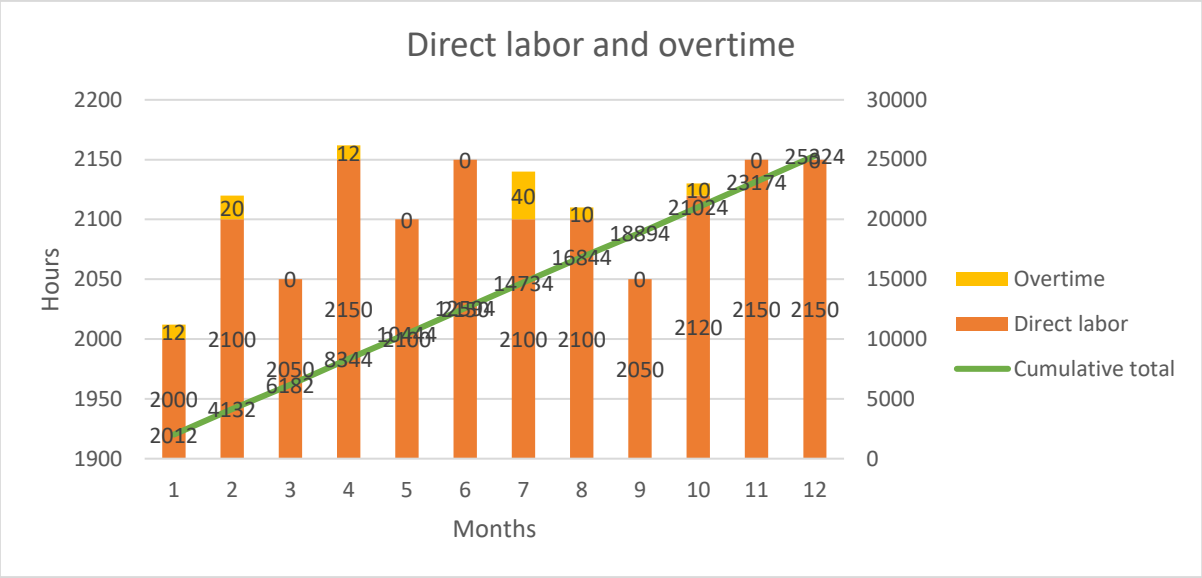

Figure 21. Warehouse BSC-category" People" metrics

On the manager level (2) the quality KPI is warehouse service level. The KPI consists of three different metrics that are followed more closely on team level. The three metrics are line delivery certainty, line delivery mistakes and inventory record accuracy. Delivery certainty is the number of deliveries made in promised timeframe as percentage of total deliveries made. Delivery mistakes is simply the number of delivery errors made, for example delivering a wrong set of parts to the production line. Inventory record accuracy is measured as told in the literature review. The delivery metrics and IRA metric are quite different, but both represent the service quality of the warehouse, therefore they are presented together to form a clear picture for the management level of the service quality. Warehouse service quality KPI in figure 22.

Figure 22. Warehouse service quality metrics

The presented KPIs are implemented as part of the daily operations and are managed in the organization as presented in the figure 16. The KPIs are operated in excel based form and presented through powerpoint based reports in daily, weekly and monthly meetings based on the presented reporting frequency and operating level. The implementation did not require further changes to the operating processes, other than providing new valuable insight into the logistics operations and the possible actions triggered by the KPI values.

5 Discussion on results and findings

This chapter discusses the main findings of this thesis in the context of the literature review with existing literature and the case of the case company. The chapters aim is to discuss how the final selected KPIs contribute to internal logistics operations and what can be learned from the selection process. And finally, to ensure that the research questions are answered.

The literature review and interviews identified a comprehensive list of KPIs that can be utilized in internal logistics. Those KPIs were then categorized according to balanced scorecard theory's different perspectives. Kaplan and Norton (1996) originally divided the BSC into four different perspectives, but the case company of this thesis namely utilized BSC as a lean tool for KPI management and categorizes the metrics into four different perspectives. The found KPIs were therefore listed according to the case company's model to be able to provide a more aligned approach for the subject. A major challenge in listing the KPIs was identified in the content analysis from the interview data, that not all the identified KPIs and KPIs utilized in the case company were relevant enough for internal logistics to be utilized effectively. In addition to relevance, challenges were identified in controllability and understandability.

