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**Performance Measurement for ABB Motors  
Customer Support Unit - An Analysis based on  
Power BI Metrics**

School of technology and innovation management  
Master's Thesis  
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**ABSTRACT:**

Performance measurement and data-based decision-making have grown in importance in the operations of companies. In a highly competitive environment, performance measurement is an outright strategic necessity. By utilizing the data generated from their operations, companies can identify trends, evaluate strategies and adapt dynamically. This approach minimizes guessing, promotes efficiency and enables a culture of continuous improvement. In particular, business intelligence utilization solutions have increased in popularity. These solutions leverage advanced analytics and technology to transform raw data into actionable decisions, revolutionizing the performance measurement landscape. The purpose of this research is to answer the presented research question: *How to develop performance measurement in customer support using Power BI?*

The goal of this research is to find out the elements that can be measured to create a balanced set of indicators, which can be viewed to provide an objective picture of the customer support unit's current performance. As well as finding the metrics that can be used to detect factors that reduce performance and increase workload. The task of the work was also to implement these metrics in Power BI.

This research is a qualitative study, which mean collecting and analysing non-numerical data. The method of data collection was interviews, which included open-ended questions. The interviews were conducted with the management and other personnel of the department that were the subject of the study. The interviews are built around a theoretical framework, which in turn is based on the most central findings of the literature review. The literature review is structured in accordance with the operating model of this study, i.e., it presents empirical findings and research results from the different stages of building a performance benchmark.

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**KEYWORDS:** Meter models, Performance measurement, Power BI

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**TIIVISTELMÄ:**

Suorituskyvyn mittaaminen ja data pohjainen päätöksenteko ovat kasvattaneet merkitystään yritysten toiminnassa. Vahvasti kilpailussa ympäristössä suorituskyvyn mittaaminen on suorastaan strateginen välttämättömyys. Hyödyntämällä toiminnastaan syntyvää dataa yritykset voivat tunnistaa trendejä, arvioida strategioita ja mukautua dynaamisesti. Tämä lähestymis-tapa minimoi arvailun, edistää tehokkuutta ja mahdollistaa jatkuvan parantamisen kulttuu-rin. Erityisesti liiketoimintatiedon hyödyntämis- ratkaisut ovat nostaneet suosiotaan. Nämä ratkaisut hyödyntävät kehittyntä analytiikkaa ja teknologiaa muuntaakseen raakadataa käyttökelpoisiksi päätöksiksi, mikä mullistaa suorituskyvyn mittausympäristön. Tämän tutki-muksen tarkoitus on vastata esitettyyn tutkimuskysymykseen: *Kuinka kehittää suorituskyvyn mittaaminen asiakastuessa Power BI avulla?*

Tämän tutkimuksen tavoitteen on selvittää ne elementit, joita mittaamalla pystytään luomaan tasapainoinen mittaristo, jota katsomalla näkee objektiivisen tilannekuvan asiakastuki yksikön tämänhetkisestä suorituskyvystä. Sekä löytää ne mittarit, joiden avulla pystytään huomaamaan suorituskykyä heikentävät ja työmäärää lisäävät tekijät. Työn tehtävänä oli myös toteuttaa nämä mittarit Power BI:ssä.

Tämä tutkimus on laadullinen tutkimus, jossa kerätään ja analysoidaan ei numeraalista dataa. Datankeräys metodina on käytetty haastatteluita, jotka sisälsivät avoimia kysymyksiä. Haastattelut toteutettiin tutkimuksen kohde osaston johdolle ja muulle henkilöstölle. Haastattelut ovat rakennettu teoreettisen viitekehyyksen ympärille, joka taas perustuu kirjallisuuskatsauksen keskeisimpiin havaintoihin. Kirjallisuuskatsaus on rakennettu tämän tutkimuksen toimintamallin mukaisesti, eli se esittää empiirisiä havaintoja ja tutkimustuloksia suorituskykymittariston rakentamisen eri vaiheista.

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**AVAINSANAT:** Mittari mallit, Suorituskyvyn mittaaminen, Power BI

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## Abbreviations

KPI – Key Performance indicator

BSC – Balanced scorecard

BI – Business intelligence

VC – Variant code

OTD – On time delivery

FAT – Factory acceptance test

GTS – Global Trade Services

# 1 Introduction

## 1.1 Background

Competition between companies for costs, quality and innovations has increased and intensified. For companies to maintain their competitiveness, companies must constantly invest in activities that improve their competitiveness and thus maintain or even improve their position in the field. To increase competitiveness, it is important to find ways to monitor changes, detect deviations and manage operations (Bititci, 2015).

Today's, organizations trust more and more on metrics to assess their progress, track their performance, and drive development. Current situation in performance measurement varies between companies. Usually company to situation affect industry, organization size, culture, and management's dedication. There has lot of advantages when company invest to developing performance metrics. There are many advantages what companies get when they are developing their performance measuring. It provides for companies' opportunity to monitoring performance, make decisions based on information and compare numbers against different timeline and industry standard (Epstein, 2017).

According to Bourne (2017), adoption the performance measurement practices vary in different companies. The industry, scale and complexity of the organization affect the scope and sophistication of these practices. Generally, companies with large resources also have more advanced performance measures. Small companies, on the other hand, usually have problems with the introduction of performance metrics. The measurement of performance is also affected by the company culture and the management's commitment to the development of the measurement system. Companies with long experience in performance measurement and are committed to its development and data utilization usually have the most advanced metrics (Epstein, 2017).

The development of performance measurement has many different advantages for companies. Metrics are an important factor used to guarantee the realization and monitoring of the company's goals and strategies. With the help of metrics, it is possible to guarantee that all company employees are working towards to the same goals. The goal of the metrics is also to clarify the understanding of the company's key goals, i.e., key performance indicators, and to help employees understand what their goals are and how they will achieve them (2015).

This means a company's ability to track progress, identify trends, and evaluate results against predetermined goals. Thanks to this, the company can take the right measures in a timely manner, which support the company's continuous improvement. When it comes to improving performance, the use of the metrics is key. With it, after staying, you can find improvement opportunities and allocate resources more efficiently (Bititci 2015).

## **1.2 Question and objectives**

Companies have often a huge need to measure their performance. Performance tells companies how well the company has performed in a certain period. But often companies' performance metrics only track financial numbers. However, a large part of the company's success factors cannot be measured by using financial indicators. For a company to be able to understand the reasons behind the numbers, it is important to understand what affects the different stages and the performance of the different functions (Bourne, 2017). The aim of this research is to revive how to work better and to find the most effective indicators for measurement.

In this thesis, the focus is on measuring the performance of the customer support unit. Customer support unit is exactly the kind of area where it is difficult to measure performance with financial indicators.

