



## **Key performance and result indicators for a product management unit**

Lappeenranta–Lahti University of Technology LUT

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Examiners: Professor Ville Ojanen, D.Sc. (Tech), Professor Juhani Ukko, D.Sc. (Tech)

## ABSTRACT

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The purpose of this Master's Thesis was to create a metrics proposal for a product management unit. The suggestion of metrics will be used to measure the case company's product management unit's performance. The case company's product management unit consists of multiple teams, and each team has its metrics, which are built to enhance performance.

Whole units' main processes are the optimizing product location and the portfolio development processes. The aim was to enhance these processes to provide more value by supporting the case company's strategy and core objectives. The added value of each team to these processes was mapped out by using value stream mapping. After analyzing units' main processes, suggested metrics for each team were created. Metrics were formulated to enhance each team's value creation and therefore support the value creation of the whole unit. The relevancy of the metrics proposal was analyzed by utilizing the Hoshin Kanrin matrix to detect how each metric supports core objectives. The result was that suggested metrics could enhance the whole unit's performance towards the case company's main strategic targets. The implementation of metrics was left outside the scope of this research.

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This thesis taught me a valuable lesson that will follow for the rest of my life. Because we all have limited hours in life, planning and executing the next step is the most valuable skill we could ever learn. Therefore, I would like to cite wise words of my Swedish colleague, *“As leaders, we need to be able to lift our sight from our toes to the horizon. We can affect the future, but the day comes too fast”*.

## SYMBOLS AND ABBREVIATIONS

### Abbreviations

CES	Customer Effort Score
CRM	Customer Relationship Management
DBB	Design bid build
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
ERP	Enterprise Resource Planning
KPI	Key Performance Indicator
KRI	Key Result Indicator
NPS	Net Promoter Score
NPV	Net Present Value
PI	Performance indicator
RFQ	Request for quotation
RI	Result indicator
ROR	Rate of return
SRM	Supplier relationship management
TCO	Total Cost of Ownership
VSM	Value stream mapping

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# 1 Introduction

To successfully lead and develop a team to be more efficient, it is vital to be able to measure how much added value they can. This thesis conducts on making metrics to measure the product management unit of the limited liability case company. Currently, the unit does not have any metrics to measure the added value of the unit, and therefore leading is based on general assumptions instead of raw data.

The primary function of any limited liability company is to maximize shareholder value. Denis mentioned in 2019 that maximizing shareholder value is equivalent to maximizing cash flow that remains in the company after all other claim holders have received their payments. Shareholder value is measured by the amount the company can provide from cash flow (Denis, 2019). Shin determines that to accomplish targets company, executives should concentrate on aligning the whole company to move in the same direction. The first step in fine-tuning a company's performance is ensuring its primary functions are optimally managed based on measurable facts. (Shin, 2019) Ishaq stated in 2014 that performance management is the only way for the organization to steer actions toward targets. Therefore it can be considered a way to get a competitive advantage. (Ishaq Bhatti and Awan, 2014)

This research will start by determining the company's current state to understand how the product management unit creates shareholder value. Then through a literature review, the research aims to determine best practices to measure value creation. This knowledge will propose key performance and result indicators to the case company's product management unit. The study will only focus on setting up the metrics phase because successful implementation takes years. This thesis proposes how metrics for the product management unit could be set to help the company tune its performance.

## 1.1 Background

This research is done with the collaboration of a case company that operates in the construction equipment rental industry. The case company is a medium-sized company with several hundred employees. The company can be considered a growth company whose main target has been gaining market share through organic growth and acquisitions.

The product management unit is a relatively new function of the company. Therefore, no metrics measure yet units' performance. For this reason, the unit does not operate optimally. The case company's product management unit is responsible for optimizing the product portfolio mix and ensuring the fleet is utilized as efficiently as possible. Product management consists of several units: product portfolio management, product coordination, pricing, supply chain management, customer service, and management. Each team is divided into smaller sections regarding product groups or designated tasks.

## 1.2 Scope and objectives

The scope of this thesis is to create a proposal of metrics to measure the performance of the product management unit. This thesis will focus on understanding how a company's product management unit can create value and how to create indicators to support value creation. Metrics will include key performance indicators and key result indicators.

The main idea behind the metrics proposal is to enhance units' profitability and make leading toward targets easier every day. The case company is measured by earnings before interest, taxes, depreciation, and amortization (EBITDA). The objective is to propose metrics in a way that helps teams to fine-tune their actions toward whole company targets. This means optimizing workloads into tasks that bring the most added value. The unit consists of multiple teams so that each team will receive its metrics. When these metrics are brought together, the status of the product management unit can be determined.

### 1.3 Structure of the thesis and limitations

This research will be made as a case study, and therefore the research method of this thesis is a case study approach. The main research question of this Master's Thesis is "*How to form key performance and key result metrics for a product management unit*". As a sub-question, this thesis will cover "*What is value and how can it be formed*", "*How to track value chain through the organization*", "*How to measure performance*" and "*How to form sub-metrics that support whole unit's goals*".

The thesis is divided into three sections. The first section concentrates on finding best practices for creating suitable metrics from the literature review. The second phase aims to analyze the current state of the company's product management unit. Target is to understand how each unit creates added value through its main functions for the company. The phase will utilize interviews and value stream mapping of product management units' different teams.

After gaining knowledge on best practices from theory and data collection, the thesis will move into the third phase, proposing key performance and result indicators for the case company's product management unit. There are multiple teams inside the product management unit; therefore, all of those need individual metrics. Target is to create metrics so that each team will be led towards mutual targets of the whole company. To represent the real status of the whole product management unit, metrics will be combined through product management units' management metrics.

## 2 Literature review

This chapter aims to discover best practices from literature to build metrics that help the product management unit. To conduct this research successfully, all begin by understanding the structure of the value chain. The product management unit is at the key position in case a company's order-delivery process. Therefore, it is important to understand what value is and how it can be mapped. The literature review defines the value chain concept and concentrates on value stream mapping.

This thesis will deliver a proposal of metrics. Therefore, the literature review also goes further on how to form good performance indicators. At this stage, the thesis will be conducted on best practices, how measurement metrics should be formed, and what tools are needed.

The product management unit handles the case company's fleet management. The first and most vital part of the process is purchasing the fleet. Therefore, the product management unit is built around purchasing process, and every stage of fleet management can be found around that process. The literature review will conduct on the theory of fleet management and investing methods to understand how each unit should bring value in optimal conditions to the whole company.

Also, the product management unit services mostly internal customers. Therefore, metrics must be formed to enhance the quality of serving internal customers. The literature review also conducts theory regarding ways of serving internal customers as well as possible. The case company's product management unit also has a customer service unit that concentrates on helping external customers. For this reason, the literature review also focuses on the theory regarding customer satisfaction.

## 2.1 Value Chain

The product management unit acts as a part of the value chain. Therefore, to successfully develop a function, the value it provides to the whole system must be understood. Michael Porter's Value Chain acts as a good framework for this task. Sub-question to find out the answer to this chapter is "*What is value, and how it can be formed*".

Kaplinsky defined at 2004 value chain as a range of activities needed to turn the concept of a product or service into delivery. (Kaplinsky, 2004) Porter also sees the value chain as a process where all company's activities are linked. Appropriate levels of examining the value chain are at the business unit level. (Porter, 1985)

Porter divides value in the generic framework of the value chain into two categories; value activities and margin. Value activities are core actions that enable the firm to provide products or services to its customers. On the other hand, the margin is the difference between the collective cost of performing value activities and the total value the product or service can provide the customer. The company uses human resources, technologies, or purchased inputs whenever value activities occur. The typical phenomenon for value activities is that they produce or use information. A company's cost position towards its rivals can be figured out when the performance of each value activity is compared to its economics. Therefore, the level of performance on each value activity determines the total costs the buyer needs to pay to be profitable. This will set the company's minimum price levels and market position. (Porter, 1985)

Hakemulder mentions that value chains are how the whole private sector has been formulated. Therefore the reason for poor performance can always be found in the part of the value chain. (Hakemulder, 2016) By examining the value chain company is forced to understand strategically relevant activities. This will help to understand the behavior of costs and potential sources of differentiation. If a firm's value chain is compared to its rivals, it can easily be seen that it differs. Those differences among competitors' value chains are the main source of competitive advantage. Reason for these lays in fundamentals regarding companies' strategies and historical success in implementation. The value chain can also

differ because of competitive scope. If the company focuses only on a particular industry segment, it can provide an opportunity to tailor the value chain to its needs. This will provide a competitive advantage because the firm can lower costs due to focused operations. (Porter, 1985) Companies will benefit by addressing systematic constraints among parts where value chains are underperforming. (Hakemulder, 2016)

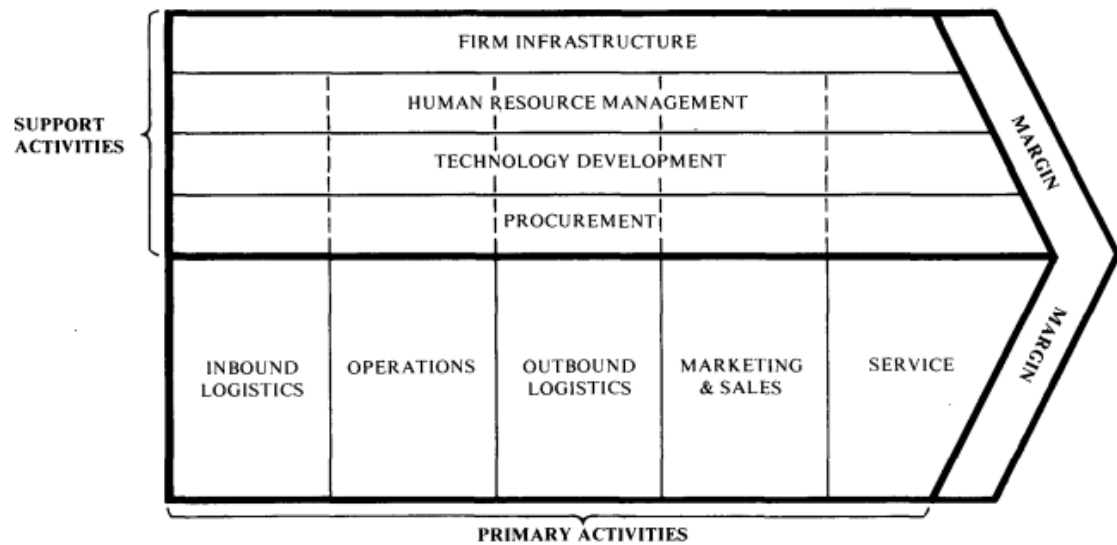


Figure 1. Generic value chain (Porter, 1985)

Porter categorizes value activities into two main levels: support and primary (Figure 1). On the framework, primary activities are directly connected to physical products or services. These are the manufacturing phase, selling process, final delivery, and aftersales assistance. In any company, primary activities can be divided into inbound logistics, operations, outbound logistics, marketing, and sales and service categories. Porter summarizes inbound logistics as all activities associated with material handling and warehousing. These include receiving goods, storing them, and returning them to suppliers. When concerning primary activity operations, the variety is much wider. Operations are all activities that transform inputs into a final service or product. In the case of outbound logistics, primary activities are part of processes connected to delivering the final product or service to the customer. These activities include ordering, processing, and distributing products or services to buyers. Primary activities also include marketing and sales. These activities are related to providing a means for customers to purchase services or products. This segment can also be categorized as such activities as pricing, promotion, and quotation. After the customer has purchased a service or product and it is delivered, the framework moves to the primary activity called to

service. This includes all activities which are associated with providing aftersales value. Such activities can be related to this segment's maintenance, installation, and adjustment. Each type of primary activity is vital to a firm's success. Still, their proportion will vary depending industry. (Porter, 1985)

Kaplinsky sees that accessing high-income yielding activities requires participating in global value chains. Therefore the company is not isolated from other value chains. (Kaplinsky, 2004) Hakemulder considers the value chain part of a wider market system (Figure 2), where the company's core value chain only consists of sourcing, production, and marketing. Support functions provide core functions platform to perform. (Hakemulder, 2016) Porter's framework also detects support activities and categorizes support activities into four different categories: procurement, technological development, human resource management, and firm infrastructure. The number of visible support activities highly depends on the industry type; they are all present. (Porter, 1985)

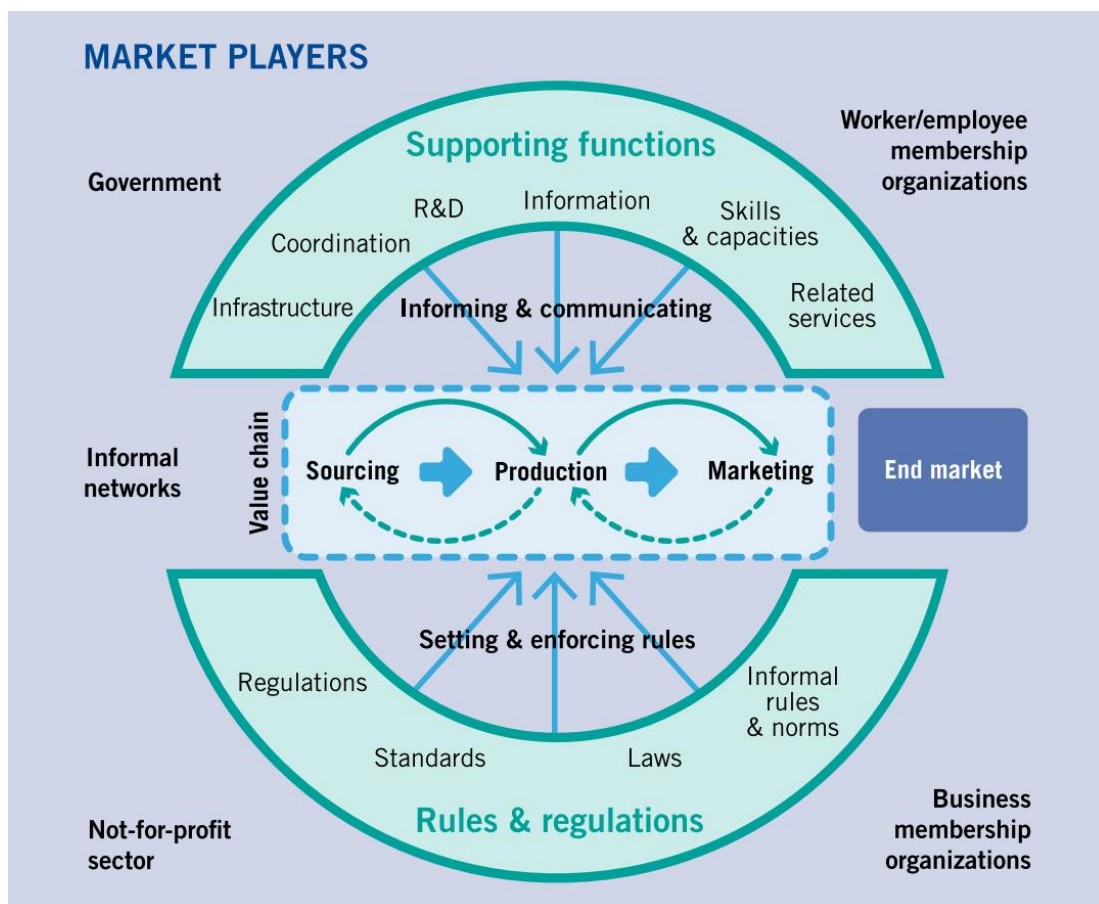


Figure 2. Value chain within the market system (Hakemulder, 2016)

Porter considers procurement as a support activity (Figure 1). This activity includes all functions that are connected to purchasing operations. Procurement is considered its activity, although every value activity consists of some. (Porter, 1985) Hakemulder sees sourcing as a part of the company's core value chain. Sourcing is under the impact of the market system and is prone to act within the market system's rules. Therefore Hakemulder does not categorize sourcing as a part of support functions. (Hakemulder, 2016) The cost of procurement activities is usually a fraction of the costs of procurement objects. Still, often the success of procurement operations has a major role in a firm's differentiation and profitability. Therefore, even a small improvement in purchasing actions will strongly affect other activities. (Porter, 1985)

Technology development is one of the key segments of support activities. Every value activity contains a sort of technological development, and it contains all procedures, technical know-how on conducting processes, and technology to provide custom products or services. The typical phenomenon for technology development is that it exists in every value activity and therefore is distributed throughout the whole organization. Technological development can most easily be detected in product design and serving procedures.