A selection matrix was developed by utilizing relevant stakeholder interview data from different operational levels together with key insights from the literature review. The content analysis data and chosen BSC categories are well supported by the literature review by authors such as Parmenter (2015), Kaplan and Norton (1996) and Baudin (2005, 2020), who all emphasize the importance of balanced multi perspective, operationally relevant and decision making supporting KPIs. A key insight was that the authors all emphasized strategic alignment, and the content analysis revealed that the current KPIs biggest issue was misalignment with poorly communicated strategy.

The structured scoring method in the selection matrix helped to clarify which metrics provide valuable insight for the daily operations of internal logistics. With the insights from the content analysis and literature review, the scoring criteria could be chosen to focus on case company specific challenges and strategic alignment. As a result, the KPIs are tailored for the case company. These results provide a lean and focused approach for KPI management, tailored to internal logistics needs.

Practical implications of the results include the selection matrix with selection criteria which can be utilized to evaluate KPIs for internal logistics operations in BRP Finland Oy. When using the selection matrix, the operating environment and current strategy needs to be aligned with it. The second practical implication is the collected list of possible KPIs that can be evaluated by possible different selection matrixes. This is not only limited to the case company but can be utilized generally. The biggest practical implication is the set of KPIs provided for the case company to be utilized in decision making and development in internal logistics operations. This set of KPIs supports the logistics organization to develop their operations in alignment with the corporate strategy by communicating clear KPIs for the team- and management level.

5.1 Research limitations and future research possibilities

Limitations of the study included factors regarding single case study and qualitative data. Single case study limits broader applicability of the selection criteria directly, but the method can be copied into elsewhere to form a tailored set of selection criteria for each case. Certain potential KPIs lacked existing accurate data sources and would require development of processes and data harvesting. There is always a risk of subjectivity when gathering qualitative data and analyzing it, although the risk is minimized because of the content analysis method but not eliminated entirely.

For future research the benchmarking of KPI values and practices with different companies to know what a good level of performance in each category is. An extended

validation of KPIs through a longer period to identify internal results and identify trends and patterns would provide valuable information. And to gather data for the KPIs but only then implement them as part of daily operations to research the impact of performance metric information on performance. Automated data collecting and visualization methods for automated KPIs is also a possible research opportunity for future to enable consistent data accuracy.

6 Conclusion

This thesis aimed to study what are the requirements for tailoring a balanced set of KPIs for a manufacturing company's internal logistics and what KPIs are best suited for the case company's (BRP Finland Oy) internal logistics. The research structured around five objectives providing answers to the two research questions. Different performance measurement systems were reviewed in the literature review, such as Balanced scorecard and performance prism. Literature review was continued by a set of interviews within the case company, seeking insight into the internal logistics challenges and requirements. Content analysis of the interview responses together with the literature review served as a foundation for identifying internal logistics challenges and developing the selection criteria for KPIs tailored for the case company's internal logistics operations.

A diverse set of logistics KPIs were identified from the literature review and interviews. This list of logistics related KPIs was scored through the developed scoring matrix, based on logistics relevance, measurability, diagnostic value, controllability and strategic alignment, to identify the best fitting KPIs. The content analysis made clear that many existing KPIs lacked alignment and were irrelevant to logistics. The validation with stakeholders confirmed the practical applicability of the selected indicators to the current performance management system that was based on the five BSC perspectives mentioned.

Internal logistics KPIs can be tailored for a specific manufacturing company by analyzing their operating environment and strategy regarding business processes and production and aligning the KPI selection criteria with identified challenges and strategic objectives. The operating environment sets its individual challenges that can be tackled with a tailored KPI approach. By having a set of KPIs from multiple perspectives measuring different metrics that are strategically aligned with the company's objectives, the internal logistics operations can be given the right tools for efficient operations and development. Since major part of the KPI evaluation criteria is strategic alignment, the KPIs need to be re-evaluated when the company's strategy is changed.

The KPIs best suited for BRP Finland Oy's internal logistics operations are the set of 14 KPIs for five different perspectives (Productivity, Quality, Finance, People and Health and Safety). They provide a rich view of the operations from multiple perspectives with various metrics that are mainly influenced by the logistics operations itself for ensuring maximum actionability. They are aligned with strategic objectives, are relevant to logistics organization. The multiple perspective view ensures the balanced development to avoid partial optimization that is a challenge is wrong metrics are focused.

Effective internal logistics performance measurement and choosing the correct KPIs requires a balance between theory, operational insight, knowledge of the operating environment and strategic alignment. This thesis provides a focused, stakeholder-focused set of KPIs, aligned with the case company's strategic pillars and a scoring matrix tool to be used to re-align the KPIs when the strategy changes.

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