This thesis work purpose is to create a customized performance measurement system with which it is possible to respond customer support specific needs. This study goals are to evaluate the effectiveness of customer support's current metrics from the perspective of the department's performance and identify possible areas for improvement. In other words, the current metrics are perceived to be insufficient to give a broad understanding of customer support's performance, and the purpose of the study is to develop the metrics so that the KPIs measure the right things. The purpose is to critically be looking the current KPI metrics and evaluate their effectiveness in the accurate evaluation of operational work. The purpose of this study is to improve Customer Support's understanding of the actual performance of its operations using these new metrics. The central research question of this thesis is formulated as follows:

**RQ1:** *How to conduct performance measurement in customer support using Power BI?*

This research also includes three objectives to support main research question. The central research objectives of this thesis are formulated as follows:

- *To identify the metrics needed to facilitate performance measurement via different sub-regions.*
- *To identify and define the different tools necessary for performance measurement.*
- *To justify the choice its application within the domain of design, building and user training.*

### **1.3 Definitions and limitations**

#### ***Meter models***

With the help of measurement models, companies can define the correct items to be measured, so as not to measure the wrong things (Nair, 2004). The purpose of the meter

models is to present theoretical points of view, with the help of which different organizations can build meter sets for their own needs. The ready-made perspectives of metric models should not be transferred directly to any organization, but they serve as a basis, by modifying which the organization can find the most suitable metrics for itself (Malmi, 2002).

This research focuses on metric models that help to find the right indicators to measure performance. The focus is on metric models that bring out both a material and non-material perspective, as well as work in internal processes that include customer support.

### ***Performance measurement***

Measuring performance means measuring the success and performance of an organization from selected perspectives. Performance measurement describes the performance that has already taken place (Lönqvist, 2006). Performance measurement consists of material and non-material measures. Performance indicators are practical tools that inform a company about the successes and failures of its operations with the help of numerical data (Kujansivu, 2007).

In this work, from the point of view of performance measurement, the focus is to focus on finding out the performance measurement needs of an identified part of the organization, both with numerical and non-numerical

### ***Power BI***

Power BI is a software service that acts as a platform to combine different data sources into coherent, visual, and engaging insights. Power BI helps you connect to your data sources, visualize their data, and find what matters, and share it with anyone you want. The way you use Power BI is based on which Power BI feature or service is the best tool for the user. With Power BI Desktop, you can create reports to share with one team or

the entire organization. In Power BI, for example, you can view customer engagement statistics, inventory, and production progress in a real-time summary screen in the Power BI service (Microsoft, 2023). Power BI is a very versatile and easy-to-use business intelligence tool and for this reason also the world's most popular business intelligence tool (Headmind partners, 2023).

In this thesis work, the focus is on using power BI to build a performance metrics and to user training.

### ***Limitations***

The work has limited to design, building and user training. The scope of the work is limited to the three domains of customer support, which are order processing, order changes and project management. The perspective of performance measurement is the measurement of the workload and the quality of the work.

This thesis work has limited on the design, construction, and training of users for a specific project. This thesis work focuses on the three domains of customer support, which is order handling, order changes, and project management. The scope of the study is limited to these areas. This thesis work focuses on the perspective of performance measurement, specifically on the measurement of workload and work quality. The data obtained through the interviews is exclusively intended for this particular project. The metrics utilized in this project are specifically designed to cater to its unique requirements and are not recommended for universal application, at least in their entirety.

## **1.4 Structure of the study**

This thesis consists of five sections: This is the first, i.e., the background part. This part is introduction chapter where presenting topic of the work, questions objectives and limitations. The second chapter reviews the theoretical part of the work. This is literature

review which focus is aims to establish a theoretical framework for this work. In the second part I present most important theoretical point of views, the things that are important to understand about creating a performance dashboard are presented. In this chapter, go through an overview of performance measurement, which presents the most important perspectives for implementing the dashboard, which stakeholders to consider, and the perspectives that should be considered when creating the performance metrics. Go through what things should be considered so that the selected metrics suit the needs of the target organization. Then presenting how the data should be presented, so that it is as understandable as possible, and how BI programs can be used in visualization. The theory also introduces various existing applications that can be used in data collection. Key performance indicators, balanced scorecard and performance prism are also introduced, which are theoretical models for creating performance indicators.

Thirdly, the research methodology is presented, i.e., how this research was done. The fourth is the empirical part, where I go through the steps of the empirical research, as well as the observations that arose from them. The last is the conclusion, where I summarize the things what is learned in this work, highlight the most important results and considerations, and give suggestions for the future.

## **2 Theoretical framework**

The purpose of this literature review is to present the theoretical basis for the development of performance metrics. The purpose of this theory part is to create a theoretical framework for what needs to be considered and understood in order to be able to plan and build a performance measurement system. The purpose is that the reader of this work will be able to start his own performance measurement construction project based on this work. First, we discuss that what is performance measurement. From here, we proceed concretely to the construction and implementation of the meter set, and from here to an even more concrete direction, i.e., meter examples and to the definition of non-economic meters.

The increase in uncertainty in the operating environment of companies, the blurring of organizational boundaries and the emphasis on the importance of human capital make it difficult to both create a successful strategy and its implementation. The transfer of strategy from top management plans to practice is an eternal problem. Various strategic measurement systems have been developed to solve this problem (Kankkunen, 2005).

### **2.1 Performance measurement**

Metrics are tangible management tools. They can be used to manage complex entities by summarizing them in the form of a simple key numbers. The company's units must be managed in some way to control its operation. Here operational activities measurement becomes a critical factor. Kujansivu (2007) defines the importance of measuring as "you get what you measure" and "what you can't measure you can't lead". However, Kujansivu (2007) also points out that this does not mean that management is not possible, even if everything is not measured (Kujansivu, 2007).

The necessity for measurements largely depends on the company's specific needs. The meters provide accurate information on how the performance has been performed in

relation to the set of goals. So, the purpose is to monitor how the planned things are realized. Metrics can also be used to concretize the strategy into achievable goals. The strategy can be shared into detailed action plans, work phases and interim goals (Kujansivu, 2007). Kujansivu (2007) states that the measure should aim to:

- Information that helps making decisions
- More motivation for employees
- Question current ways to working
- Create prerequisites for reward goals
- Forecast business development
- Better understanding the operation of the organization
- Communication about the company's resources

When talking about performance, the most important stakeholders and their needs must be considered. The unit's performance is often seen as a complex issue. The needs of the stakeholders can be very different or even conflict with each other, so it is important that when making the plan, the needs of all the stakeholders are considered, i.e., employees, supervisors, customers, and authorities. Often, the person who order the creation of the metrics is the unit's management. It is important to notice that it is not enough to consider only management's perspectives and needs; rather, it is important to recognize the perspectives and needs of all key stakeholders (Lönngqvist, 2006, p. 19-20).