Regarding Michael Porter's framework of a generic value chain, a third of support activities are called human resource management. This support activity includes all human-related activities such as recruiting, training, and all types of compensation. The cumulative costs of human resource management are rarely well understood. Human resource management directly affects the performance level of the firm. The last support activity on the generic value chain is immutable infrastructure. This includes activities that are related to keeping the firm running. Such activities as general management, finance, accounting, quality management, and government affairs can be categorized under firm infrastructure. The function of these activities determines the whole company's level of performance, and therefore these activities can be seen as a source of competitive advantage. Even though firm infrastructure is categorized as a support function, they service the whole value chain, not individual activities. (Porter, 1985)

Teece describes value formation as a combination of business models and stakeholders. It is based on how well the business model can serve customers' needs. (Teece, 2010) Therefore, the customer perspective must consider the traditional Porter's value chain above.



## 2.2 Performance measurement indicators

The objective of this thesis is to propose performance indicators. To understand better how these indicators should be formed, looking at best practices from the literature is vital. The approach for this section is “*How to measure performance.*” Target is to formulate a theoretical framework that supports the case company’s strategic goals; therefore, metrics provide value to steer into them.

When measuring a company’s performance, two perspectives need to be considered. The first is to evaluate financial metrics and profitability because enterprises are investments to owners and should be evaluated as such. Employees operate companies, and therefore companies need also to understand socio-economical perspectives. Therefore metrics should include both financial-metrics and non-financial metrics to fulfill both perspectives. (Benková *et al.*, 2020) Measuring should consist of results from which period is past and indicators that guide future actions. (Alshakhshir and Howell, 2017)

### 2.2.1 Key result indicators (KRIs)

Parmenter stated in 2015 that key result indicators are a tool that represents an organization's performance to the board. They provide a clear view of the organization progressing towards the desired direction with designed speed. Result indicator (RI) differs from key result indicator by telling management how teams combine to produce results. Parmenter defines KRIs as a series of the most important RIs. The problem with RIs is that they report a change in direction too late after the problem already occurs. Therefore KRIs and RIs time periods are in the past (Figure 5). (Parmenter, 2015) Therefore, they do not provide any insight into what activities were successful and missed targets. They also do not tell what should be done to improve results. (Alshakhshir and Howell, 2017) Therefore neither KRIs nor RIs should not be used as a tool of daily management. (Parmenter, 2015)

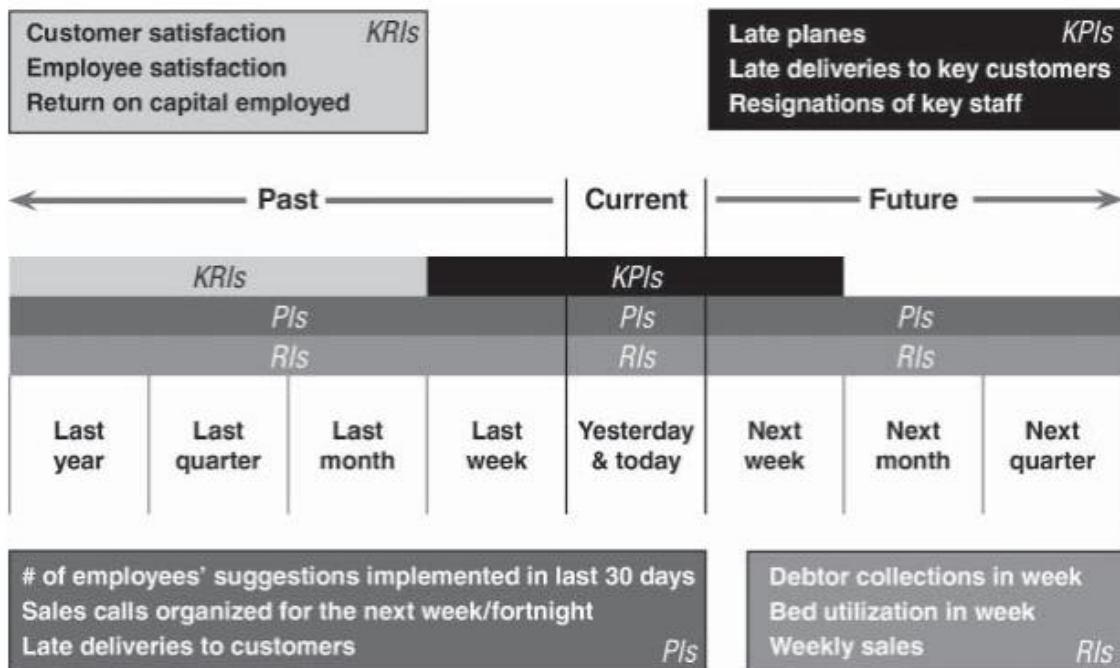


Figure 3. The difference in the four measures and their time periods. (Parmenter, 2015)

A typical phenomenon is that multiple teams can affect the result when KRIs are built around financial measures. For this reason, Parmenter mentions that all financial indicators are result indicators. (Parmenter, 2015) To completely understand what activities need to be done to increase or decrease the direction of financial indicators, it is vital to look at activities that create financial indicators. KRIs only measures the result of goals and implemented strategies. (Alshakhshir and Howell, 2017)

### 2.2.2 Key performance indicators (KPIs)

The main function of performance indicators (PIs) is to tell management what level the organization is performing on critical success factors. Performance indicators are nonfinancial metrics that can be traced back to the individual team. The difference between PIs and KPIs is that the latter is a pack of indicators representing the company's overall wellbeing. Parmenter states in 2015 that PIs are still important because they will help to complement KPIs and steer the team's efforts towards it through PIs. The time perspective of both PIs and KPIs should be current-state or future-oriented (Figure 3). (Parmenter, 2015)

Alshakhshir defines KPIs as a measure of actions that impacts the KRIs (Figure 4). KPIs should be formed to lead towards the wanted KRI that supports the goal. KPIs should be considered actionable; once completed, one must find another to support the movement toward KRI. (Alshakhshir and Howell, 2017)



Figure 4. KPIs relation to KRI. (Alshakhshir and Howell, 2017)

When well-created KPIs link daily actions to the organization's critical success factors. This will show improved performance and create wider ownership of process and fulfillment. (Parmenter, 2015)

Parmenter stated in 2015 that KPIs should be in alignment with seven characteristics of KPIs:

1. Non-Financial
2. Timely
3. Management focus
4. Simple
5. Team-based
6. Significant impact
7. Limited dark side

The important factor in understanding when creating KPIs is that they need to be non-financial. If KPI is set on financial measurements, it will become KRI, and the cause for the issue is lost. When KPI is set, it should be followed consistently weekly. The reason for frequently following is that otherwise, KPI will be forgotten, and there is no improvement. Parmenter stated in 2015 that KPIs should also be the focus of management. Change needs to come horizontally in the organization to be stable. Therefore, management should utilize KPIs as a part of the management toolkit. Parmenter discussed the importance of making

KPIs simple to make the implementation process possible at a fundamental level. This is vital because all staff needs to understand the reason behind measuring and in what actions they can influence metrics performance. The fifth of seven characteristics of KPI is team-based forming. It means that KPI is tied deep enough to an organization that one team can affect KPI. For this reason, return on capital employed (ROCE) cannot be used as KPI because it results from many activities and teams. (Parmenter, 2015)

Parmenter stated in 2015 that in the design process of KPIs must be taken into account that the result has a significant impact. (Parmenter, 2015) Hoque mentions in 2000 that there is empirical evidence on an organization's financial performance depending on whether they utilize KPIs. Therefore, KPIs must be determined to enable measuring (Hoque, 2000).

KPI needs to affect one of the more critical success factories. This leads to a situation where the organization succeeds on multiple levels when staff needs to concentrate on KPI. Before implementing KPI, Parmenter considers testing a crucial part of the success of limiting the dark side. When KPIs are also created, the designed outcome must be considered. Well-planned KPIs will cause staff to move towards strategic targets. (Parmenter, 2015) Chenhall mentioned in 2005 utilizing KPIs will help align strategic objectives and reflect on the company's performance. (Chenhall, 2005)

### 2.2.3 Strategic objectives into metrics

When setting up targets, it is important to understand the current state and what is desired. Targets must be achievable but simultaneously challenging so that those push organization towards the desired path. (Alshakhshir and Howell, 2017) This chapter aims to answer on sub-question, “How to form sub-metrics that support the whole unit’s goals?”

Parmenter divides target setting process into the following sections,

1. Define current state
2. Determine what is wanted to be achieved and in which time period

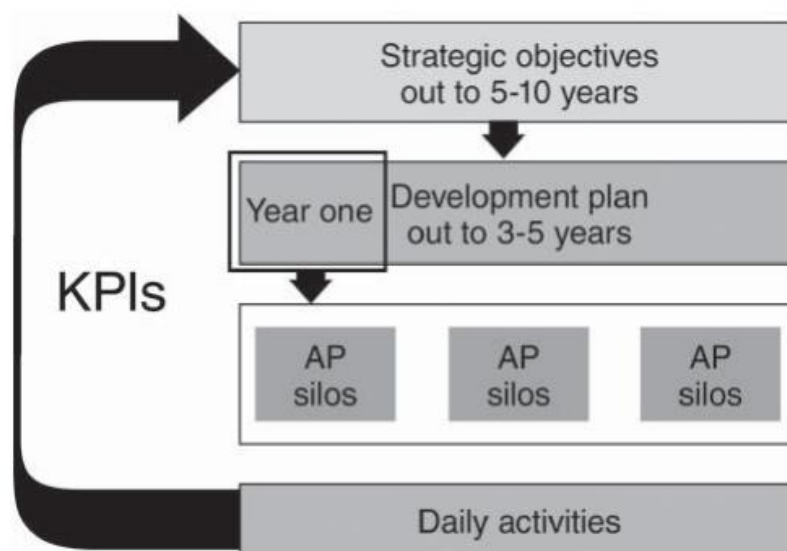


Figure 5. Linkage of KPIs to Strategic Objectives. (Parmenter, 2015)

Parmenter stated in 2015 that when designing metrics, there should be a 10/80/10 rule utilized. This rule means a maximum of 10 KRIs, 80 PIs, and 10 KPIs at the company level. These can be kept as a general guideline of a company's maximum number of metrics. When designing metrics for teams, these guidelines should be utilized and amount compressed based on the importance of the team to the whole performance. (Parmenter, 2015)

Howel and Alshakhshir stated in 2017 that the SMART framework should be used in the target-setting process. Targets made by SMART-framework should be *specific* and cannot be misunderstood. They also need to be *measurable* to easily show the status of achieving the target. When planning targets, they must be *achievable* with available resources. Howel refers to SMART-framework that targets must also be *realistic* and have a specific *timeframe*. (Alshakhshir and Howell, 2017)

Cudney stated in 2016 that Carjo's Hoshin strategic plan summary is useful when it concerns the right metrics to measure to steer the company toward its targets. Matrix shows the relationship between determined factors. Symbol (●) indicates a strong relationship, and symbol (○) represents that there is a direct relationship. (Cudney, 2018) Chiarini mentions that Hoshin Kanri is very flexible and can manage every strategy. Therefore there can be a limitless number of determined relationships in Matrix. (Chiarini, 2016)

Hoshin Kanri starts by defining strategic goals that the company wants to achieve. These should follow the company's strategic plan and represent future goals for five to ten years. These goals should ensure the company's long-term success. After setting strategic goals, Hoshin's strategic plan summary determines core objectives. These objectives should be specific and measurable goals that ensure the company's success on a three-to-five-year timescale and should be aligned with strategic goals. This ensures that strategic goals are progressed by using appropriate objectives. (Cudney, 2018) If Hoshin Kanri is compared to BSC, it can be seen that due direct connection between objectives and strategic goals, Hoshin Kanri is more effective at the more operative levels. (Chiarini, 2016)

The next phase of the Hoshin strategic plan summary tool is to set up metrics. These need to relate to core objectives. When planning metrics, they must be measurable with limited options to cover only quantitative factors. They also need to be benchmarked to represent the current status of the process. The final important criterion of metrics is that they must be achievable and realistic. This will determine system will succeed or fail because if metrics are set far from the realistic level, employees will lose interest. When metrics are set, the tool moves to the final phase, identifying who is responsible for meeting core objectives. Only one can be an objective owner, but usually, these have cross-functional connections throughout the organization. (Cudney, 2018)

<i>Strategic goals</i>				<i>Core objectives</i>			<i>Hoshin strategic plan summary</i>			
Strategic goal 1		●								
Strategic goal 2	●									
Strategic goal 3		○						●		
Strategic goal 4	●									
<i>Measures</i>				Core objective 3	Core objective 2	Core objective 1				
Metric 1	●					○				
Metric 2	●									
Metric 3	○									
Metric 4	●									
Metric 5	●	○		●						
Metric 6	○									
Metric 7	●									
Metric 8			●		●					
Metric 9			●		●					
Director of Operations	●					●				
Director of New Business	●	●			○					
Director of Marketing		○			●					
Director of Engineering	●	●								
Director of Quality	○									
Director of Finance	●					●				

Figure 6. Carjo's Hoshin strategic plan summary (Cudney, 2018)

## 2.3 Value stream mapping

The aim of value stream mapping (VSM) is to answer the question, “*How organization is able to provide value*”. VSM is a flowchart-based method where the idea is to map how the value flows through the organization. The process starts by analyzing the current state of the function that is wanted to focus on. (Cudney, 2018) Rother sees VSM as a way to understand how information moves among the material. (Rother and Shook, 1999) Then it is compared to future-state VSM in how the process should be done in an ideal situation. When using VSM, it is possible to detect where and how value is generated and eliminate waste using lean methods. (Cudney, 2018)

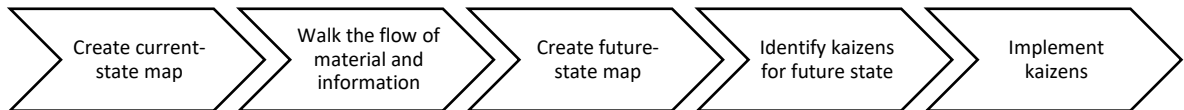


Figure 7. Value stream mapping steps (Cudney, 2018)

Value stream mapping shows the process as a whole and can be used to optimize the entire process. (Cudney, 2018) When the target is to determine how value is formed, it can be emphasized by reducing seven classical wastes, which are the following:

1. Overproduction
2. Transportation
3. Inventory
4. Overprocessing
5. Waiting
6. Motion
7. Defects

The first of seven classical wastes is overproduction. This means producing more than immediate internal or external customer needs. The phenomenon of overproduction is also present when there is produced information that is not necessary. (Ohno, 1978) Porter states that buyers are unwilling to pay value they do not perceive (Figure 8). This phenomenon exists even though the buyer would get a higher true value from the solution. (Porter, 1985)



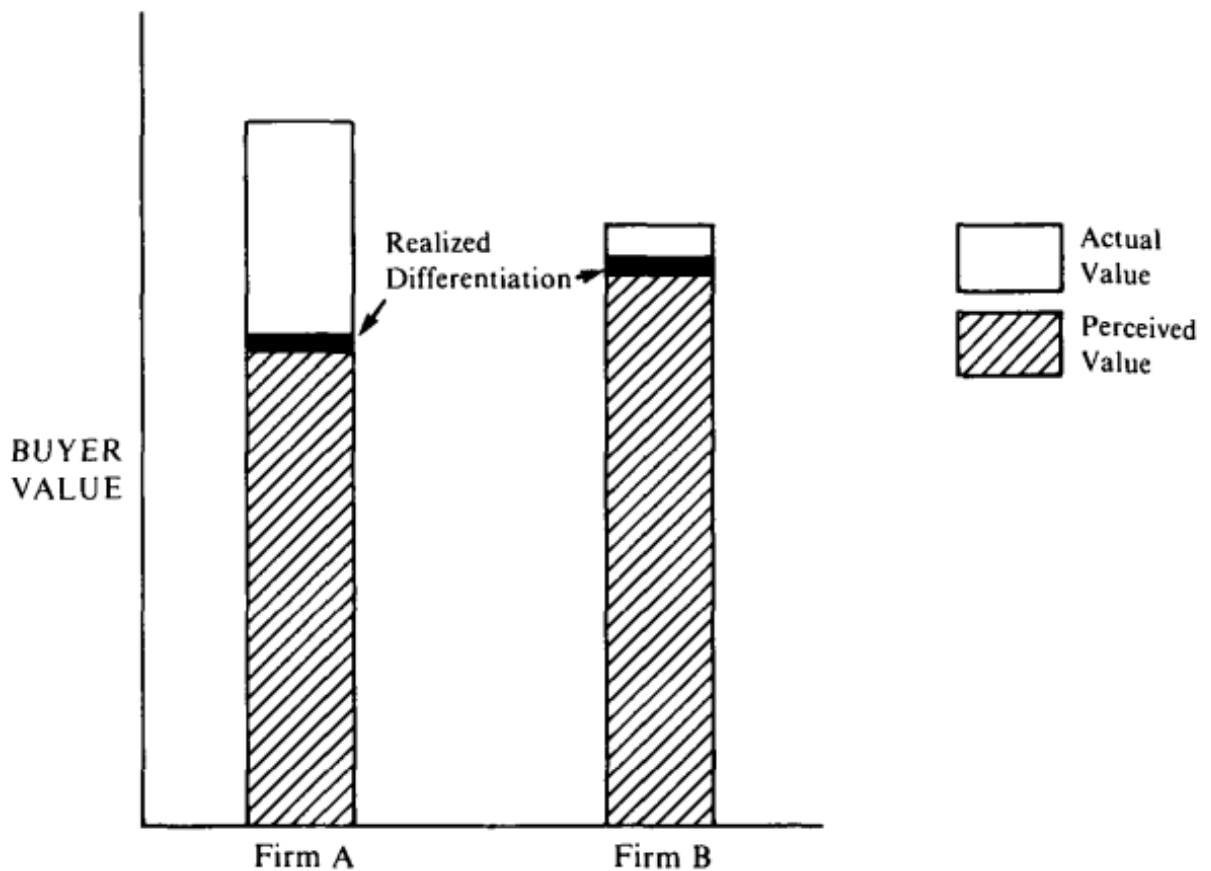


Figure 8. Actual versus perceived buyer value (Porter, 1985)

Ohno considers transportation as the second classical waste. It does not bring added value if it is related to internal transportation. Therefore, reducing it can greatly make the process more efficient. The third form of waste is inventory. Customers do not need it immediately and therefore only produce external costs. Typically, inventory is caused by a push schedule. Overprocessing can also be determined as a form of waste. It means bad product or tool design which causes excess work which could be avoided. When the process does not perform optimally, there is always mistiming, which causes the fifth element of classical waste – waiting. (Ohno, 1978) This is typically caused by unbalanced production lines. It can be minimized through VSM (Cudney, 2018).