It is important to commit all stakeholders into development process. Even though the company's management sets strategic goals for the company, in accordance with the principle of representativeness, it is important to include every stakeholder who is affected by this in the discussion. Ukko (2005) states that providing stakeholders with the opportunity to participate in planning at an early stage has effects on work productivity, satisfaction with new changes, and reduces the criticality in the introduction of new processes. A good way to involve all stakeholders is open

information, so that all employees which this affect, feel that they are involved in the process. Overall, openness between stakeholders is key to success because hiding information does not inspire trust and increases the risk of criticism (Ukko, 2005).

The general trend is to look at performance from several different points of view, and no longer emphasize only the financial view. To help understanding better different views, there has been made several different models to this purpose. These models aid in understanding and considering various aspects because the unit's performance is influenced by different factors at different levels. When creating metrics, it is crucial to comprehend the various levels of the organization and how changes at these levels impact different aspects (Lönngqvist, 2006, p. 19-20). Different models will be looking later in this chapter.

## **2.2 Selecting the right metrics**

Choosing the right meter is one of the key issues in evaluating the performance of operational activities. In general, the common way accepted correct metrics in literature is to choose these meters according to the company's strategy (Liu, 2014). When creating a balanced set of indicators, it is important to have a set of indicators that is clearly linked to the company's strategy and key success factors (Kankkunen, 2005).

When the measuring targets have been synchronized with the company's strategy, the next question is the number of meters. There is no right amount to metrics, the amount depends on the company's size and needs (Duke, 2013). When evaluating the right number of metrics, it must be taken into account that the number of metrics does not weaken the understanding of the perspectives of the metrics, that the cause-and-effect relationship does not become unclear, and its maintenance does not require too much resources (Kankkunen 2005).

According to Duke (2013), it is important to pay attention to Paetro Principle's 80/20 thinking when choosing meters, to be able to get the best possible benefit with the smallest possible number of meters. According to the Pareto Principle, 80% of the results are due to 20% of the causes. This means that the company must identify the factors that produce the largest part of the result. There is only few scientific researchs that provides the 80-20 principle works, but it is anyway very popular with Six Sigma and other management strategies users (Tardi, 2023). Other important aspects are the availability of data, i.e. how easily data can be collected, the reliability of the data, what kind of sources the information is collected from, whether the sources are reliable and whether there are opportunities for abuse or errors, and the costs of data collection, i.e. what costs arise from data collection, processing, storage and presenting (Duke, 2013).

When choosing a meters, user must also consider that is the meter direct or indirect, or objective or subjective. With a direct meter, the desired information is measured directly from target. Direct measurement is more accurate and cheaper than indirect measurement, but if direct measurement is not possible or the things that need to meters of necessary information is extensive, indirect meters are used. Especially when measuring productivity, indirect measures are preferred, because productivity involves a lot of indirect things, such as, the number of errors, delivery times or underutilization of resources. Objective measures, are things that can be measured with some measuring device or platform. Numerical values are usually obtained from these meters. Objective metrics are well suited for measuring concrete activities, because deliverables can be observed from them. Subjective measures mean measures whose results are based on opinions or values. These are usually implemented as surveys or interviews. Subjective measures are usually used to measure intangible resources (Kujansivu, 2007).

According to Duke (2013), when the measured items have been initially selected, the following questions must be asked: "Are there significant gaps in what is being measured?" and "Is there a conflict between the measures?". So, after the selection of metrics, the purpose is to looking the interaction between metrics interconnected

processes. It is important to be aware that some gaps, distortions and contradictions probably exist and try to understand them as best as possible.

Summarized, the most important factors for success in choosing metrics are finding the metrics that fit with the strategy, defining the right number of metrics, and the ease of metrics from the point of view of data collection and use.

### **2.3 Presenting the data**

Data is pointless if it is not presented in a clear form what help to making smart decisions. When looking at data, data must show to distinguish between variations, seeing correlations and trends, and compare time and activity. Presenting data as numerical statistics is generally a bad option, because then it can appear that the values have almost the same mean, variance and correlation coefficients, but when these values are presented graphically, they can show very different behavior. This is called the “Anscombe Quartet” (Duke, 2013).

Anscombe's Quartet is a research made by statistician Francis Anscombe in 1973 about the importance of diagrams in the presentation of information. He use four groups whose values are almost identical when these values presented in numerical statistical form. But when these statistics are presented as graphs, it can be noticed that they have clearly different distributions. This shows that it is always important to present the data in a visual form in so the data user is order to be able to see the differences in the data (Gupta, 2020).

Anscombe's Data									
Observation	x1	y1	x2	y2	x3	y3	x4	y4	
1	10	8.04	10	9.14	10	7.46	8	6.58	
2	8	6.95	8	8.14	8	6.77	8	5.76	
3	13	7.58	13	8.74	13	12.74	8	7.71	
4	9	8.81	9	8.77	9	7.11	8	8.84	
5	11	8.33	11	9.26	11	7.81	8	8.47	
6	14	9.96	14	8.1	14	8.84	8	7.04	
7	6	7.24	6	6.13	6	6.08	8	5.25	
8	4	4.26	4	3.1	4	5.39	19	12.5	
9	12	10.84	12	9.13	12	8.15	8	5.56	
10	7	4.82	7	7.26	7	6.42	8	7.91	
11	5	5.68	5	4.74	5	5.73	8	6.89	
Summary Statistics									
N	11	11	11	11	11	11	11	11	11
mean	9.00	7.50	9.00	7.500909	9.00	7.50	9.00	7.50	
SD	3.16	1.94	3.16	1.94	3.16	1.94	3.16	1.94	
r	0.82		0.82		0.82		0.82		

Figure 1 Anscombe's data in numerical form (Gupta, 2020)

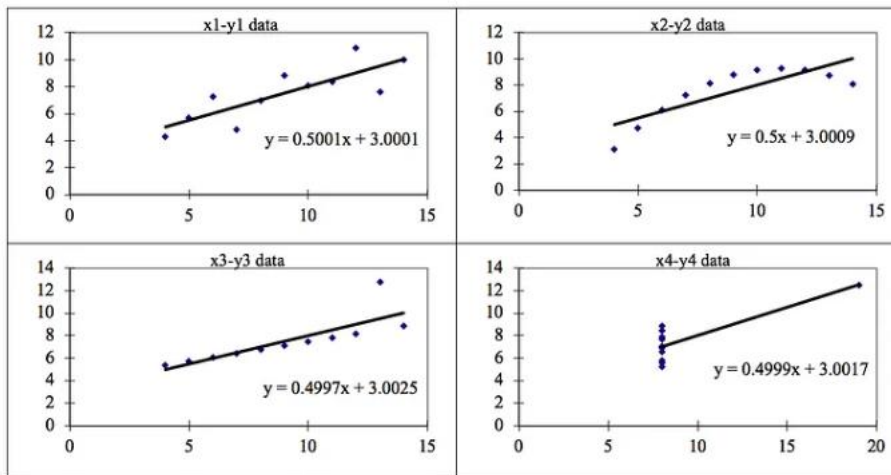


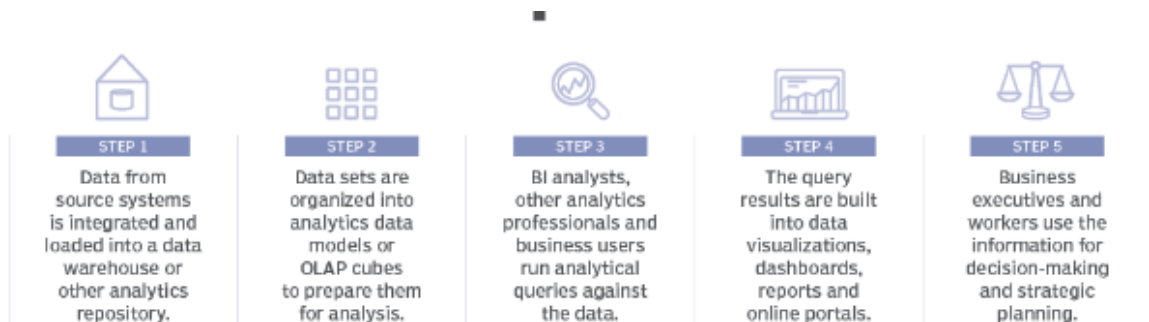
Figure 2 Anscombe's data in visual form (Gupta, 2020)

Duke (2013) gives advice for clear visualization: present a lot of information in a small space, possible comparison of information, for example at the micro and macro level, looking large deviations in statistics and think about what causes them and how to react to them, clarify the visualization with the right colours and shapes and clearly indicate which points are the most important.

### 2.3.1 Business intelligence (BI)

Understanding what are high-quality metrics is not enough if there is not good platform to implementing this information in right form. It is important to choose a tool for creating and maintaining a dashboard that meets the needs of the dashboard as well as possible (Wiley, 2016).

Business Intelligence (BI) programs have been created for data processing, which can be used to help analysing data in a clear format. BI includes, for example, analytics, data management and reporting tools, as well as several methods for data management and analysis. BI programs collect data from several different organizational sources, then serve that data a way that the user can easily create visualizations, dashboards, and reports. This helps the organization's management and employees to make better decisions so that the organization can improve the company's profitability, accelerate growth, and give a competitive advantage over other competitors (Stedman, 2023). The principle of operation of Bi is illustrated in figure 3.



**Figure 3 How the BI process works (Stedman, 2023)**

The benefit of BI is the help of BI functions. Tool users can make observations in their processes that they would not have understood without BI tools. With the help of these observations, organizations can make decisions that lead to improved operational efficiency and productivity (Stedman, 2023). Although it is possible to make good

decisions even without BI tools, as Gupta (2020) stated, processing data without visualization easily enables mistakes and reduces a person's ability to understand the data, and then important observations are missed. Duke (2013) also comment that it is not enough that the data is presented in a visual form, also matter that visual form is right kind. The human ability to illustrate visual images is limited. For this reason, poorly made visualization easily leads to wrong decisions. There are also differences between people, another person may understand the presented matter even the opposite way of what the creator of the meter intended. For this reason, it is important to allow stakeholders to use the dashboard, and then make possible changes to the dashboard during the use.

## **2.4 Data source for metrics**

In terms of the operation of the meters, it is very important that the data collection is accurate and reliable. Operational business metrics help the company to see the efficiency of its operations and other numerical results. This chapter looking the different data collection strategies that organizations use to collect data for operational metrics. The purpose is to prove the meaning and importance of the data collection methods in terms of the operation of the measurement. With the help of efficient data collection systems, companies can therefore enhance their decision-making processes and improve their operations (Pochiraju, 2019). This chapter focusing to internal data collection and data warehousing, which means involves collecting data from existing company systems and databases and how to warehouse the data.

### **2.4.1 Insert data collection**

Data collection is a critical part of indicators and provides the basis for analysis and insights. By utilizing reliable and functional data collection systems, companies can ensure the accuracy, validity, and reliability of the results.

Data collection methods cover various techniques for collecting information from data sources. According to (Trang, 2019), the most effective way to collect data in today is to use an automated data collection system. In these days, there are many different systems for automated data collection. Each method has own strengths and limitations, and the company must choose the option that best suits its needs (Trang, 2019).

The first advantage of using automated systems is that automatic data collection methods offer much better quality in terms of data. Automated systems can, for example, minimize data errors, such as data transcription errors or the risks of subjective assessments. That mean, the risks that arise when typing or interpretation errors are made in manual work. This leads to higher quality and more reliable data, which increases the validity of research findings (Porter, 2004). Another advantage is that automatic data collection significantly improves efficiency and speed compared to manual data collection.

With the help of technology, information can be collected and processed in real time, so the users of the meters get real time information about the operational situation for analysis. This enables timelier decision-making and shortens the delay in receiving information (Brewer, 2007). The third benefit is that, with the help of automatic data collection, it is possible to collect large amounts of data, which is especially important when dealing with large amount of data or when data comes from several different places or periods. With the help of automatic systems, information can be collected simultaneously from several sources, which increases research information (Trang, 2019).

#### **2.4.2 Data warehouse**

Data warehouses play an important role in supporting decision-making processes by providing the opportunity to store large amounts of company data. Today, companies generate huge amounts of data from their various internal systems. When storing, sharing and analysing this data, companies increasingly rely on large data warehouses,

which can manage large amounts of data easily and flexibly, as well as combine data from several sources.

Effective data modelling is the core of effective data warehousing. Dimensional modelling techniques, such as the star diagram and the snowflake diagram, enable optimized data collection and retrieval. By organizing the data warehouse around key business dimensions, organizations can significantly improve query performance and reduce data redundancy.

Data modelling is a critical part of building an effective data warehouse. Dimensional modelling is the most common technique for modelling data in data warehouses. Dimensional modelling focuses on organizing data into different business dimensions, such as time, geographic location, and product categories. This facilitates analytics-based and efficient information retrieval. Dimension models can be divided into two different table models, which are dimension tables and fact tables.

Dimension tables store attributes that describe business entities and provide context for the data. These tables contain hierarchies and hierarchies contain text or descriptive information. For example, the products dimension table can contain attributes such as product name, category, and brand.