Usually, processes also contain unnecessary motion, which is the sixth element of waste. This can show as double handling and actions required to do other actions. The final element of classical waste is defects. This results from bad quality which can only be solved through additional work. It creates unusable inventory and a bad customer experience. (Ohno, 1978)

VSM shows all activities during order-delivery processes within a product or service. (Cudney, 2018) Rother stated in 1999 that every product has a value stream. Therefore VSM can be made from any business activity. (Rother and Shook, 1999)

Activities can be categorized as value-adding and non-value-adding activities. Value-adding activity can be detected by behavior that transforms raw material or information to meet customers' requirements. On the other hand, non-value-adding activities take time, resources, or space but do not provide any value to a service or product. Customers are not willing to pay for any non-value-adding activities. Typically process contains 95% of non-value-adding activities and 5% of value-adding activities. (Cudney, 2018)

## 2.4 Asset management as a part of fleet management

The product management unit does asset management, and therefore this chapter aims to answer “*How to form key performance and key result metrics for a product management unit*”.

Lloyd stated in 2019 that asset management handles the relationship between money, risk, and business performance. (Lloyd, Corcoran and Lloyd, 2019) Hastings defines asset management as a function that enables an organization to have appropriate assets to conduct the organization's core business. Asset management aims to steer value through assets to an organization the customer determines. (Hastings, 2021) Fleet management is closely connected to asset management and handles assets' most effective operational side. The goal is to make decisions regarding asset uptime to optimize the total cost of ownership (TCO). Powell stated in 2019 that strategic business decisions must be made through out total assets lifetime cycle to optimize TCO. This includes taking everything from asset purchase, operational use, and disposal. (Powell and Suresh, 2019)

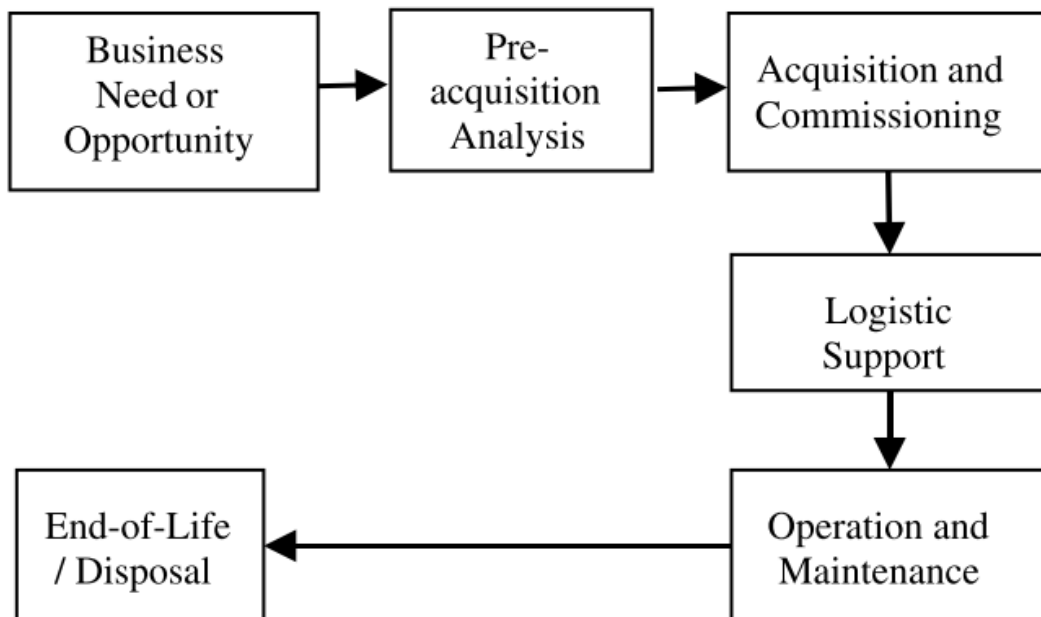


Figure 9. Asset life cycle. (Hastings, 2021)

## 2.5 Procurement to optimize assets

Procuring capital equipment is one of the main processes when optimizing assets. (Hastings, 2021) Therefore it is important to understand the procurement process to create metrics for case companies operating in the field.

The process lasts the whole product's lifetime and consists of numerous phases. In asset-related organizations, procurement influences the company's future decisions and competence. Therefore, when planning procurements, contingent decisions need to be made. This means taking earlier purchases into account to strengthen possible existing synergies. Synergies can be found in maintenance and operational processes. (Hofmann *et al.*, 2019)

Schuh stated in 2014 that handling supplier relationship management (SRM) in procurement-related businesses is important. Well-executed SRM and help find synergies through functions that both supplier and company make procurement share. Therefore it helps both parties on achieving mutual goals. (Schuh *et al.*, 2014)

The procurement process can be divided into three larger sections: the preparatory, agreement phase, and execution phases. The preparatory phase starts with detecting customer needs which can be converted into demand. The phase ends when the first negotiations with the supplier begin. Then the process moves toward the agreement phase, which includes everything from negotiations to ordering and monitoring delivery. The final phase starts when products arrive at the organization, and the organization will start conducting its core business with them. The phase includes everything from the operational side and ends with the disinvestment of products. (Hofmann *et al.*, 2019)

Russill mentioned that the results of the well-executed procurement process are affecting the company. Therefore, the procurement process risk must be considered during the process. (Russill Richard, 2010)

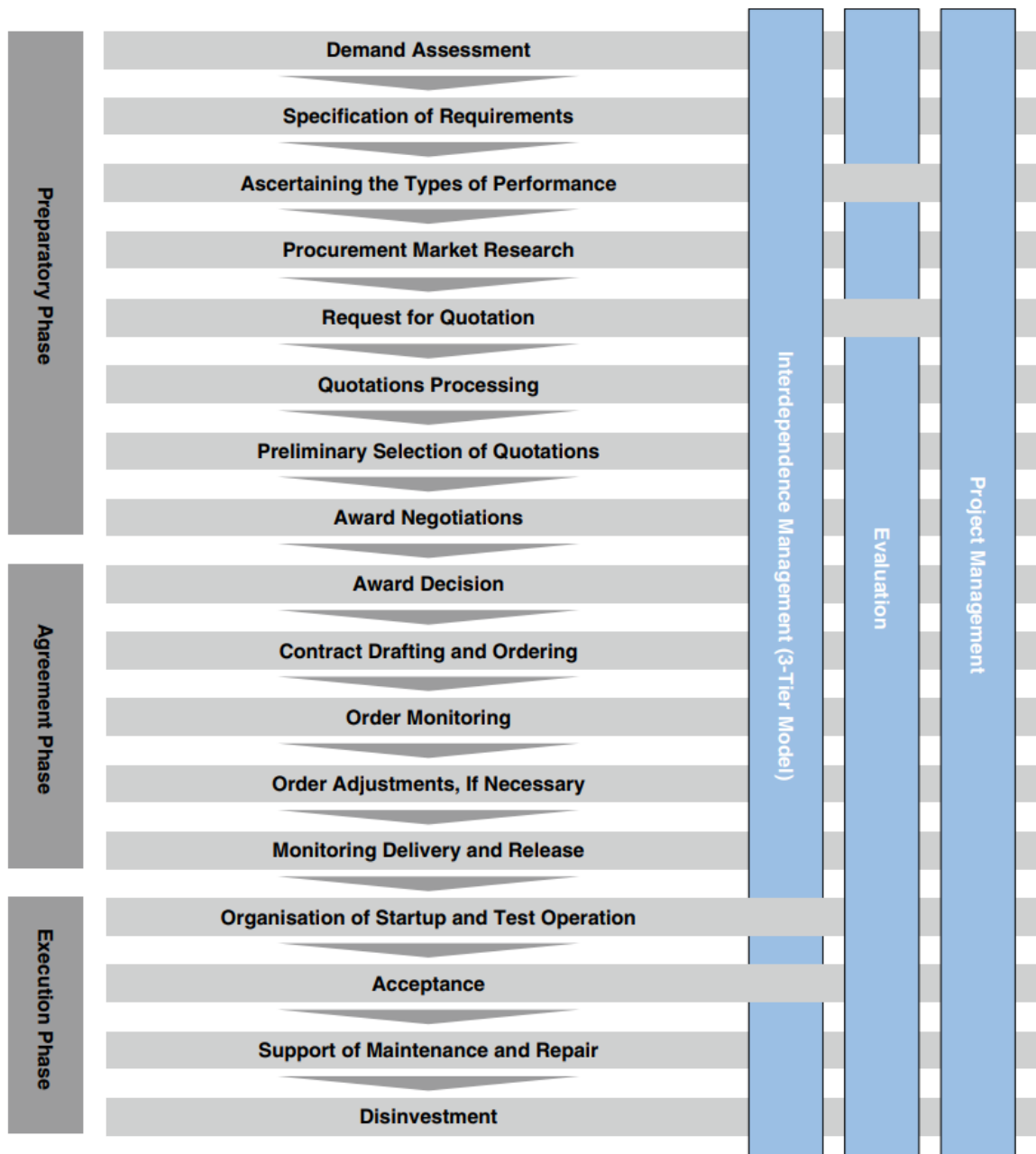


Figure 10. Process for the procurement of capital equipment (Hofmann *et al.*, 2019)

Hofmann stated in 2019 that capital equipment procurement starts from the preparatory phase. (Hofmann *et al.*, 2019). The first step in this phase is demand assessment. When doing demand assessment, the target is to clarify what objects should be purchased, timing, and match quantities to meet demand. Nicolette mentions that the process should start with assessing the current situation. (Nicoletti, 2020) During this step, one of the key functions is to evaluate the initial cost these procurement objects would cause. (Hofmann *et al.*, 2019)

When demand assessment is done, the process moves into requirements specification. The content and scope of this phase depend on the financial risk purchase is causing. If a purchase is important and includes many financial commitments, then the user and decision-makers should be involved in the process among the buyer. When listing requirements of procurement objects, those need to be categorized by necessity. Buyers must be capable of detecting requirements that must have and requirements that are nice to have. Those requirements need to be weighted accordingly. (Hofmann *et al.*, 2019) Nicolette stated in 2020 that the procurement process should have a clear goal of ensuring efficient communication between users, procurement organization, and partners. This can only be ensured by defining also needs of inner customers. (Nicoletti, 2020)

If the buyer is sure that the requirements are specifications, the clear process can take the next step: ascertaining the types of performance. This step aims to find alternative solutions to solve the customer's issue. For example, suppose there is demand for container cargo operations instead of buying a new truck to haul containers. In that case, the solution can be solved by combining transport via planning and rising efficiency. (Hofmann *et al.*, 2019)

The next step in the procurement process is called procurement market research. At a fundamental level, this phase is continuous and requires constant information gathering about technologies, market prices, suppliers, and market development. Multiple information sources must be utilized to gain a comprehensive image of the whole market. These sources include trade fairs, internal contacts, supplier catalogs, and visits, cooperation with other companies. (Hofmann *et al.*, 2019) Information from all relevant entities inside the organization should be used on this level. (Nicoletti, 2020)

After finding a supplier for the procurement object, it is time to set a request for quotation (RFQ). What does an acceptable number of quantitations depend on the value that the procurement object has. The main idea is to send quotations in written format to the supplier with all needed specifications, written inquiries, and expectations regarding the delivery date. After suppliers reply to quotations, it is turned in for quotations processing.(Hofmann *et al.*, 2019) Semanik mentions that it is important that each participant gets the same information in the same form to ensure measurable results. RFQ should be used to determine suppliers' capabilities to conduct orders and reflect their financial health (Sollish and Semanik, 2010). If the supplier's reply misses any needed information, that must be requested. In case of a low reply to quantities, it is vital to send further inquiries to other

suppliers. The idea is to keep all the time competition going on. (Hofmann *et al.*, 2019) Herbs stated in 2012 that design-bid-build (DBB) method is an effective way to attract competition from suppliers and obtain acceptable market prices. The method utilizes bidding as a component of the procurement process. (Herbst and Edmondson, 2012)

After the formal check of quotations, it is time to move on to the preliminary selection. At this phase, it is vital to inform all major suppliers that have left quotations about the decision. It is recommendable to prevail in negotiation potential and maintain long-standing business relations. The final step in the preparatory phase is award negotiations. At this point in the process, the target ensures all terms and details are correctly understood, and all differences solved. The award negotiations should not appear as a competition where either supplier or buyer has on edge. It should be considered an interaction where both parties cooperate towards the mutual target and therefore appear as a winner. A prominent factor in this step is that both parties use their negotiating powers to balance the situation. The supplier is now in a monopoly whether the buyer still has market power. To successfully continue this situation toward the next phase, both organizations must be well prepared to withstand opponents' negotiating tactics. (Hofmann *et al.*, 2019)

The first step in the agreement phase is called the award decision. The Target of this phase is to decide to purchase a procurement object. This step should be considered a final check that there have been enough alternatives, life cycle costs are calculated correctly, and the scoring model looks good. The decision should result from a rational evaluation between available options and choosing one that fulfills the need. At this point supplier and buyer should have a common view on terms such as price, quantities, and due dates. (Hofmann *et al.*, 2019)

When the decision to proceed with the current procurement object and the supplier is done, it is time to start contract drafting. Normally purchase contracts are highly standardized. Those include due dates, technical specifications, terms and termination possibilities, and jurisdictional venue clauses, especially for late supply. The contract states in 2019 how the order is executed and confirmed. After the contract drafting process is ready ordering process can initiate. (Hofmann *et al.*, 2019)

Depending on the delivery time and value of the order next step is to monitor the order. If there are any deviations from the original plan, both parties must communicate about the

changed situation. It is important to react to deviation when a normal situation occurs and act accordingly immediately. Situations can also change from the buyer's side. There might be a need to change order details after the confirmation. This can occur due to changes in external framework conditions. Especially in these conditions written contract is valuable because it will state who will be responsible for added costs and possible time delays. After the procurement object has been delivered, it is time to monitor delivery and release. This step includes examining that procurement object that is exactly what was negotiated. (Hofmann *et al.*, 2019)

The last phase of the procurement process is execution. This phase starts with organizational start-up as the test operation. When conducting testing, it is important to discover any security defects and ensure reliability. If the procurement object is wholly new to the organization, it is recommended to have employees instructed in the operation of the item. (Hofmann *et al.*, 2019)

After testing, operations are ready, and the procurement team is sure that all went according to the contract process moves into acceptance. It is a written report which confirms that the order was received in the condition it was supposed to be. What is good to acknowledge is that a significant part of contract power ends with acceptance. Depending on the contract, there might be terms over warranty and later upcoming issues. Still, if defects are not detected on the acceptance report, the ordering party needs to be able to provide proof, and most of the costs can land on the ordering party. (Hofmann *et al.*, 2019)

Maintenance and repair support should be emphasized when considering procurement objects from an operational point of view. Maintenance aims to sustain an organization's ability to gain value through the bought object. Therefore it has a significant effect on the total operating age of the object, and its needs should be taken into account already at the procurement phase. (Hastings, 2021)

For every procurement object, there should be a calculated lifetime cycle which represents when the cost of ownership supports divestment of the object. This means action when the item will be moved into sales, and there are initiations on investing more in the designated object. It supports organizations' investment projects by making divestment at the right time. When an item is sold, it makes room for new objects by giving cash flow to be invested into the core business. There are various methods for determining optimal replacement time and



useful lifetime. One of the best-known methods is the net present value of the object.  
(Hofmann *et al.*, 2019)

## 2.6 Fleet performance

Fleet investing is one of the key actions the product management unit handles. To be able to understand better what best practices are to do investing and how these activities should be measured as a part of metrics, investing strategies are also conducted in this chapter. The approach is to answer the question “*How to form key performance and key result metrics for product management unit*”. When planning fleet investments, the most critical variables are competitors’ actions and the rate of return on investments.