Fact tables, on the other hand, contain numerical, measurable data that represent business transactions or events. The fact tables act as the core of the data warehouse and are surrounded by related dimension tables. These tables contain numbers, i.e. measurable information. These numbers represent business transactions and events. Fact tables usually contain information such as sales, profit, or inventory levels.

In data warehouses, data is usually normalized, i.e., data redundancy is reduced by organizing it into several interconnected tables. The purpose of these is to make data processing as fast and efficient as possible (Kimball, 2013).

### 2.4.3 Process mining

Process mining is a powerful analytical technique that allows organizations to extract insights from event log data to gain a deeper understanding of their operational processes. This is especially suitable for a deeper examination of the data, when you want to find out the reasons, for example, why a certain KPI decreases or increases.

With process mining, companies can find valuable information about process inefficiencies, bottlenecks, and optimization opportunities. Process mining involves the analysis of event logs that record the chronological order of activities and related information in a process. By applying process mining techniques to event log data, companies can visualize, analyse, and interpret the actual flow of processes, identify patterns, deviations, and performance metrics (An der Aalst, 2016).

Process mining has several advantages when used to analyse a data source. First, it offers an objective and data-driven approach to understanding processes, so companies don't have to assume things but can get deeper and thus get a comprehensive picture of their operations. Secondly, process mining helps to identify process bottlenecks and inefficiencies, and this in turn enables targeted development efforts to these targets. Third, process mining improves compliance monitoring and regulatory compliance by uncovering non-compliant activities and deviations (Günther, 2012).

Process mining using three different techniques for analysing event log data. These are process discovery, compliance review and performance analysis.

*Process discovery:* Process discovery creates a visual representation of the actual process based on event log information. Process discovery uses various techniques for its operation, such as alpha algorithm, heuristic mining tool and inductive mining tool. With these techniques, automated process models that highlight process flow, dependencies, and decision points (An der Aalst, 2016).

*Compliance check:* In the compliance check, the observed process implementation is compared with their planned or reference process model and thus identifies possible deviations, aberrations, and bottlenecks from the data. Techniques such as token-based replay, alignments, and health metrics assess the alignment between the event log and the process model (Adriansyah, 2011).

*Performance analysis:* performance analysis means analysing data from a performance perspective. These are for example, cycle time, performance and resource usage. These techniques help to find improvement targets through performance data and bottleneck analysis, and then help to optimize the efficiency of the process (Adriansyah, 2011).

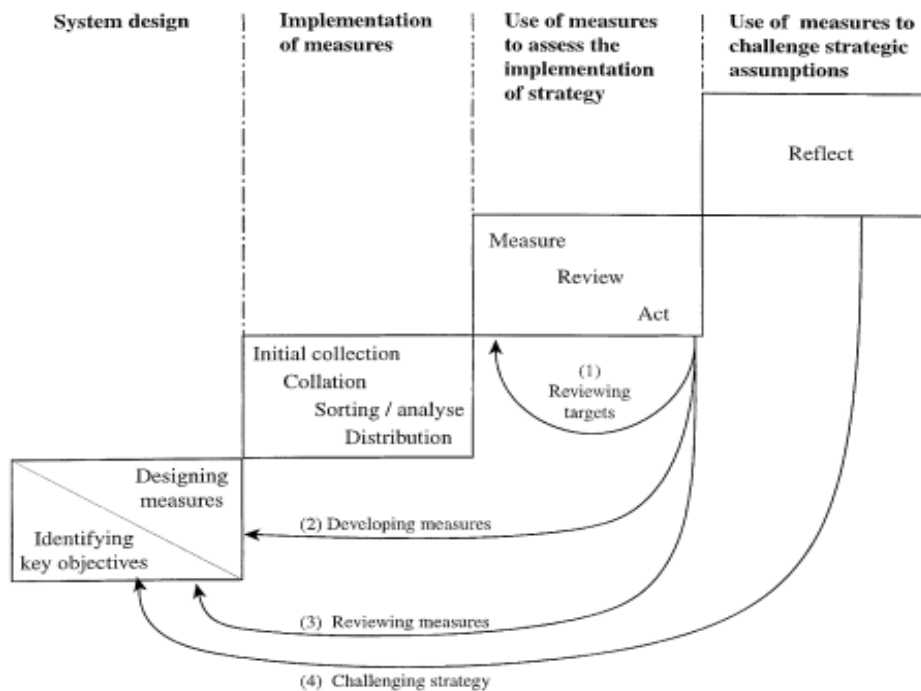
In summary, it can be stated that data collection automation and data warehouses form an effective combination that gives companies better opportunities to enhance data collection processes, improve data quality and facilitate data-driven decision-making. By leveraging automated data collection techniques, companies can efficiently collect large amounts of data that can be stored in centralized and integrated data warehouses for data storage and analysis. The collaboration of these two systems allows the company to gain valuable insights, improve operational efficiency and gain a competitive advantage in today's highly competitive business environment.

## **2.5 Metrics design**

Building a measurement system to company is an extensive process that typically takes 12-18 months. Because of this, measuring instruments are often built as parts. This is recommended especially in large organizations where there are several areas of operation. Then it is smart to do the measurements as separate projects, where the knowledge and understanding of measurement develops, errors are noticed and these errors can be corrected, before expanding the measurement to other areas (Kankkunen, 2005).

Often the process of designing meters is outsourced to a company or person what specializing to measurement. The organization can also appoint an internal responsible person to develop the metrics. This person is charge to responsible for the planning of the metrics, as well as the control of their implementation. The selection of things to be measured should be done together with the organization's management team and the necessary stakeholders (Lönqvist, 2006).

Most often in the literature, the instrument design process is divided into four areas. These areas are design the metrics, implementation planning, implementation and instrument panel development based on continuous improvement. Bourne (2000) points out that since the metrics are derived from the firm strategy, it is important to view the metrics in terms of the success of the strategy. Therefore, evaluating strategy implementation and questioning strategic assumptions are the two most important subdivisions for using performance metric (Bourne, 2000). Even if metrics are often perceived in the literature as part of the company's strategy, Kankkunen (2005) points out that company management rarely sees the matter in the same way. Although the design of meters is often divided into different parts in the literature, in actual implementation these parts go overlap. This is due to the fact that the implementation of different measures progresses at different paces, and one activity should not be the bottleneck of the project, so it is important to continue with another part. This is illustrated in Figure 4 (Bourne, 2000).