When looking at the situation purely through the rate of return on investments, two things need to be considered: is the net present value high enough to meet targets, and is the direction of the market demand favorable? Healthy investments must generate enough profits to determine if the investment case is solid.

### 2.6.1 Fleet net present value

When optimizing fleet performance, its financial performance abilities are crucial. Opportunity costs of invested capital need to take into consideration. Buchanan stated in 2017 that opportunity costs are the predicted value if another choice had been made. It reflects a connection between choice and scarcity. Due limitation of resource scarcity, a component that is always present forces one to make choices between possibilities. (Buchanan, 2017) For this reason, investing in a certain object is always away from other possibilities, and the rate of return on a financial object becomes important.

The Rate of Return (ROR) formula represents how fast an investment can generate cash flow to payout itself. The model assumes that there are only two cash flows in the system, capital layout at the beginning of the year and total cash flow at the end of the year.(Dayananda *et al.*, 2002)

The model of ROR model assumes that in an ideal situation, by extracting cashflow  $C_0$  layout from cashflow at the end of year  $C_1$  and dividing the outcome by cashflow layout  $C_0$ , the speed on recovering invested funds can be calculated. This model gives a rough assumption of how many percentages of return investment can generate from the total invested amount during one year. (Dayananda *et al.*, 2002)

$r$	Rate of return (ROR)
$t$	Time period
$C$	Cash flow
$C_t$	Cash flow at the end of period $t$

$$r = \frac{C_1 - C_0}{C_0}$$

When calculating investments' future profitability key factor is to determine the level of future cash flows FV. This can be done by multiplying the current investment value PV by the interest rate  $r$ , which can be considered as same as ROR. This model only exists when there is only one future payout.(Dayananda *et al.*, 2002)

$PV$	Present value of a cash flow
$FV$	Future value of a cash flow

$$\text{interest rate } (r) = ROR$$

$$FV = PV(1 + r)^n$$

The total cost of ownership (TCO) must be considered when considering investment profitability. This means considering service costs that might occur during the ownership period and decreasing positive cash flow. TCO can be done by calculating NPV and subtracting capital outlays on a designated period. The model assumes the discount rate to be equal to the interest rate. (Dayananda *et al.*, 2002)

$r$  discount rate

$t$  Time period

$CO_t$  capital outlays at the beginning of period  $t$

$C_t$  Cash flow at the end of period  $t$

$NPV$  net present value

$$NPV = \sum_t^n \frac{C_t}{(1+r)^t} - \sum_{t=0}^n \frac{CO_t}{(1+r)^t}$$

The formula can be converted into cash flow streams to infinity if there is no exact expiration date when the existing investment object will be conducted. The following formula will represent the total profitability of the investment decision. (Dayananda *et al.*, 2002)

$NPV_p$  NPV at present of all the PVs in replication stream to perpetuity

$NPV_r$  NPV of the initial replication

$NPV_n$  NPV of each replication at year  $n$

$$NPV_p = NPV_r + \frac{NPV_n}{[(1+r)^n - 1]}$$

### 2.6.2 Fleet utilization rate

Physical asset management aims to optimize assets' capability to produce financial results. Therefore it is connected with productivity. (Hastings, 2021) Reid mentions that productivity is the ratio between process inputs and outputs. It measures how the company is using its financial measures. (Reid and Sanders, 2011)

$$Productivity = \frac{Output}{Input}$$

When going one layer deeper into asset management, it is important to understand productivity from a utilization standpoint. (Reid and Sanders, 2011) Assets need financial resources, and their utilization is connected with financial results. (Hastings, 2021) Utilization measures how much time a resource is used compared to when it is available. (Reid and Sanders, 2011)

$$Utilization = \frac{Time\ a\ resource\ used}{Time\ a\ resource\ available}$$

The time resource is available depends directly on capacity and demand. Therefore, the utilization formula should be modified to represent capacity. From a capacity point of view, utilization is the actual output rate divided by the capacity, which shows how well the asset is used.

$$Utilisation = \frac{Actual\ output\ rate}{Capacity} (100\%)$$

In every product, there is an optimal utilization level, which is called the best operating level. At that point, capacity is exactly right, which causes the lowest possible unit costs. When capacity is closing toward the best operating level, economies of scale help to bring the unit cost down. After the best operating level is achieved, diseconomies of scale come into place, increasing unit costs. The reason for diseconomies of scale is that if capacity is too high, it tightens more operating resources around it. To cover added costs require utilization when the best operating level is met. (Reid and Sanders, 2011)

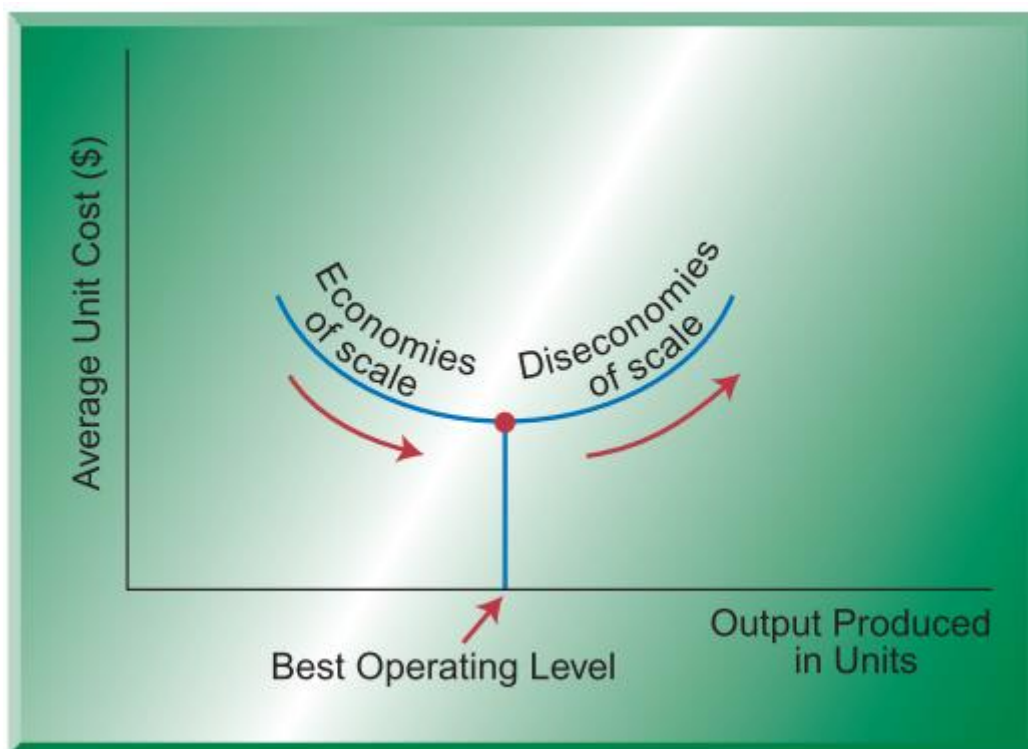


Figure 11. Different operating levels. (Reid and Sanders, 2011)

This same phenomenon is always present despite the size of the company. The point of the best operating level depends on markets and the company, but capacity needs to be balanced with demand. (Reid and Sanders, 2011) The fleet is a physical asset; therefore, its capacity should be set accordingly to have a utilization percentage at the best operating level. (Hastings, 2021)

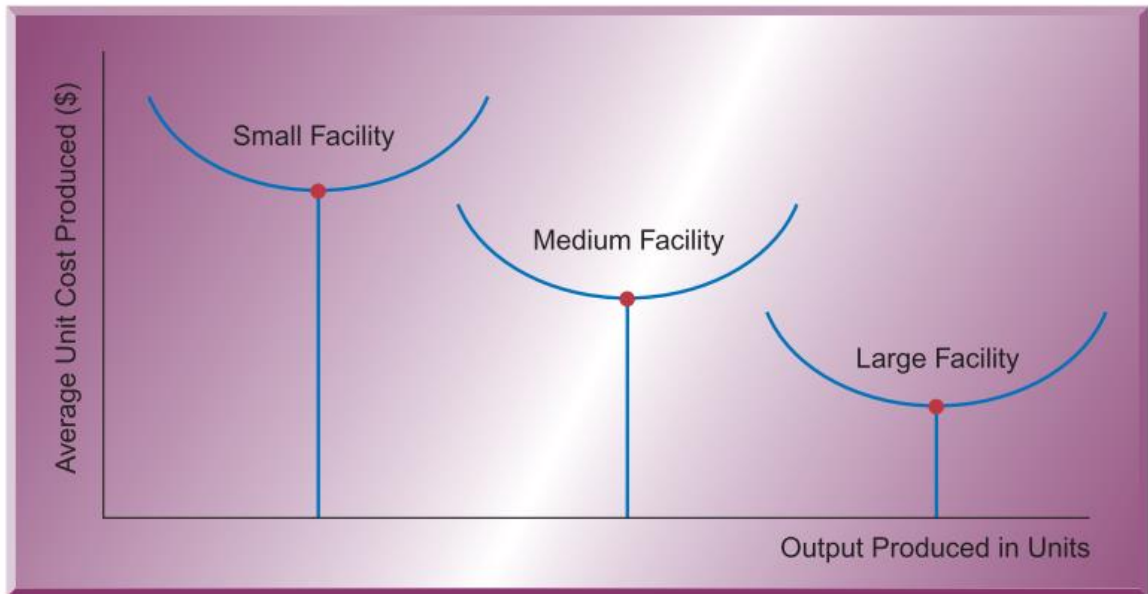


Figure 12. Best operating level as functions of facility size. (Reid and Sanders, 2011)

## 2.7 Internal customer service process

Asset management is about enabling resources for organizations to fulfill their main function. Therefore asset management serves the inner customer. (Hastings, 2021) Product management is a form of asset management, and therefore this chapter aims to answer the question, “What is value, and how can it be formed”.

Understanding how inner customers could be served better and measured is vital. Senn stated in 2013 that value an internal customer perceives directly depends on the performance of functions. (Senn, Thoma and Yip, 2013) Ishaq mentions that the performance of different organization functions can be enhanced by adapting working performance measurement indicators. (Ishaq Bhatti and Awan, 2014) Senn mentions that an organization needs to choose which customer to prioritize because not all customers are equal. Those with strategic importance should be treated as the company’s most important assets. Therefore first-come, first-served principle does not lead to optimal results. (Senn, Thoma and Yip, 2013)

Stauss stated in 2019 that every complaint contains valuable information from part of the process that the customer does not like, and this information should be used to develop processes better. Complaints are telling what customer level is of the required standard and the minimal level to achieve it. Therefore, customer service levels should be measured to ensure the overall process meets customers’ needs and requirements. Fixing processes based on feedback will raise profitability because it helps to avoid external failure costs such as legal processes and warranties. (Stauss and Seidel, 2019)



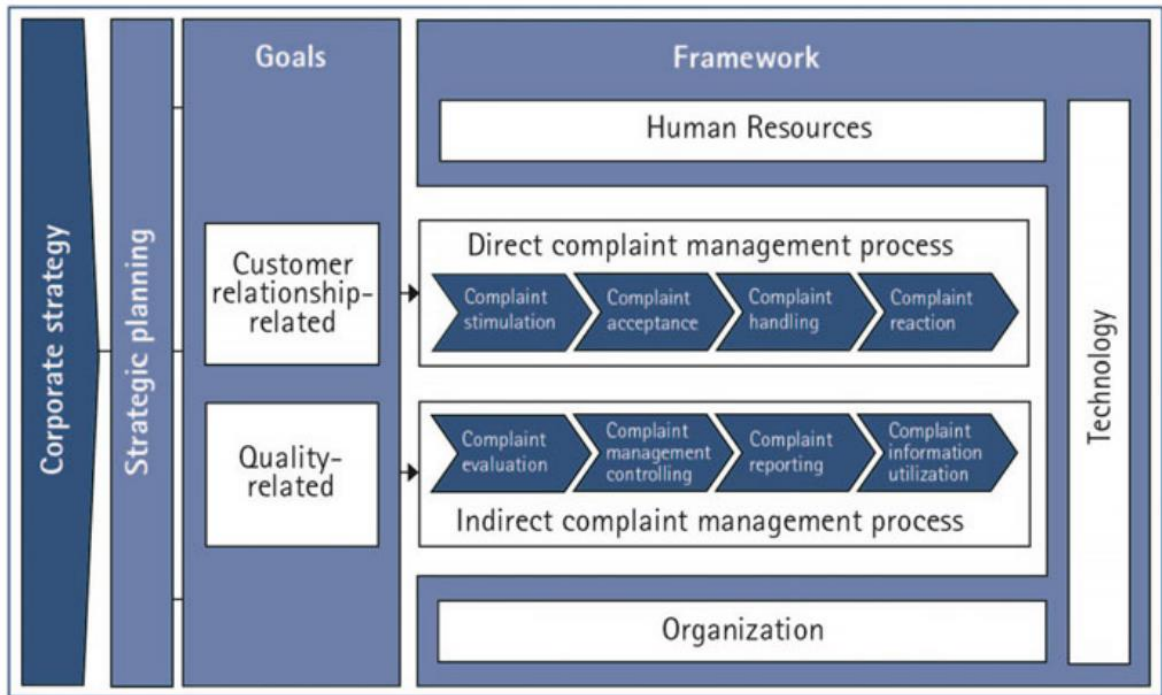


Figure 13. The complaint management concept (Stauss and Seidel, 2019)

Stauss mentioned that building a complaint management framework starts with understanding corporate strategy. To make sure that framework will support the company's strategic goals, the strategical-oriented head of complaint management must be clarified. How to complain management will be linked to other business processes must be found. The key question is also what sort of influence is needed to change things from a hierarchical point of view. When planning complaints, the direct management process should be oriented to align with customer relationship-related goals. This includes accepting complaints as it is represented and handling them in such form. An important factor is always to show a reaction to a complaint.

On the other hand, when the target is to develop indirect complaint management, quality factors should be those to follow. Root causes should be evaluated when indirect complaints arrive to determine their reason. Then the head of complaint management should make a statement about it and utilize gained information to adjust the process. (Stauss and Seidel, 2019)

Senn stated in 2019 that building customer relationships with business partners could mutually benefit both parties. Building customer relationships and trust can take years, whereas harming them only requires seconds. (Senn, Thoma and Yip, 2013) Therefore complain management should not be ignorant of other divisions. The main focus should be, “What can I do to better exploit strategic potential”. To start the fine-tuning process, it is important to ensure that operational tasks are performed at a level that meets internal customers’ requirements. This requires a systematic flow of information. Systematic information flow also helps prove internal functions' contribution to the company’s value creation. The problem with accounting is it usually captures the source of costs but not its economic benefits. Therefore in centric of developing functions is to prove their profitability. (Stauss and Seidel, 2019)

### 2.7.1 Customer satisfaction

To serve inner customers well, it is important to understand how they provide value to end customers, reflecting on the business performance. There is a significant linkage between service quality and customer satisfaction. (Ou *et al.*, 2011) Therefore there is a link between customer satisfaction and asset management.

Customer satisfaction is depending how well-perceived quality meets expectations. (Parasuraman, Zeithaml and Berry, 1988) Therefore complaints management act an important role as a part of customer satisfaction. As Stauss mentioned, complaint management's overall target is increasing profitability and differentiating from competitors. It can be done by minimizing the negative effect on the customer, that is, dissatisfaction about an object to which the complaint refers. This target can be turned into smaller sub-goals related to quality and customer relationship management.(Stauss and Seidel, 2019)

Overall goal	<ul style="list-style-type: none"> <li>• Increase of profitability and competitiveness</li> </ul>
Customer relationship related sub-goals	<ul style="list-style-type: none"> <li>• Stabilization of jeopardized customer relationships through the establishment of (complaint) satisfaction</li> <li>• Increase in purchase intensity and purchase frequency, as well as promotion of cross-buying behavior</li> <li>• Implementing and clarifying of a customer-oriented corporate strategy</li> <li>• Creation of additional promotional effects via word-of-mouth communication</li> </ul>
Quality-related sub-goals	<ul style="list-style-type: none"> <li>• Improvement of the quality of products and services via the use of information that is contained in complaints</li> <li>• Avoidance of external failure costs</li> <li>• Avoidance of internal failure costs</li> </ul>
Productivity-related sub-goal	<ul style="list-style-type: none"> <li>• Efficient task fulfillment</li> </ul>

Figure 14. Goals of complain management. (Stauss and Seidel, 2019)

When thinking about customer relationship-related sub-goals important action is to try stabilizing endangered customer relationships by turning bad customer experience into positive ones. Doing this correctly leads to improved customer loyalty, thus securing sales and profits. Satisfying complaint handling will affect customer willingness to intensify purchases from the company. It will also raise the possibility that customers will start promoting the company through word-of-mouth communication, leading to more customer streams. Both reasons for complaint and complaint handling process will be discussed in word-of-mouth cases. Therefore this phenomenon can affect heavily on customers' behavior.(Stauss and Seidel, 2019)

When creating key performance indicators among complaints, the management aims to turn verbally formulated objects into measurable, concrete targets. This can be done by making indicators to affect economic targets positively. The main target of complaint management and setting up key performance indicators is to increase the profitability and competitiveness of the company. (Stauss and Seidel, 2019)

### 2.7.2 Net promoter score (NPS)

Kompella stated in 2019 that there is a linkage between customer satisfaction and the company's financial results. Therefore measuring customer satisfaction should be taken into account when leading a business. (Kompella, 2019) Reichheld mentioned in 2003 that the only way a company can grow is to enable its loyal customer to promote the company to others. (Reichheld, 2003)

Net Promoter Score (NPS) tells how committed customers are to promoting the company. It asks customers, "Would you recommend brand x to a friend or colleague" with a scale of 0-10. Responders are categorized based on their answers from 0 to 6 as detractors. Answers from 7 to 8 are categorized as passives. Those who answer 9 or 10 are considered promoters. The total score is net of percentages of each three groups. (Kompella, 2019)

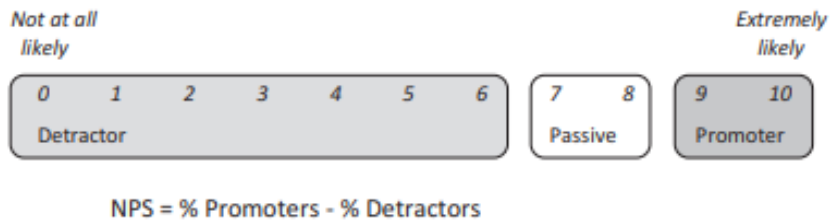


Figure 15. The Net Promoter Score scale. (Krol *et al.*, 2015)

$$NPS = \frac{\text{Number of Promoters} - \text{Number of detractors}}{\text{Number of total answers}}$$

The problem with NPS is still the quality of the data it is based on. It is extremely difficult to know the exact NPS score of the company because it would require every customer to answer. Also, another question is whether every answer should be weighted equally due to their different influence on business. (Kompella, 2019)

On the other hand, NPS represents the company's current status. When its limitations are considered, it is a great starting point for developing better customer satisfaction. (Kompella, 2019) Companies should especially consider the risk of detractors and avoid having them. (Reichheld, 2003)

### 2.7.3 Customer Effort Score (CES)

When developing the quality of service, it is important to understand whether there is a bottleneck in the processes. An effective way to improve service and increase customer satisfaction is to lower the effort that customer needs to put into the service. (Dixon, Freeman and Toman, 2010)

Customer Effort Score (CES) represents the effort that the customer. It starts by asking the customer, “How much effort did you personally have to put forth to handle your request?”. The answer is scored from 1 to 5, where 1 represents low effort and five high efforts. CES is best when used with operational measurements because it helps simplify processes. Dixon's study shows that 94% of customers who reported low effort would like to utilize the service again, and 88% are willing to use the service more frequently.

On the other hand, 81% of them who scored service as a high effort would speak negatively to others about their experiences. The customer effort score is better than the Net Promoter score because it directly measures customer experience. (Dixon, Freeman and Toman, 2010)

When setting up CES, it is important to evaluate the following guidelines.

1. Don't just resolve the current issue – head to the next one.
2. Arm reps to address the emotional side of customer interactions.
3. Minimize channel switching by increasing self-service channel “stickiness.”
4. Use feedback from disgruntled or struggling customers to reduce customer effort.
5. Empower the frontline to deliver a low-effort experience.

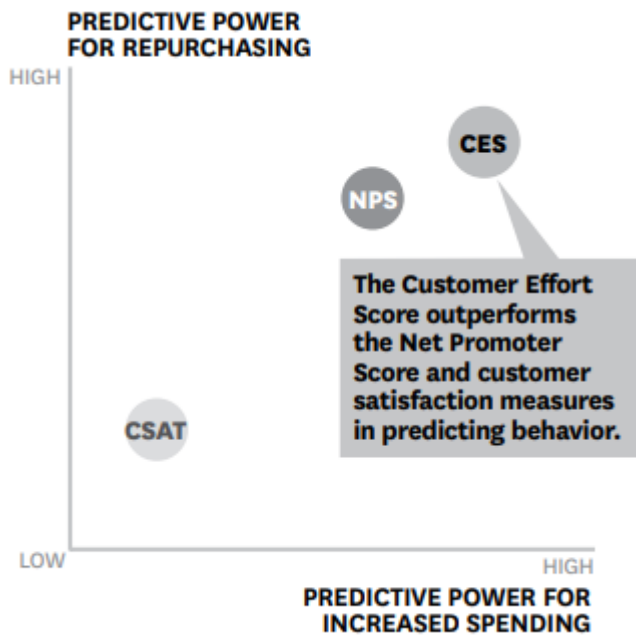


Figure 16. Customer Effort Score (Dixon, Freeman and Toman, 2010)

## 2.8 Summary of theory

The objective of the literature review was to gain knowledge and theory among subjects that will be utilized in methodology. The literature review starts with the theory regarding the value chain. To make metrics measure efficiently, it is necessary first to understand how the value of an activity is formulated to measure the right activity.

The main objective of this thesis is to formulate suggestions for metrics. Therefore, it is important first to understand how metrics should be built. To answer this question, the performance measurement indicator was covered. It built a theoretical framework on the difference between KRIs and KPIs and determined how strategic objectives can be turned into metrics.

The theory also covered value stream mapping. It will be used as a main theoretical framework in methodology when determining how each team will formulate added value. Therefore, it will provide information that will be utilized when detecting what actions should be measured.

The case company's product management unit controls its whole product portfolio, which is its main asset. To understand how value is formulated through the fleet, asset management as a part of fleet management was covered. Because the case company's main business is built around assets, fleet procurement was also part of the literature review to understand how product portfolios can be optimized.

When considering how the product management unit produces value, it is connected to the fleet. Therefore, also the optimization of fleet performance was covered. This information is needed to formulate metrics that support fleet performance optimization.

The product management unit also serves inner customers through processes. Therefore, it is vital to understand how internal customer service can be improved and measured. For this reason, the internal customer service process was covered through customer satisfaction, net promoter score, and customer effort score.



### 3 Methodology

The principle of the metrics proposal will concentrate on how each team should be led to maximize the added value they can provide through their actions to the company. The research will help contrast on the current state of the unit to detect how the unit creates added value. This will be done through value chain analysis and interviews. Data and results will be analyzed to learn how each team inside the product management unit creates value. This chapter research focuses on understanding the case company's product management unit and how the unit creates value throughout its actions. The value will be collected by utilizing value stream mapping, which will act as a baseline for creating key performance indicators for the product management unit. Therefore, it is all connected around the main research question "*How to form key performance and key result metrics for product management unit*". Data collection for value stream mapping is done through interviewing.

Interviewees for the study are the head of product management and the manager of support functions. Both interviewees are in managerial positions of different teams in the unit and therefore have perspectives on what is expected from teams. Interviews were done semi-structured, where the target was to keep the conversation within scope but not restrict views that affect the result.

### 3.1 Case Company

Case company operates in the construction machine rental equipment industry. The industry is very sales-oriented and product-centric. Because the company's main function is to rent out products, the product management unit is at the center of the company's operational environment. The main function of the product management unit is to enable sales department conditions where it is possible to make deals with customers. This includes setting the right price levels and adjusting product mix and quantities to meet customer demand. The product management unit is also responsible for ensuring that the company's fleet operates at the most profitable level possible and optimizing the total cost of ownership (TCO). This includes moving and coordinating the fleet in the right locations at the right time. The product management unit is also responsible for keeping the case company's ERP system running and sharing product-related knowledge throughout the company.

The company's total performance is measured through EBITDA. Also, the case company's strategy is built around four main components "*Always available*", "*Good quality products*", "*Never late delivery*," and "*Competitiveness*". By being "*Always available*," the target is to be within customers' reach at all time customer needs. On the other hand, "*Good quality products*" means having products that will not break during the customer's rental period. The strategy's third component, "*Never late delivery*," means that customers will receive needed machines when needed. The last strategy component, "*Competitiveness*," means that the company always tries to implement new product types into the product portfolio and stay ahead of the competition.

### 3.2 Product management unit functions

The product management unit can be divided into product portfolio development and support functions. Both units work close to products, and the product portfolio development unit is responsible for upper-level strategic planning and purchasing operations. On the other hand, support functions coordinate products into correct locations and ensure that the case

company's ERP system gives the sales organization the best possible tools to succeed and handle customer support.

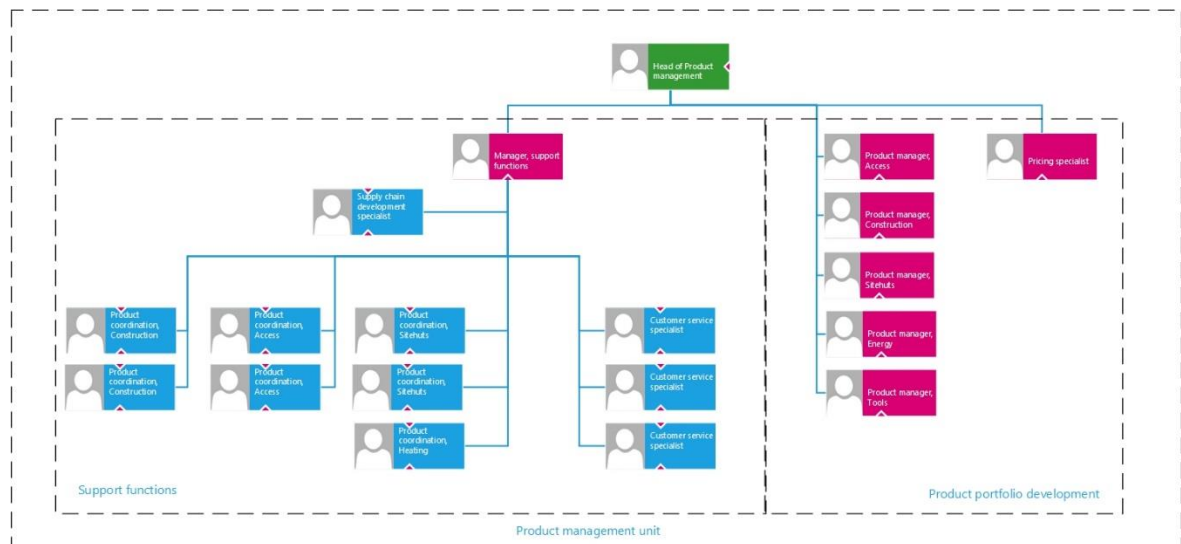


Figure 17. The organizational chart of the product management unit

Product portfolio development includes purchasing operations and product mix development functions. The case company's product portfolio is divided into five larger sections, each led by the field's product manager. The position is responsible for developing their product portfolio profitability by changing the fleet through product mix.

The product managers' daily tasks focus on analyzing the market's direction and taking advantage of momentum in market movement. Succeeding in this requires following rising trends that markets are representing and understanding the fundamental market changes. Those changes can occur through rival acquisitions, strategy changes, or changes in customer demand. The product manager is responsible for pricing items, so that item profitability meets the company's financial targets. Pricing is done with the help of a pricing specialist who keeps the company's pricing software running and solves pricing-related issues.

The product management unit also has support functions responsible for daily product-related operations regarding the order-delivery process from a product point of view. Support functions are run by a manager whose main responsibility is running the daily order-delivery process. Support functions can be divided into three major sections supply chain development, customer service support, and product coordination.

Supply chain development solves product flow-related issues and keeps inventory data updated. This includes developing existing material flows and enabling up-to-date data.

The customer service department is responsible for helping inner and outside organization customers. This includes solving ERP-related issues with inner customers. The customer department handles customer calls for outside organizations and solves product-related issues. This function is vital when considering customer engagement because, if possible, the problem can be solved on the spot, and a negative customer experience can be positive. This is a great way to gain customer loyalty in the long run.

The last department of support function is product coordination which consists of product coordinators. Their main task is to choose and identify the right machines for each order. Therefore, their input significantly impacted optimizing fleet flow and coordinating machines into locations where demand is predicted. When the product coordinator is notified about sales departments closing deals, they connect the machine to that deal. After the product coordinator has chosen a suitable machine, the order moves to the local depot, which will arrange transportation through a partner network and communicate the order situation straight to the customer.

### 3.3 Value stream mapping

By utilizing value stream mapping, the aim is to determine how each team in the product management unit creates value for the three most critical processes that product management units conduct. The approach for this chapter is to answer questions like “*What is value and how it can be form*” and “*How to track value chain through the organization*”. The product management unit has two different sections, product portfolio development function, and support functions, and therefore, these value stream mappings are done in two separate phases.

Processes under product portfolio development functions are mapped by interviewing the head of the product management unit. The most critical process of the function is the product portfolio development process, which is evaluated here. On the other hand, processes under support functions are mapped by interviews with the manager of support functions. When considering the total produced value, the most critical process of support functions is the product locating optimizing process, which is chosen for closer research.

#### 3.3.1 Product portfolio development process

The product portfolio development process is one of the most critical processes from the case company’s future financial performance perspective. The case company has roughly 1400 different products, and the company’s total performance strongly depends on whether the product portfolio answers to customer needs and the portfolio's financial performance. Fine-tuning product portfolios requires a constant understanding of market behaviors and following rising trends in the industry.

The product manager's main task is to develop product groups' profitability and ensure the company has products that meet market needs and demand. Therefore, position value generates by making the right choices in optimizing the product portfolio.

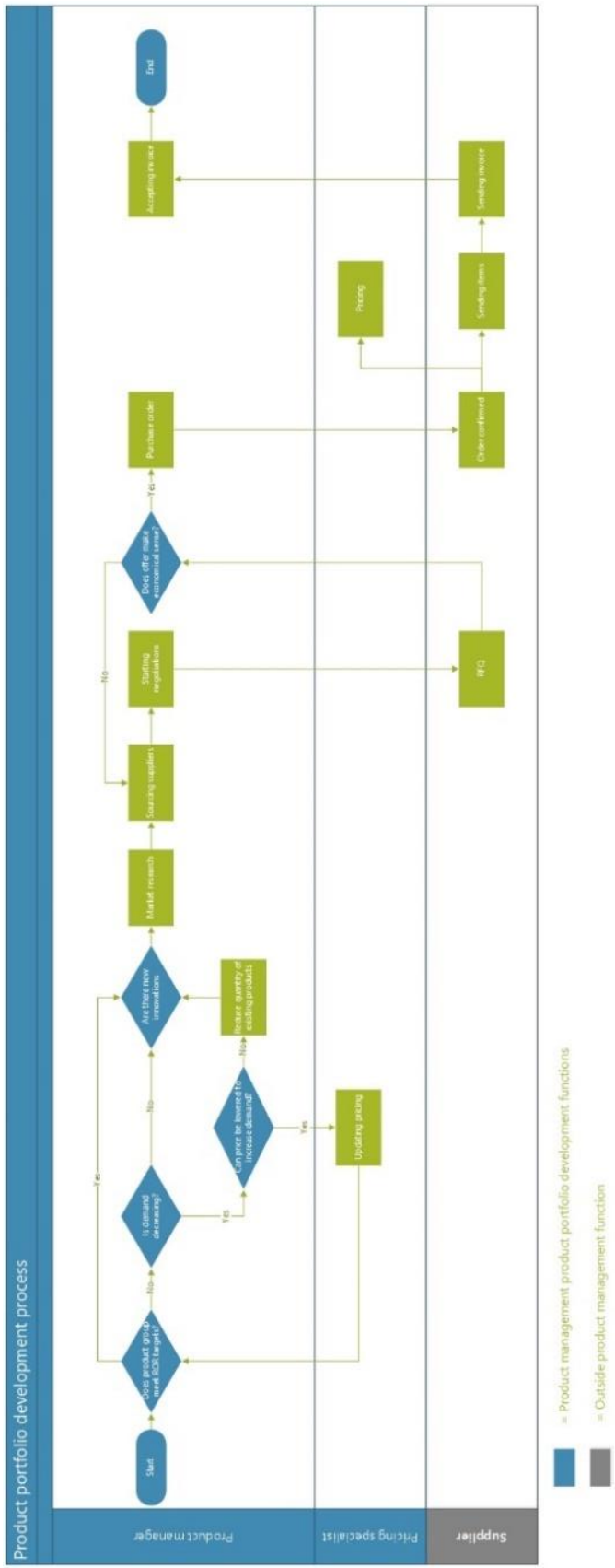


Figure 18. Product portfolio development process

The product portfolio development process asks, “Does the product group meet Rate of Return (ROR) targets?”. The product group can consist of multiple subgroups of 5 to 50 different types of products. Each product group has its own financial ROR targets, and the product manager brings targets down to the individual product level. If the individual product is meeting ROR targets, then the process moves into a section where the product manager finds out are there are innovations regarding the field of that product.