**Figure 4 Phases in developing a performance measurement system (Bourne, 2000)**

The project starts by defining what the target state is, i.e., what we want to measure. To understand what we want to measure, it is necessary to understand the target state of the unit, i.e., the definition of the core objectives. For this, need to understand the unit's mission and vision. They define what the unit's main goals are, where the unit want to go, and the things the unit want to focus on (Rampersad, 2003). Kankkunen (2005) also emphasizes that in addition to the vision and mission, concrete choices must also be made during planning, such as when the metrics is need to be use, whether it is better to build an metrics what being developing during its operation, or to try to create the correct and functional meters already in the development phase, whether to create new meters or whether old ones will be used and the definition of responsible persons for different areas of the project.

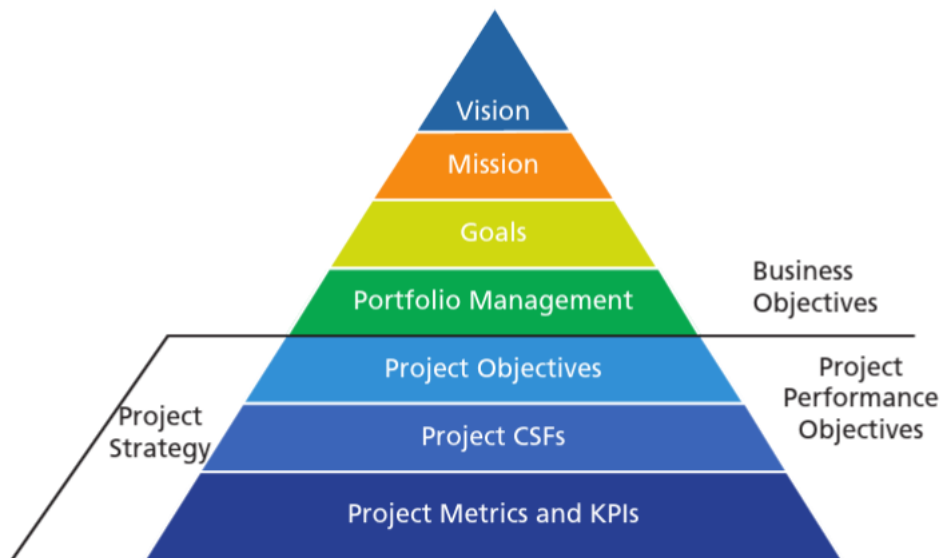
The company's measurement targets are always individual, and it is not possible to create a general guideline for what things should be measured in the company. Although the measurement goals come individually according to the company's primary goals, Kankkunen (2005) divides the goals according to more general needs as follows:

- *Solving problems*: Problems in operation, poor efficiency or finding incorrect functions.
- *Encouragement and reward*: The efficiency of the workers, it is important that they have clear goals that are rewarded for reaching them.
- *Crisis*: If the company faces exceptional circumstances, it is important to be able to find the challenges to bring about change quickly.
- *Cooperation between stakeholders*: Increase cooperation between different stakeholders and at the same time harmonize goals.
- *Comparison between departments*: How well can perform in relation to other departments, or to the set goals.
- *Achievement of strategic goals*: It is important that the metrics focuses on this.
- *Clarifying the strategy*: Find out what are the most important areas of the strategy and focus on them.
- *Learning*: One essential goal of measurement is to increase understanding of the reasons that affect the operation and improve the opportunities for continuous learning.

Lönnqvist (2006) approaches the matter through the identification of critical success factors. These can be financial, physical, or intangible. Often, these factors are chosen to be the most important things in terms of performance and goals. It is about the same idea as the goals presented by Kankkunen (2005), the difference is that in the success factors are functioning entity.

Wiley (2017) summarizes the critical success factors in the form of a pyramid, which is shown in Figure 5. Main idea of metrics is that those are base to all other levels and the meters information is going to support and direct of every level in company's strategy. It is important to understand the overall picture, why things are measured and what are the relationships between different levels. Communication between project implementers and stakeholders becomes a most significant factor. Different stakeholders

look at metrics from different perspectives, and the most common reason for measurement failure is that the perspective of stakeholders has not been considered enough when creating metrics (Wiley, 2017).



**Figure 5 Establishing projects strategy (Wiley, 2017)**

It is also important to determine how many meters the company need. There is no correct amount, so the company need determined the correct number. The most important thing is that the meters can measure the critical factors. An excessive number of metrics makes their interpretation confusing, as well as makes it unclear which metrics are essentially important in terms of operations (Kankkunen, 2005). It is often easy to find things to measure, but it is difficult to determine the most essential metrics so that number of metrics does not grow so large that it becomes difficult to use them (Rampersad, 2003). Also, it is necessary to examine the current metrics critically, and remove unnecessary ones (Bourne, 2000).

When the first design phase is done, the determination of the meters begins. So for each meter, you should consider what it will be used for. How accurate the meter should be. Is it enough for the meter to lead the workers to do the right things, or whether the meter is used, for example, to interpret financial numbers, so that the meter should be

extremely accurate. Is it advantageous to make a meter, or does it require a high amount of resources to build or maintain, because there is no sense to create too expensive meter. However, it should be noted that it is important for the operation that the metrics measure important issues, even if the cost of the meters is high. Occasionally, a meter can describe more than one desire, or several meters are needed to describe one object to provide a sufficiently wide image (Lönqvist, 2006). However, when determining the metrics, it should be noted that there are no perfect metrics. The meters defined and developed is a continuous process, and first meters do not need to be perfect (Kankkunen, 2005).

The meters have many different users and use situations. It is important to define the metric operating background before use. It is important to consider how often the information is collected, who is responsible for collecting information, and what is the target value should be taken into account. Also, defining a operating period is a long process where the actual status is determined during use (Lönqvist, 2006).

The metrics commissioning start after design. Often this involves modifying databases or processes to produce to get needed information for measure. Commissioning usually involves data collection, testing, reporting, and calculating and analyzing results. Information and educating workers about changes is of paramount importance to make succeed in commissioning. If the workers does not understand the purpose and perpetrators of the instrument panel, it is difficult to use the meters (Lönqvist, 2006).

### **2.5.1 Examples of different meter models**

The most common reason why company operational performance measuring fail is the choice of the wrong measures. To help with this, several ready-made theoretical methods have been created, which help the designer of metrics to figure out which metrics best describe the company's strategy and how to balance them into one complete entity (Nair, 2004). This chapter introduces various gauge models that can be

used in planning the measurement of the company's operational performance. These models are key performance indicator, balanced scorecard and performance prism.

### **2.5.2 Key performance indicators**

Key performance indicators (KPIs) main idea is to find the most important performance indicators for current and future operations (Parmenter, 2015). The operation of KPI meters is based on collecting data, storing data, cleaning data, and finally combining the data (Twin, 2022). These indicators are used to measure and manage performance. According to the literature, the use of KPI has a significant positive effect on the performance of the organization. These areas include, cost, financing, design, time, customer satisfaction, flexibility, delivery reliability, safety, employee satisfaction and social performance (Bhatti, 2014). Literature does not give directly correct KPI metrics to the company because all companies are different, and so are the needs of companies. But several different dashboard models have been developed based on KPIs to help companies understand how they can effectively find out their own needs and develop a dashboard that improves the company's performance (Kucukaltan, 2016). Most common of these dashboards are balanced scorecard and performance prism, which will be discussed later in this chapter.