On the other hand, if ROR targets are not met next phase, ask, “Is demand decreasing?”. The question aims to determine if internal pricing changes should exist to meet better markets. If demand data shows that the time utilization of the product is high and is predicted to stay high, the process moves into a section where the product manager starts to seek innovations.

In cases where demand is decreasing, and there is a negative trend, the product manager asks, “Can the price be lowered to increase demand?”. It will be done if the price can be adjusted and the product remains profitable. The pricing specialist will update new product prices in the system and then move back to the question, “Does the product group meet ROR targets?”. If lowering prices makes a product profitable, the only doable action is the existing markets of that certain product. This means that the product manager decides to reduce the quantity of that certain product, and those are moved into the inventory of the used equipment sales department. When products are taken out of the fleet, it will reduce the total quantity of the fleet if that is not compensated. To avoid diminishing fleet quantity, the process also moves to the phase where the product manager asks, “Are there new innovations around?”.

In the case company’s industry where almost all competitors have the same products, following market trends is an extremely important way to gain a competitive advantage. Therefore, following new product innovations is always on the path of product portfolio development despite earlier process outcomes. This phase includes market research, where the product manager looks at markets to find out if there is any alternative solution to solve problems or if the current idea is the best way forward.

Initiative for market search can be product innovation, boosting the profitable existing market, or request from the customer side to the sales department on a certain product. The market research target is to decide what product is in the purchase scope. At this phase, the product manager also makes financial estimations of ROR percentage and time utilization.

Based on quantities and purchase prices product manager also forms a budget for the case. It also includes making longer-term estimations of how demand for certain product categories will look. This includes interviewing the sales department who interact proximity with the end user. It also requires comparing products against rising trends that will change the industry in the following years. If the product does not fit the future strategic picture well or the expected ROR is too low, the product manager moves to look at another potential product and conducts the same principles.

When a potential product for purchase is found, the process moves into finding a supplier. At this phase, it needs to be figured out if there is already a supplier for the existing product or if the product requires engineering from scratch. The product manager must find a manufacturing company willing to proceed with the idea if there is no supplier.

On the other hand, if the product already exists and there are potential suppliers process moves into supplier negotiations with them. It starts by contacting suppliers and asking for an offer for a certain product with certain delivery terms and conditions. Suppliers must meet the case company's supplier evaluation criteria and code of conduct. After a request for quotation (RFQ) is sent to suppliers, it is time to evaluate the answer, and the product manager asks, "Does the offer make economic sense?". The product must have enough safety margin to conduct unknown issues during market launch. It also needs to support the company's strategy, and total TCO needs to be considered when comparing offers from different suppliers.

If none of the received offers are at the wanted level, the process moves back to the sourcing suppliers' phase, and new alternative suppliers are contacted. In case of an accepted offer process moves into making a purchase order. At this phase, the product manager makes purchase orders through the purchase approval system, and after approval, the purchase confirmation is automatically sent to the supplier by the system.

When an order is sent, the product manager connects product information to the system and sets prices. The pricing specialist will update prices in the central system and ensure they align with contracts. After the supplier has sent items to the case company's central warehouse, the last step for the product manager is to accept the invoice for the received items and inform the organization about new products. The product development process is



now finished and continuing because the new product is affecting product group ROR performance, and it starts the whole process again.

### 3.3.2 Product location optimizing process

Product management unit support functions control product flow, which means they must ensure that the existing fleet is at the optimal location to fulfill customers' needs. The main process of product management units' support functions is the product location optimizing process, and the goal is to have the right amount of product at the right place and time.

The process starts with supply chain development specialist input to the organization by ensuring correct inventory data. Its data varies from the real situation, and there are products missing supply chain development specialist contacts on the operative fleet team to start researching a missing product. If inventory data is correct, the process moves to the product coordinator, who asks, "Is the product at the location where demand is most probable?". When products are at a location where demand is not probable, the product coordinator sends the operative fleet team request to order transportation to another better location. Target is to enable better customer service quality when products are where customers most probably ask them.

The process starts with the customer first contacting sales or the customer service specialist and asking if the case company has a product to fulfill customer needs. This first contact is also registered to the Customer Relationship Management system (CRM), and a customer identification number is opened. The customer service specialist connects the customer to the sales department unit, and they start negotiations with the customer. The sales department unit tries to agree on frame agreements with customers. If the customer does not agree to the terms, negotiations are over. When terms are agreed upon, a customer service specialist will connect the contract to the customer.

When a customer orders a product from the sales department, it moves to the product coordinator. In this phase, the product coordinator asks, "Are there enough products available?". If there are enough machines to fulfill the order product coordinator will connect the machines to the order. In cases where there are not enough available products, the process moves to the operative fleet team, who will be asked, "Can repair of machines be

prioritized?”. If prioritizing repair will solve the problem, the product coordinator will connect the machine to the order after it is repaired. There are still cases where it takes a long time to receive spare parts, and repairing broken machines is not an option. In this case, the product coordinator arranges alternative machines from partner companies and connects that machine to the order.

After connecting the machine to the order process, the operative fleet team is responsible for arranging product transportation and communicating their status to the customer. The product location optimizing process ends in this phase. When multiple machines are transported to the customer, supply chain development specialists check the inventory status, and the process starts again. The optimal location for each product varies constantly, and therefore process needs constant development.

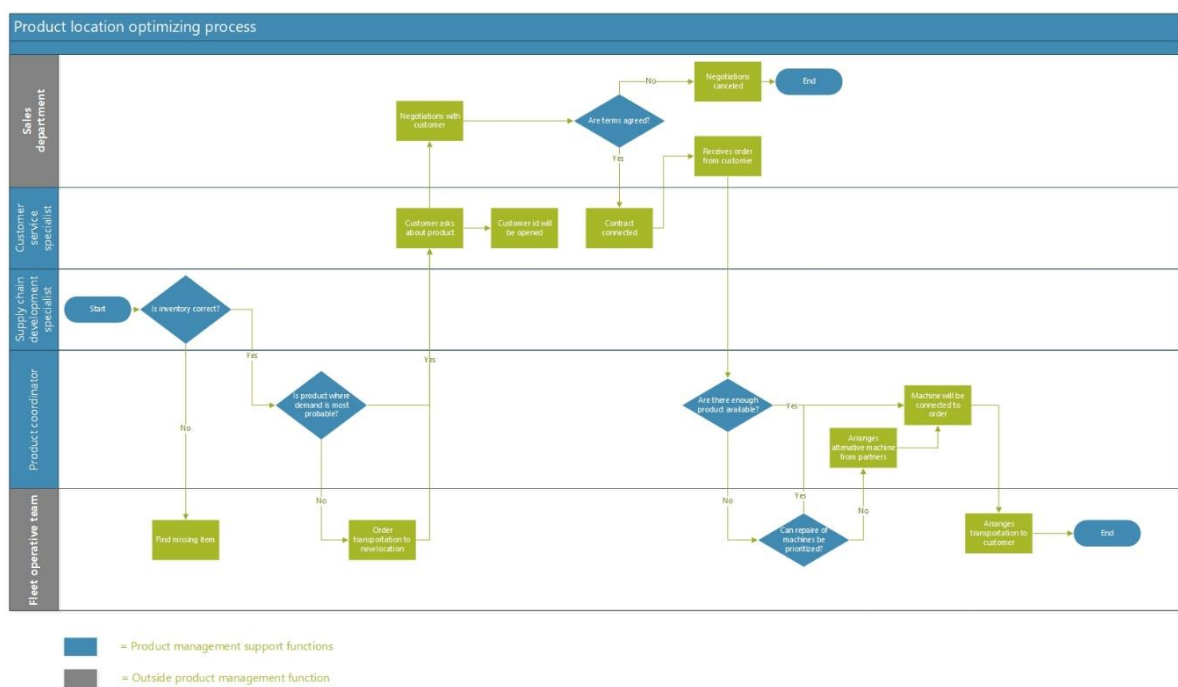


Figure 19. Product location optimizing the process.

## 4 Value analysis

This chapter aims to emphasize how each position forms value. Therefore, the chapter aims to answer the *“How to track value chain through organization”*. Cudney mentioned in 2018 that value formation could be optimized by reducing seven classical wastes. These classical wastes are overproduction, transportation, inventory, overprocessing, waiting, motion, and defects. (Cudney, 2018) Analyzing how each position reduces those in the product portfolio development process and product location optimizing process value can be added.

### 4.1 Value creation on product portfolio development process

The main target of the product portfolio development process is to optimize product groups' profitability as high as possible. To make it happen, a product mix must be built to attract demand and support profitability. There needs to be the right balance of products that customer needs and have low profitability and products with high profitability but need to have a certain volume first to be utilized.

#### 4.1.1 Product Manager

The main value of product manager input comes from the effect of decisions, especially whether they can make the company's product portfolio support growth. The main value of their work comes from effective portfolio management, which means optimizing the rate of return-on-investment capital. There are also other dimensions of how a product manager can provide value, and the seven classical forms of waste are a great tool to examine it. Thinking about the challenge through the first of seven classical wastes is considered overproduction.

In classical waste, overproduction means producing more than immediate internal or external customer needs. (Ohno, 1978) This means that features on a product bring only value to customers if they perceive the need in the same way. All excess information produced that the customer is not needing is categorized as waste. In the context of the case company, this can be turned into the statement *“Excess features in a product which customer is not using”*. The borderline between innovation and excess features is slim, and it all tight

down to can those features be communicated to the customer so that they perceive added value from them.

Ohno mentioned in 1978 internal transportation was a part of the classical waste. When considering the product portfolio development process, internal transportation can be formulated when the product needs to be repaired in a specific location. The case company has locations around the country, so when a product must be transported away from one depot to another, excess waste is formulated. The product manager can minimize this waste by centralizing the product portfolio into fewer brands and models. This enables the depot to learn how to repair machines when the same situations occur more often and results are more standardized.

The third dimension of seven classical wastes is excess inventory. Because the case company's main function is to rent out machines sentence can be turned into "Is the products time utilization rate at a level where the external customer is always served, but there are no extra products on warehouse shelves." Therefore, optimizing the product portfolio to meet exact customer demand can be done by following time utilization and adjusting the quantity to meet the wanted level.

Ohno mentioned in 1978 overprocessing is a form of waste, and it means a bad product or tool that causes excess work to the organization that could have been avoided. In the context of the case company, the product manager can affect this dimension by buying simple, reliable products that do not demand any specific added knowledge from the rest of the organization. It is also connected to favoring brands that are well known for their quality products and has a local support network available in case of issues.

Waiting is also considered a type of classical waste. How this can show in the daily product actions of a product manager is utilizing suppliers with short delivery times. When a purchasing object can be put faster into generating revenue effect of compound interest can be utilized. Waiting can also occur if objects need to be locally equipped, which causes makes products' total delivery time longer. Each time spent waiting will have alternative costs with short-term and long-term impacts.

The sixth dimension of waste is motion which means unnecessary actions needed to do other actions. In the case of the product manager, these actions occur when the product arrives from the factory, but it is not suitable for local markets without equipping. Usually,

equipping needs sending machines to a local dealer. This causes unnecessary actions when products arrive at the central warehouse just to be determined that they must be sent to the local dealer.

The last element of classical waste is defective, resulting in bad quality that can only be solved through additional work. When considering product managers' positions, they affect their product portfolio's content by deciding what to purchase. Bad quality generates unusable inventory and a negative customer experience. Unusable inventory creates additional maintenance work for the whole organization, and because it is solely internal work, it generates waste.

#### 4.1.2 Pricing Specialist

The pricing specialist is responsible for product pricing and inputting customers' contracts into the system. Therefore, position plays an important role in getting the best possible price from the products and ensuring that each customer gets the price they agreed on. There are two sources of main value that position creates. Profitability increases when products are priced at the highest amount possible, and customer satisfaction increases when there are no complaints regarding wrong prices. Still, it is possible to develop every position; therefore, it is good to evaluate how the theory of classical waste reflects on the actions of this position.

Overproduction is present if more is produced than internal or external customer needs. The pricing specialist is responsible for the company's pricing methods, which can be complicated. Therefore, pricing units can be minimized at just the level each customer needs to create value by simplifying the process. The position is also responsible for developing a pricing system that salespeople utilize when negotiating with external customers. Therefore, the position can gain value by ensuring that the system works efficiently and contains only the information that salespeople need to avoid excess work caused by complications.

The second type of classical waste is considered transportation. This dimension is present when salespeople need to manually convert their old price list into new updated versions, which creates internal data to be transferred manually from one location to another.

The position of pricing specialist also affects the sixth element of waste, considered motion. Increasing the overall price at a minimum rate higher than inflation can reduce each salesperson's overlapping efforts to increase pricing individually. Therefore, pricing specialists can reduce waste by changing prices in mass.

## 4.2 Value creation on product location optimizing process

The product location optimizing process aims to have the right product at the right time and place. This ensures supply meets demand which improves the overall utilization of the fleet. The case company's main function is to rent out products. Therefore, a higher utilization rate means less waste, reflecting higher profits and a more optimal fleet structure. For these reasons, optimizing the process brings value when the product's location is optimized correctly.

### 4.2.1 Product coordinator

The product coordinator brings value by enabling perfect circumstances for the sales department to succeed in closing deals from a product point of view. This means they can connect the right machine to order to fulfill customer needs. Case company's geographical market goes across the whole nation, so decisions on which machines will be connected to order will greatly affect transportation costs. Also, efficiently connecting the existing fleet to suitable locations will lower the time needed for transportation. Customers only pay for the time they have machines at their location, so choosing machines from favorable locations will increase the utilization of the whole fleet. This will affect the total profitability of the machine by generating more revenue faster.

Considering product coordinators' position from seven classical waste points of view, the first – overproduction is present if more information is produced to internal customers than is needed. The product coordinator decides which machines go to each customer's order. If customer orders fulfilling reasons for each machine are reasoned to each salesperson, unneeded information is produced, which will not generate added revenue.

Internal transportation generates waste. Optimizing several internal transportations by always choosing the closest machine to the customer is possible in the product coordinator's position. Choosing a closed machine also adds value to end customers because it shorter delivery time and enables them to conduct work faster. This is only possible through effectively controlling inbound and outbound fleet.

The product coordinator can also make the fleet rotate more effectively by adjusting the right service times between orders and choosing the right machine for each order. This lowers unusable inventory, which is also part of the seven classical wastes.

When considering product coordinators' input on the product location optimizing process, their output should only contain information on which machine is chosen. Therefore, the product coordinator can reduce a fourth of seven classical wastes by not overprocessing information and delivering only necessary information.

The success of the product location optimizing process can only be measured through waiting time. Waiting is also part of seven classical wastes; reducing it causes added value. The less time machine waits to deliver to the next customer, the higher the total utilization will be. This also converts to choosing orders with long rental periods over short-term rentals because each order contains two-way transportation, which will take time by will not bring any profits. After each order machine's condition must be checked by another user, which causes internal work, part of the sixth element of seven classical wastes. Therefore, there is a balance between waiting and optimizing order length to produce maximum added value.

As a part of the product location optimizing process, the product coordinator needs to push the organization to accomplish internal between-rental checks faster and prioritize non-vital repairs at the most suitable time. This cannot still affect the quality of repairs and between rental checks because it will cause defects which are also part of the seven elements of waste. To ensure that the product location optimizing process also supports minimizing defects, repair request soon after delivery needs to be measured.

#### 4.2.2 Customer service specialist

When considering the product location optimizing process, the customer service specialist is very important in how the process looks outside the organization. Customer service specialists can be the first contact with what customers have about the company. Therefore, fulfilling customers' expectations in the first place will reflect how the rest of the customer experience is formulated.

The principles of the seven classical waste can also be utilized when analyzing how position can add more value to the overall process. When a customer contacts a customer service specialist, a customer usually already has a task that must be solved. The customer might request the recommendation of the machine for a specific task or wants to do business with the company. When looking at the problem through seven classical wastes in a customer service specialist position, it is prominent to exceed customers' expectations while not making any overproduction. In this context, it means delivering only needed information to the customer in the simplest possible form. If a customer asks for a machine recommendation, going into very detailed technical capabilities is usually unnecessary.

A customer service specialist can also help optimize inventory by recommending machines that would otherwise be unused. This also supports the overall product location optimizing process because customer service specialists can steer demand in the wanted direction through customer interaction.

Fluent customer experience can be turned into a competitive advantage by affecting the emotional level of customer decision-making. Therefore, customer service specialists can improve the overall experience if customers get answers to questions. Suppose a customer requests information about the machine. In that case, the customer service specialist can exceed the customer's expectation if it is possible to close the request by reserving that machine for the customer. This will also add value to the seven classical waste model because it will lower waiting time and reduce motion when the customer does not need to call another person to make a reservation.



### 4.2.3 Supply chain specialist

The supply chain specialist is responsible for having inventory data correct. When considering adding value from the product location optimizing process, having correct data is fundamental to everything beyond the process.

From the seven classical wastes point of view, it affects every seven dimensions. Data needs to be coherent and only contain needed information to ensure it serves its needs. Incorrect quantity data causes the need for internal transportation when the fleet needs to be moved from one location to another to serve customers. It also reflects on long waiting times due to unnecessary transportation and causes unnecessary work to the rest of the organization, which can be detected as motion. Therefore, supply chain specialists add value to the whole process when the data is right and can be trusted.

## 5 Developing key metrics for product management unit

This chapter's main target is understanding what should be measured to gain optimal performance for case organizations. This chapter aims to answer the main resource question “*How to form key performance and key result metrics for product management unit*”. In this chapter, each team of the product management unit will receive a proposal of its performance metrics.

### 5.1 Defining targets for measuring

Metrics should consider both socio-economical perspectives and financial perspectives. For this reason, metrics are built around product management units' main processes: product portfolio development process and product location optimizing the process. Therefore, metrics are built for each position from these perspectives. In every position, numerous necessary tasks are included in daily work, which is not part of those two main processes. But still, most added value is brought through these two processes; therefore main focus should be kept on these.

### 5.2 How metrics will be used

Metrics will be implemented as a part of the leading product management unit. This will ensure that the whole unit has a common direction and is steered into bringing possible added value to the company. The product management unit is vital to the whole company's value creation, and therefore ensuring units are effectively working should reflect the whole company's ability to perform.

The head of the unit will set quarterly targets for each position, and their performance will be evaluated every two weeks in one-to-one meetings held by each unit's supervisor. If

metrics are not developing in the desired direction, then corrective actions should be taken into account to detect the main reason for fluctuations. The idea is to detect underlying reasons in processes to make them perform better.

### 5.3 Metrics to sub-units

Each sub-unit will have its metrics to measure its performance. To consider financial and non-financial factors, each position will have its own KRIs and KPIs to reflect on both sides. Parmenter mentioned in 2015 that the number of metrics needs to be minimized when designing metrics for teams. There are only 10 KRIs, 80 PIs, and 10 KPIs at the company level. (Parmenter, 2015) For this reason, the number of metrics must be as minimum as possible.

#### 5.3.1 Product manager

When considering product managers' contribution to the company's overall performance and product portfolio development process, it all comes down to maximizing return on invested capital. Still, dividing critical success factors into financial and non-financial related ones is important.

From a financial point of view, each product manager is responsible for the profits accumulation of their product portfolio. Therefore, it is reasonable to measure how much profit they can generate with limited investment. To get the best possible outcome in investment planning, the NPV should be used. The problem is that the case company operates in a highly changing environment, and therefore accurate NPV model is impossible to build. For this reason, the best outcome comes from simplifying; therefore ROR of the product group will be their main financial measurement.

$$\text{Rate of return (ROR)} = \frac{C_1 - C_0}{C_0}$$

$C_1$             R12 revenue

$C_0$             Purchase price of a machine

Also, product utilization reflects on customer demand and is closely connected with ROR. When utilization is high, it means that the fleet is inefficient usage and represents that demand is covered. Also, the easiest way to improve ROR is to improve utilization which causes fewer lost rental days, reflecting higher revenue. Utilization through the capacity of the product group is also one metric that will be followed.

$$\text{Utilization} = \frac{a}{s} (100\%)$$

U = Utilization

$a$  = Actual output rate

$s$  = Capacity

To meet annual profit targets, getting invested in products as fast as possible is extremely important to enable them to generate revenue. As the year progresses, there are fewer days to generate revenue, making receiving great annual ROR figures on new products harder. Also, the faster the product generates revenue, the greater the effect of compound interest, which results in higher investment possibilities and greater returns. The revenue of product groups' current-year manufactured products will be measured to enable the fastest possible time to turn invested capital into profits through purchased products. This encourages boosting sales on new products, and if new products contain some features which will change markets, there is motivation to ensure that each salesperson is aware of them.

$$\text{Yield of new invested products} = \frac{y}{365i} (100\%) = \frac{y}{365i} (100\%)$$

$y$  = total revenue of products manufactured in the current year at the product group

$i$  = annual investment budget of the product group

Successful launch of new products is important because if a launch fails, all other previous steps that have been done regarding the product become useless. One of the key features of a successful launch is to have an internal organization known for its existence and main features. To keep extra attention on this side, it is also notable for measuring how many internal posts product managers have posted from their products to the companywide intranet.

The metric to measure that side will be,

$$\text{Internal posts percentage from products} = \frac{k}{h} (100\%)$$

$k$  = number of posts to internal intranet

$h$  = number of items in product group

Ohno stated that motion is a type of waste that forms from internal work. In the case company, internal work is formed each time a product needs to be repaired. It also makes the product unable to bring revenue, lowering total profitability. Time spent on repair can be lowered each time when there are fewer different items and brands to ensure experience caused by repetition on maintenance people. Also, better overall quality of products lowers the probability of being in usable condition because of maintenance needs. For these reasons, it is viable to follow a number of different items divided by a number of brands representing the fleet's coherency. A good thing to consider is that item consists of multiple different units of products.

$$\text{Coherency of fleet} = \frac{h}{b}$$

$h$  = number of items in product group

$b$  = number of brands in the product group

The case company operates in an industry where competitive advantage is based on products and rivals can soon copy those products into their portfolio. For this reason, it is important to constantly keep bringing new products to a portfolio to stay ahead of the competition because product managers can affect this dimension through their actions constant innovation needs to be kept going.

This will be measured by following the number of new product launches quarterly. In the context of the case company, this means a number of totally new products brought to the portfolio. It can be a new product type or an updated model from an existing one. The idea is to concentrate on three months ahead in the future to keep the current state of innovation rolling. Some innovations may take quite a long time to formulate, so they should be based on rolling 12-month figures. Therefore, metrics for innovation can be announced in the following formula,

$$\text{Number of future innovations per quartal} = \frac{d}{4}$$

$d$  = number of innovations R12

Another metric that needs to be followed is lost revenue by time in repair, transportation, and between rental checks. This can be calculated by calculating the average daily revenue of an individual product and multiplying it by the probability of not being in rental condition. When this is multiplied by the utilization rate of the product, the result represents the demand factor as in real life scenario.

$$\text{Lost daily revenue per product} = \frac{C}{365} * \frac{e}{n} * U = \frac{CeU}{365n^2}$$

$C$  = R12 revenue of product group

$n$  = average number of products in product group

$e$  = number of products is not rental condition product group

$U$  = utilization of the product

When product managers' metrics are divided into financial and non-financial metrics, they can be categorized into KRIs and KPIs.

KRIs	KPIs
Rate of return	Internal posts percentage from products
Utilization	Coherency of fleet
The yield of newly invested products	Number of future innovations by quartal
Lost daily revenue per product	

Table 1. Product managers suggested metrics by product group.

### 5.3.2 Pricing specialist

When considering the pricing specialist position, the main function is to enable the sales department system environment to succeed. Along with this, the target of pricing specialists must also ensure that the overall price level develops in the direction stated by the company strategy. Therefore product group price index development represents the direction of current development and will be part of the metrics.

$$\text{Product groups price index development} = \frac{j_1 - j_0}{j_0}$$

$j_1$  = Price index current month

$j_0$  = Price index last month

The pricing specialist is also responsible for updating and developing the company's pricing software. Target is to make software as optimized for daily usage as possible. Still, the software contains a lot of different information from different databases. Therefore, the execution time of software should be measured, and the target is to lower the total execution time.

$$\text{Improvement of code execution time} = \frac{z_1 - z_0}{z_0}$$

$z_1$  = Recent code execution time

$z_0$  = Original code execution time

Position's purpose is also to serve inner customers; therefore, it is reasonable to measure how effectively inner customers are served. From a customer perspective, CES represents a platform for improvement by asking, “How much effort did you have to put forth to handle your request”. The aim is to simplify processes; therefore, CES helps detect bottlenecks that can be improved.

KRIs	KPIs
Product group's price index development	Improvement of code execution time
	Customer effort score

Table 2. Suggested metrics for pricing specialists.

### 5.3.3 Product coordinator

The position of product coordinator is vital for optimizing fleet location and overall utilization rate. There are still many variables that the product coordinator cannot affect, which still influences the utilization rate. These are the seasonality of product demand, overall economic cycle, sales departments' input on making deals with customers, and total fleet quantity.

Because of seasonality, current utilization cannot be compared to the previous month. To ensure the data is comparable from the seasonality side, it must be compared to the same time period from the past. Still, there need to be considering variable caused by the economic cycle. We can assume that by comparing the current situation to the average from two previous years at exactly the same time, it is possible to reduce fluctuation caused by the economic cycle significantly. Also, the product coordinator can affect the sales department's input by delivering information to the product manager, who will push the sales department. For these reasons, the product coordinator's main KRI metric will be the following formula,



$$\text{Product groups utilization change} = \frac{U_0}{\frac{(U_1 + U_2)}{2}} = \frac{2U_0}{U_1 + U_2}$$

$U_0$  = Actual output rate two years before

$U_1$  = Actual output rate one year before

$U_2$  = Actual output rate current month

Product coordinators can also produce value by making order processing as fast as possible to maximize internal information flow. Therefore, average order processing time efficiency should be measured. Average order processing time is highly dependent on the total utilization rate of the product group because if sales go down, it also affects the total number of orders. Therefore, it should be compared against other product groups to move resources to help more hectic product groups to get better overall service speed.

$$\text{Average order processing time} = \frac{V * T}{W}$$

$V$  = Total hours of order processing time in a month

$T$  = FTE on product group

$W$  = Number of orders in a month

In the case company, every product must be checked between rentals, creating internal work, a form of seven classical wastes. Product coordinators can help prioritize orders with longer rentals, reducing the amount between rental checks and transportation. Therefore, it should be measured how many percentages of the fleet are over 90 days in rental status, which is considered a long rental period. The higher the percentage, is less internal work it produces.

$$\text{Percentage of fleet over 90 days rental status} = \frac{f}{s}$$

$f$  = Number of over 90 days in rental status current month

$s$  = Capacity current month

The product coordinator also serves internal customers, and therefore the quality of service should be measured. The aim is to make internal customers part of the process as smooth as possible; therefore, CES is a great tool for this target. It will be done by asking, “How much effort did you personally have to put forth to handle your request”.

KRIs	KPIs
Product group utilization change	Customer effort score
Average order processing time	
Percentage of the fleet over 90 days in the rental status	

Table 3. Suggested metrics for product coordinator.

### 5.3.4 Customer service specialist

When considering the customer service specialist position, they are responsible for answering customers' machine requests and running the company's ERP system.

Therefore, they can bring the most value when solving internal and external customers' problems quickly and effortlessly. Internal customer cases can sometimes be very difficult to solve. Therefore the most important factor is whether the customer gets the answer to the problem, which will be measured through the customer effort score. In the case of an external customer, service speed is a key factor in keeping the customer happy. For this reason, external customer service is measured by the average waiting time before answering.

$$\text{Average waiting time} = \frac{x}{t}$$

$x$  = Total waiting time per month

$t$  = Total number of calls per month

Customer service specialists can also bring value by recommending machines with low utilization rates. For this reason, measuring the total impact of steering customers into these products is reasonable. The impact can be measured by determining how many fleet percentages are considered in over 30 days in available status.

$$\text{Percentage of fleet over 30 days in available status} = \frac{q}{s}$$

$q$  = Number of over 30 days in available status current month

$s$  = Capacity current month

KRIs	KPIs
Average waiting time	Percentage of the fleet over 30 days in available status

Table 4. Suggested metrics for customer service specialists.

### 5.3.5 Supply chain specialist

The supply chain specialist keeps the fleet's inventory and product data updated. When considering how position brings value to everything in case the company is dependent on correct quantity data. Therefore, if supply chain specialists can reduce the number of lost items in inventory by making sure depots make data coherent, added value is produced. For this reason, position will be measured by the total value of the lost fleet, and the total value of the lost will be converted to today's purchase prices.

$$\text{Value of lost inventory in purchase prices} = \sum_{i=1}^m (r_i g_i)$$

$r$  = type

$g$  = purchase price of new product

$m$  = number of lost products

The supply chain specialist is also responsible for updating product data and certificates. For this reason, it is reasonable to measure the percentage of products with the right product data against all products.

$$\text{Percentage of fleet with correct product data} = \frac{p}{\beta}$$

$p$  = number of items with correct product data

$\beta$  = number of all items

KRIs	KPIs
Value of lost inventory in purchase prices	Products with correct data

Table 5. Suggested metrics for supply service specialists.

## 5.4 Whole product management unit's metrics

Product management unit's metrics should be built so that they do not have controversial effects on each other. Metrics should be built so that each team has a clear direction for improving the case company's main target: improving EBITDA.

### 5.4.1 Manager, Support functions

Because the manager of support functions is in charge of the product management unit's support functions, it is reasonable that the result of different teams will measure of manager. This enables them to have the same goal of succeeding.

One of the main functions of support functions is to optimize product groups utilization rate in a way that is always better than a year before. Therefore, product groups utilization change will be one of the main KRIs of the manager. Also, the feeling of external customers' first seconds is extremely important because they will impact the company's performance later. For this reason, the average waiting time is also considered one of KRIs. Also, each lost item is a lost resource away from the company's main way of generating profits. Therefore, the value of lost inventory in purchase prices is considered one of the metrics. It is important to divide workload evenly inside teams; therefore, the average order processing time is considered RIs. It is RI and not KRIs because it will not directly impact EBITDA but will affect service quality, which will later reflect that.

The support function should also be led in metrics focusing on future performance rather than the current situation because it is possible to steer the current situation by reacting to future indicators. Therefore, as manager, KPIs will be considered the percentage of the fleet over 90 days of rental status. It aims to favor long-term rentals because those will affect the rest of the organization, enabling other organizations to handle larger fleet sizes without expanding the number of FTEs with the same phase. Fleet should always be where it meets the demand to optimize profit generation. Therefore, how many percent of the fleet has been in the wrong location at the warehouse for over 30 days should be measured.

When thinking about the direct EBITDA impact of internal customer effort score, it will not directly correlate with EBITDA generation. The direction of the customer effort score will show the internal customer service quality trend. Eventually, it will reflect on the service quality provided to external customers and impact EBITDA. For these reasons, it should be considered as PIs. The percentage of the fleet with correct product data goes into the same category: it will not have a direct impact but have correct data effects on the whole organization's input and service quality. For this reason, it is also included in metrics that evaluate the success of whole support functions.

KRIs	RIs	KPIs	PIs
Product group utilization change	Average order processing time	Percentage of the fleet over 90 days rental status	Customer effort score
Average waiting time		Percentage of the fleet over 30 days in available status	Percentage of the fleet with correct product data
Value of lost inventory in purchase prices			

Table 6. Suggested metrics for the manager of support services.

#### 5.4.2 Head of Product management

When considering the total effect of a product management unit on the case company's performance, it can create opportunities or issues through the right choices. Therefore, leading units to maximize profit generation at the highest possible level is extremely important to have enough margin between targets and outcomes.