According to Parmenter (2015), in companies where KPI measures have noticed no effect to performance, a lack of understanding in the selection of KPI measures has been observed. It is very important that when choosing metrics, we are going in the right direction, i.e., achieving targets in relation to the goals and objectives of the organization (Bhatti, 2014). Problems have also been experienced in effectively of changing the set of indicators, as it has not been successful in defining key figures and identifying the relationships between different key figures (Kucukaltan, 2016).

Based on Parmenter (2015) previous research and books, he has developed a model to find the right measurable KPIs. In this model, it is important to define the right KPIs from the company's normal routine tasks before starting the process. The way of finding the

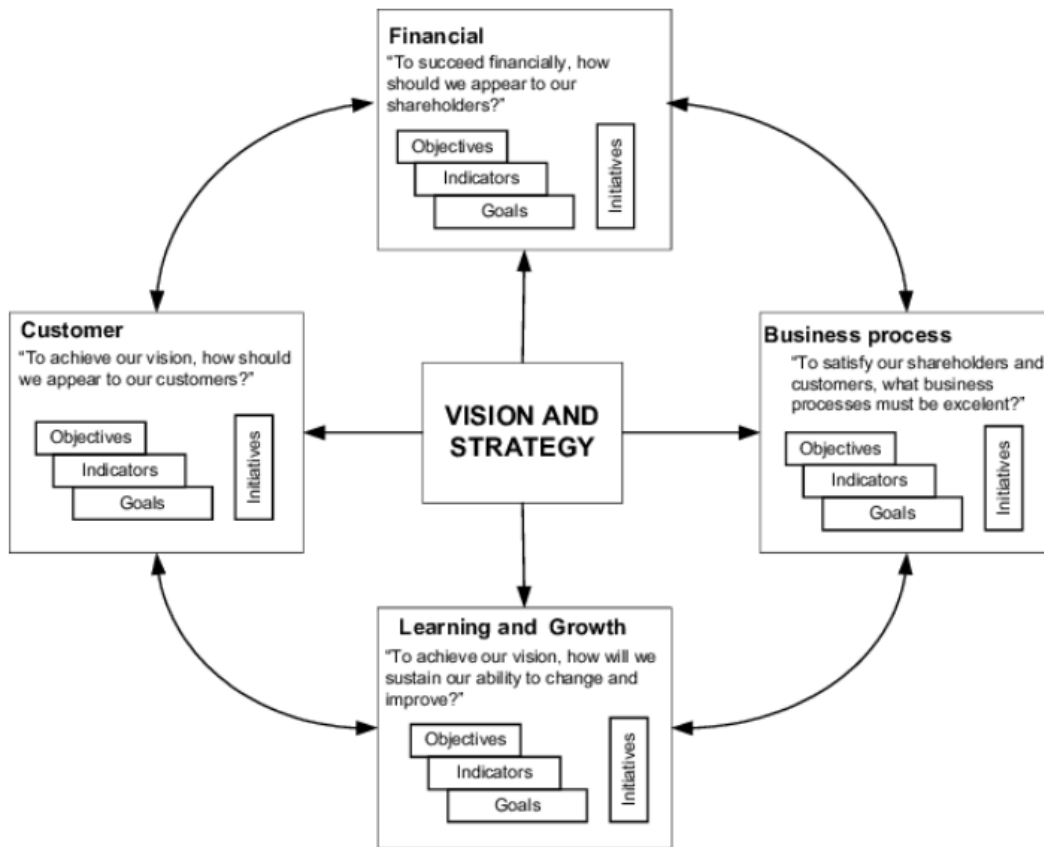
right KPI is to map the relationships in the organization's success factors and then choosing the most important one, which has related to several other success factors. This model encourages the development of KPIs by the company's internal member team, which can anyway be led by an outsider.

### **2.5.3 Balanced scorecard**

Perhaps the most well-known indicator system based on KPI thinking is the balanced scorecard. The BSC dashboard was developed in the United States and Canada in a project that implemented twelve large companies in both countries. The companies understood that the importance of knowledge and know-how is the way to success. In the companies, there was felt that the metrics that only describe financial key figures are not enough to describe the company's performance. The needs were felt to be especially in the measurement of intangible assets. This includes, for example, know-how, employee efficiency, process efficiency, equipment functionality and customer relations.

Based on the project data of these companies, Robert S. Kaplan and David Norton developed the BSC measurement system (Malmi, 2002). According to Kaplan and Norton's methodology, the BSC benefit is creating indicators which also examine the company's intangible success factors. With the help of these, the company can make better decisions and thus move the company forward. Instead of the previously used financial metrics, now the intention is to look more broadly at the company's future. For example, in financial indicators, development and improvement activities have only been shown as expense lines. With the help of the BSC, it is possible to evaluate the impact of research and operational actions on the company's efficiency (Nair, 2004). So that the future prospects of the company would be long, in addition to financial metrics, research and development investments should also be monitored.

Kaplan and Norton developing BSC model has four perspectives. The perspectives are Financial, customer, internal processes and learning and growth (Nair, 2004). Malmi (2002) points out that these four perspectives have been made according to the needs of these target companies and it is important to remember that the same perspectives do not necessarily serve all other companies. Because of this, the user of BSC should define himself these four perspectives, and not directly copy the original ones.



**Figure 6 Strategic elements of the BSC model (Haya, 2005)**

The financial perspective is often also called the ownership perspective. This is because, from a financial perspective, things that measured are the ones what the owner is interested in. The financial metrics express how well the company has succeeded in implementing the strategy financially. In addition to this, financial metrics determine the goals that strategies and other metrics in use aim to achieve. The weighting of the metrics depends much on the stage of the company. For example, a new company is

much more interested about growth than profit. (Malmi, 2002). So, the key is to develop a scorecard that naturally builds on cause-and-effect relationships, includes sufficient performance factors, and finally provides a link to appropriate actions.

Financial metrics are the most critical part of the scorecard. All development in improving customer satisfaction, quality, on-time deliveries, employee competence development and other improvements in operational activities should be reflected in financial metrics in the long run. Financial metrics should be the most accurate metrics (Wiley, 2014). Therefore, all actions should be reflected in the company's profitability at some level.