The main way of ensuring profit generation is progressing in the wanted direction is to monitor the rate of return on products. This main metric is affected by each action of the whole company and does not consider operating variable costs, which are related to operative management. Because operative management of depots is out of product management units, the scope rate of return is the perfect metric to measure success. Therefore, it is considered the main KRIs for the head of product management. Product utilization can help detect demand levels and optimize the fleet size and profitability to meet demand. Utilization level also affects return rate, but it should still be considered one of the metrics to ensure the right weighting in each product group.

The case company also has yearly targets built around a fleet investment budget. Because the company is evaluated by calendar year performance, it greatly impacts how successfully the investment budget is turned into products. The faster it happens lower, the total rate of return needs to be on the remaining year to meet the budget. Therefore, the yield of newly invested products should also be considered one of the main KRIs.

The indication of lost revenue represents how successful product groups go to customers. Therefore, it shows the total quality of investments where products are easy enough to use, not to generate internal work. This type of work can occur when the built quality of products is bad and require maintenance. It also occurs if products are so complex that their repair and rental checks are not possible in each location which causes waste. This has a direct impact on EBITDA because lost revenue is missed opportunity.

The product management unit provides value by optimizing fleet location and developing a product portfolio. Therefore, product management units' operative performance should be included in the Head of Product management metrics. For this reason, RIs are considered

the average order processing time, average waiting time, and value of lost inventory in purchase prices. All of these are included in the manager of support functions metrics who will take ownership of them; therefore, they are RIs and not KRIs.

The level of innovation will impact gaining a competitive advantage over competitors. Still, detecting new rising innovations is slow and will not directly impact EBITDA. By the time, they will still have huge positive potential to succeed if the quantity of new products is larger enough. Therefore, the level of innovations needs to be kept at a steady, continuous level to ensure that the stream of new products will stay constant. For this reason, a number of future innovations per quartal should be included in Head of Product management metrics.

Also, the price index's direction will directly impact current performance and reflect the general trend of product group market development. For this reason, it should be considered more as a future indicator of whether the product group has the potential to beat inflation if it is invested today. Heavy competition in one product group can turn top performer product group into not worth investing class, but an indication can be detected earlier.

The simpler the fleet structure, the easier it is for the rest of the organization to learn products, which correlates with the capability to sell and maintain products. Under this same category also goes internal posts percentage from products, supporting the organization's capabilities to learn from products. Therefore, these will have a future impact on generating a better rate of return, and for this reason, they are considered PIs.

The product management unit also affects the service level of the whole sales department by keeping the pricing tool updated and running. For this reason, making that tool work as fast as possible generates better customer service quality. In the long term, customer service quality will become a competitive advantage. Therefore, improving pricing tool code execution time is also one of the PIs of the Head of Product management.



KRIs	RIs	KPIs	PIs
Rate of return	Average order processing time	Number of future innovations per quartal	Coherency of fleet
Utilization	Average waiting time	Product group's price index development	Internal posts percentage from products
The yield of new invested products	Value of lost inventory in purchase prices		Improvement of code execution time
Lost daily revenue per product			

Table 7. Suggested metrics for Head of Product management.

## 6 Discussion

The main research question was “*How to form key performance and key result metrics for product management unit*”. Also, the scope of the thesis was to create a proposal of metrics to measure the performance of the product management unit in a way that supports value creation. A suitable tool for analyzing how metrics correlate with the company’s strategic goals is to utilize the Hoshin Kanri matrix. In a matrix, there are two kinds of correlations between things, direct and strong. Direct relationship means that improving one correlates directly with counterpart.

On the other hand, a strong relationship means that improving one influences the other but is not directly detectable. For this reason, it is notable to analyze the suitability of the product management unit’s metrics against the case company’s strategic goals, as seen in Figure 20. Case company’s strategy is built around four main components “*Always available*”, “*Good quality products*”, “*Never late delivery,*” and “*Competitiveness*”.

Strategic goals			
Always available	○	○	
Good quality products	○	○	
Never late delivery	○	○	
Competitiveness	○	○	○
	99% of orders delivered successfully	Improve financial performance to exceed EBITDA target	Improve amount of innovation
Product group utilization change	●	○	
Average waiting time	○	●	
Value of lost inventory in purchase prices	●	○	
Average order processing time	○	○	
Percentage of fleet over 90 days rental status	●	●	
Percentage of fleet over 30 days in available status	●	○	
Customer effort score	○	●	
Percentage of fleet with correct product data	○	●	
Rate of return	●	○	●
Lost daily revenue	●	○	
Utilization	●	○	
Yield of new invested products	●	○	
Number of future innovations per quartal	●	●	○
Product groups price index development	●	○	
Coherency of fleet	○	●	
Internal posts percentage from products	●	●	○
Improvement of code execution time	●	●	
Head of Product management	○	○	○
Manager support functions	○	○	
Product manager	○	○	○
Product coordinator	○	○	
Pricing specialist	●	○	
Customer service specialist	○	○	
Supply chain specialist	●	○	

- Direct relationship
- Strong relationship

Figure 20. Hoshin Kanri matrix from product management unit's metrics.

When case company's top-line strategic targets of *"Always available"*, *"Good quality products"*, *"Never late delivery"* and *"Competitiveness"* are brought one step down into product management units core objectives, they turn into: *"99% of orders delivered successfully"*, *"Improve financial performance to exceed EBITDA target"*, *"Improve amount of innovation"*. The first core objectives directly relate to the company's all four strategic components. Third, an *"Improved amount of innovation"* is also directly correlated with competitiveness because new products are a way to develop a competitive advantage.

Based on Hoshin Kanri, after comparing the correlation of strategic goals to core objectives, it is time to compare the correlation between core objectives and metrics. The first of the metrics is *"Product group utilization change"*. Metric aims to detect how made actions improve utilization without the effect of market changes. Therefore, it strongly correlates with *"99% of orders delivered successfully"* because better the utilization, more deliveries have been made to customers. It also correlates directly with *"Improve financial performance to exceed EBITDA target"* because the better the utilization, the more revenue it generates and decreases lost potential on investment.

The metric *"Average waiting time"* reflects the total time that the customer is forced to wait before answering. It directly relates to *"99% of orders delivered successfully"*. The reason is that higher less time a customer needs to wait, the higher probability of customer engagement is, and the customer will make an order. Ordering is the minimum requirement to make successful delivery happen in the first place. Also, if the customer is pleased with the service quality, it can be steered into a product that would otherwise have low utilization. Therefore, the metric strongly relates to the core objective of *"Improve financial performance to exceed EBITDA target"*.

One of the product management unit's metrics is the *"Value of lost inventory in purchase prices"*. It measures how much capital it would require to neutralize the negative impact of lost inventory. For this reason, it directly correlates with the core objective *"Improve financial performance to exceed EBITDA target"*. Each amount of capital needed to fill the hole of lost inventory is away from capital used on the growing fleet, which would gain more revenue and EBITDA. Also, more fleet is lost, reducing the probability of having the right product to serve customer orders. Therefore, it also strongly impacts the core objective, *"99% of orders delivered successfully"*.

The metric “*Average order processing time*” measures the efficiency of product group coordination. It directly relates to core objectives “*99% of orders delivered successfully*” and “*Improve financial performance to exceed EBITDA target*”. The reason is the faster the orders are processed, the better the fleet is utilized, which increases the capability of serving orders. It is one of the main components behind ensuring customer orders are accomplished correctly. Also, it helps balance the workforce between product groups to give each product group the same order processing time. It will increase the total amount of orders that can be processed, directly correlating with EBITDA.

The product management unit will also be measured through the metric “*Percentage of fleet over 90 days rental status*”. This metric aims to prioritize longer rental times over short-term rentals. Longer rental times will generate less internal work in the organization. Therefore, it strongly correlates with core objectives “*99% of orders delivered successfully*” and “*Improve financial performance to exceed EBITDA target*”. Less internal work means that more resources are steered into actions that help to put not rented fleet into a condition where it can be rented to the customers, improving the probability of succeeded order. Less internal work also means the company can handle more fleets with the same workforce, improving EBITDA margins.

Metric “*Percentage of the fleet over 30 days in available status*” puts extra effort into a fleet that is not utilized most efficiently. If demand can be steered into excess supply, resources will be used more efficiently and generate more revenue. This has a strong relationship with the core objective, “*99% of orders delivered successfully*” because if orders can be steered towards the available fleet, it rises the probability of successful orders. It also directly relates to the core objective “*Improve financial performance to exceed EBITDA target*”. The reason is that otherwise, that resource would not generate any revenue. More revenue is connected to more EBITDA if the assumption that margins stay the same is made.

The product management unit serves mostly inner customers, and its main function is to create an environment where the sales department can succeed. Therefore it is reasonable to measure how well the product management unit can solve problems that inner customers face through the “*Customer effort score*”. The quality-of-service unit directly relates to the “*99% of orders delivered successfully*” core objective. Also, service quality correlates with how well a unit can create an environment to succeed, which is connected to how much the

company can make in EBITDA. Therefore, there is a strong relationship with the core objective *“Improve financial performance to exceed EBITDA target”*.

The metric *“Percentage of fleet with correct product data”* measures the fleet status with correct data behind it. Having the right quantity numbers and meta-data directly correlates with the customer being served in the first place. Therefore, it directly relates to the core objective of *“99% of orders delivered successfully”*. Without correct product data, there is a risk that customers will not be served at a. Therefore, it has strong relationships with the core objective *“Improve financial performance to exceed EBITDA target”*.

One of the main financial measurements of a unit is *the “Rate of return”* which reflects how much-added revenue the product can produce if it is invested. Therefore, it has a direct relationship which the core objective, *“Improve financial performance to exceed EBITDA target”*. Investment decisions made by utilizing the *“Rate of return”* also directly impact quantities of products. For this reason, it has a strong relationship with the core objective *“99% of orders delivered successfully”* because product quantities affect the probability of successful orders. It also has a strong relationship with the core objective of *“Improve the amount of innovation”* because it can help detect new market segments that are trending and need to be examined more closely.

Opportunity cost is always present in all actions that are made. This is also why *“Lost daily revenue”* is part of the metric. Its main function is to compare an ideal situation where the case company’s fleet is in rentable condition against a reality where part of the fleet is under non-rentable condition. Target is to get reality towards the ideal situation. For this reason, it directly relates to the core objective *“Improve financial performance to exceed EBITDA target”* by making more fleet into rentable condition, enabling it to generate more revenue. For this reason, it also has a strong relationship with the core objective *“99% of orders delivered successfully”* because more fleet is broad to rentable conditions, increasing the probability of successful orders.

One of the main metrics is also *“Utilization”* which helps detect how well a case company can fulfill demand with supply in different product groups. If utilization is low, it means there is excess inventory that is not performing optimally. On the other hand, if utilization is high, more fleets should be invested to meet demand with supply. For this reason, it directly relates to the core objective *“Improve financial performance to exceed EBITDA target”*

because it tells if the invested capital is steered where demand is, which gains revenue and EBITDA. Also, it has a strong relationship with the core objective “*99% of orders delivered successfully*” because if utilization is too high, it lowers the probability that customer orders will be successfully fulfilled.

The company’s financial targets heavily lean on results that invested capital can produce. Therefore, the timing of investment decisions is also key to success. If two identical products are purchased, the one received to the fleet faster can generate more revenue during the year. For this reason, the “*Yield of newly invested products*” is broad to the metrics, and it directly relates to the core objective “*Improve financial performance to exceed EBITDA target*”. Also, it has a strong relationship with the core objective of “*99% of orders delivered successfully*”. The reason is that the quantity of fleet correlates with the probability of successful order, and therefore the earlier product is received, the better the total probability is also.

The case company operates in an environment where competitive advantage is hard to gain because the barrier to entry is relatively low. All competitors utilize third-party suppliers' products, so the fleets of all competitors are relatively similar. For this reason, gaining short-term competitive advantage through innovation is extremely important, and being the first to adopt new technologies to have an advantage on segments before competition arrives. This is why the “*Number of future innovations per quartal*” is part of the metrics. It directly relates to the core objective of “*Improve the amount of innovation*”. Also, it has a strong relationship with the core objective “*Improve financial performance to exceed EBITDA target*” because each time innovation success and added value to the customer is provided, competitive advantage is gained. It reflects the same delay to revenue and EBITDA. It can also help shift demand into the wanted direction and therefore has a strong relationship with the core objective of “*99% of orders delivered successfully*”.

The metric “*Product groups price index development*” aims to detect product group pricing trends. The aim is to ensure that prices consider inflation and generate at least the same phase. Therefore it has a direct relationship with the core objective “*Improve financial performance to exceed EBITDA target*” because targets are not taking the effect of inflation into account and can be considered as added revenue without any added work. Pricing is

also one component of demand, so it strongly correlates with the core objective of “99% of orders delivered successfully”. If pricing develops slower than inflation, it will increase utilization, leading to fewer available products and reducing the probability of successful orders.

The case company's extremely broad fleet has turned against it because it is much harder to learn. It is also impossible to sell anything without having the base knowledge of the product. Therefore metric “*Coherency of the fleet*” measures how the spread case company’s product portfolio is product-wise. It aims to narrow the product portfolio into the simplest format possible, which will still serve customer demand. This helps on making the whole portfolio more learnable. It directly correlates with the core objective, “99% of orders delivered successfully,” because it increases the number of products when the larger fleet is steered into fewer items. Still, the total quantity of the fleet will not decrease. Therefore making the fleet more coherency increases the probability that there are enough products to fulfill customers' orders. Metris also has a strong relationship with the core objective “Improve financial performance to exceed EBITDA target” by making portfolios easier to learn and sell.

The metric “*Internal posts percentage from products*” encourages making an internal post about the product, which also increases internal knowledge. It has a strong relationship with all three core objectives. Making internal organizations more aware of the product increases the total utilization of products supporting the core objective. “99% of orders delivered successfully”. When product awareness is spread, salespeople are more confident in creating sales arguments to customers, impacting revenue and EBITDA. Also, when people think about the product and their benefits and downsides, it turns the whole organization into more product-centric thinking. They start to think about what could be done differently, and after that, instead of having one person generate new ideas, we suddenly have the whole organization mention new ideas. Each groundbreaking innovation needs hundreds of bad ideas before finding one good one. This will help on generating a volume of ideas. Therefore, it directly relates to the core objective, “*Improve amount of innovation*”.

The last of the product management unit’s metrics is “*Improvement of code execution time*”. The metric aims to create an environment where salespeople can use pricing tools easily and fast when offering to customers. Therefore, improving the speed of the tool also reflects practical usability. The first part of getting customers to order something is to contract with



customers where a pricing tool is needed, and a working pricing tool is the first step in making an order happen. Therefore, it has a strong relationship with the core objective “99% of orders delivered successfully” and reflects along with the core objective “Improve financial performance to exceed EBITDA target” as soon as the customer orders.

Hoshin Kanri's matrix shows that each position can directly affect the most important core objective, “Improve financial performance to exceed EBITDA target,” through these metrics. Therefore, the whole unit's metrics proposal is built to support the whole company's main strategic targets. In metrics, there is also a balance between KRIs and KPIs to receive enough information regarding units' current status and capabilities to maintain good performance in the future. Metrics are built assuming that other company units perform optimally and can improve their performance when product management units' performance is improved. In real life, each unit's level of performance varies, so we cannot be sure that the rest of the organization can utilize improved action at their full scale. Therefore, other unit metrics should also be aligned.

## 7 Conclusion

The case company's product management unit had no metrics before this research. Therefore, leadership was based on general assumptions, and at the same time, it left a lot of room for improvement. The unit consists of multiple teams with precise specialties and ways of providing added value.

Metrics were built using value stream mapping to detect how added value is formulated. The case company's main target is to maximize EBITDA creation. In the product management unit, two main processes are connected to EBITDA: product location optimization and portfolio development. Utilizing methods of seven classical wastes, each team's contribution and value creation were analyzed as a part of the units' main processes. After evaluation, metrics were built to concentrate on each team's value creation and help increase it. For these reasons, metrics improve value creation, which correlates to improving EBITDA. In the end, the Hoshin Kanri matrix was utilized to analyze the suitability of metrics to lead the unit toward the company's main strategic targets and core objectives. Each team can enhance the company's main targets through their performance through metrics.

The performance metrics proposal made in this Master's Thesis is valid only in the case of the company's product management unit's current state. This means they support the unit's current goals with the current structure. These metrics should be updated accordingly if goals or structure changes during the years. Therefore, these results should not be used outside the context without evaluating the results.

The total impact of metrics depends on how successful their implementation process will be. Metrics must also be followed sequentially to enable positive movement and change in working habits toward the most productive outcome possible. When thinking about the implementation and daily leadership, a key factor is that clear targets for each metric need to be set. They must be ambitious to provide a challenge but realistic enough to be

achievable. Therefore, the next step for the case company is to evaluate the current status through these metrics and mark that as a performance baseline. After that, product management units management should evaluate realistic targets for each team, which progress will be followed.

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