The customer perspective should answer questions about who the target customer is, what they expect or demand from us as an organization and what our value proposition is for them (Wiley, 2014). Based on these questions, the customer perspective can be divided into two parts. They are basic metrics and customer promise metrics. Basic metrics include market share, customer satisfaction, customer profitability, customer loyalty and the number of new customers. Customer promise metrics are more challenging to determine, as their content varies widely depending on the company. In general, Malmi (2002) defines customer satisfaction with the factors that a product or service needs to satisfy customers. This can include, for example, punctuality, response times, customer service and image (Malmi, 2002). According to Nair (2004), the developers of the BSC, Kaplan and Norton, stated that companies often look at basic metrics, and measuring the customer promise is often non-existent or completely absent. This is usually because it is more challenging to measure, and from a measurement point of view, collecting data for basic metrics is simpler.

Also, Wiley (2014) states that fulfilling the customer promise is the most challenging part of the customer perspective. Wiley (2014) Presents three alternative perspectives with which a company should start reviewing its customer promise. These are operational excellence, which means focusing on price and ease of use, product leadership, which

means focusing on innovating your product so that you can constantly offer a better product than your competitors, and customer proximity, which means focusing on creating long-term relationships.

From the perspective of internal processes measuring the company's processes and how successful these processes have been to achieve the financial and customer perspective goals. This can include, for example, innovation, building new functions, customer service process and product manufacturing process (Malmi, 2002). The primary challenge of this perspective is to limit the number of processes involved to only genuinely strategic ones that drive the chosen value proposition, meet customer requirements, and ultimately fuel the economic engine. Even small companies could, if asked, list dozens of processes that are necessary for efficient operation (Wiley, 2014). BSC's strength is specifically its ability to measure internal processes. Because when building a BSC, it is usually necessary to define completely new metrics to achieve the goals (Nair, 2004).

The perspective of learning and growth enables all other perspectives. This perspective includes mostly intangible metrics. For the company to be able to implement effectively, it is important to invest in the implementers, i.e., people. The categories measured here are human capital, skills, competencies, and abilities. The second is the information technology aspect. It is important to ensure that IT investments are aligned with, and support company own strategy. The third perspective is to make sure that the organization can grow and changing. Here we explore the key components of success, such as corporate culture and teamwork. It is necessary to understand that if company wants to achieve ambitious results for internal processes, customers and ultimately shareholders, where these profits can be found (Wiley, 2014).

The Balanced Scorecard was introduced in 1992, and since then there have been thousands of companies and dozens of researchs on the benefits of implementing the BSC (Madsen, 2014). According to Tawse (2023), an improvement in company

performance has been observed after the introduction of bsc. In particular, research have shown that the improvement in performance is dependent on how effectively bsc has been implemented. To maximize the BSC's chances of success, organizations must have the ability to develop it effectively, the organization's commitment to its effective use, and the necessary coordination between key stakeholders during the development and implementation process. Based on research results, Tawse (2023) has divided the keys to success in using BSc into three parts.

The first is the creation of a strategy map for the BSC. A strategy map is an effective systems thinking tool that helps determine the actions related to strategic goals (Tawse, 2023). These strategic goals should be the company's critical success factors. Because according to the literature, these are the key factors to the success of BSC (Quesado, 2017). The strategy map has been found to improve the organization's ability to reduce and prioritize goals, assess the strategic importance of complex information and mitigate the motivational reasoning bias. This way, with the help of the Strategy map, a more sustainable change can be achieved (Tawse, 2023).

The second is management's participation in BSC implementation and use. According to the literature, management commitment was one of the most important factors for successful management through measures. The argument is that committing the management to the implementation and use of the BSC improves the allocation of resources and incentives for the implementation of the BSC together with the information obtained from the strategy map.

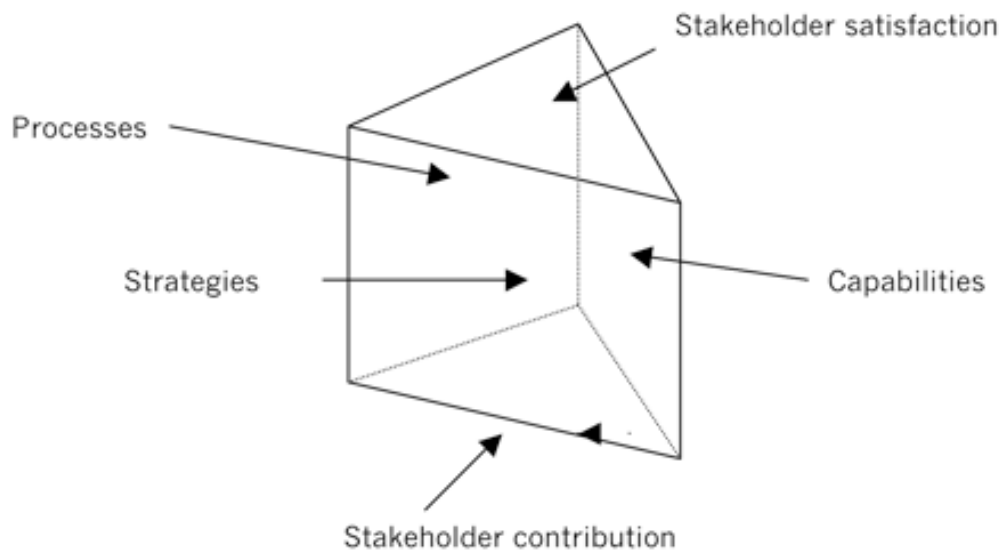
A third is good communication between stakeholders. The BSC must be consciously implemented through broad participation, regular dialogue and discussion. Communication and sharing of information between functional groups is most important in the development phase, when the causal connection is clarified and measures are chosen. All relevant stakeholders must have a good understanding of the strategic objectives and how internal processes, customer needs and organizational

learning relate to each other (Tawse, 2023). In summary, it can be stated that the advantage of BSC is its ability to take into account non-financial aspects. In order to be successful, BSC requires the identification of critical success factors and the close cooperation of management and stakeholders. Based on research, the implementation of the BSC improves the company's performance if the implementation of the BSC is successful.

#### **2.5.4 Performance Prism**

Performance prism is a scorecard what is developed at the University of Cambridge for helping measuring performance. The main idea was to developed as an updated version of the balanced scorecard (Severgnini, 2019). The idea of the balanced scorecard was perceived as excellent, but the developers think that the balanced scorecard did not respond to the changes that had happen in the organizations after balanced scorecard has been made. The developers want make a scorecard that notice changed busniess enviroment and answer today's business problems (Neely, 2001). The idea behind the performance prism is that instead of just measuring performance, to trying understand the needs of the entire company. This means that the purpose is to understand and find the needs of all stakeholders and try to fulfill them (Severgnini, 2019). Compared to the balanced scorecard performance prism's advantage is that it pays more attention to stakeholders and combines both performance measurement and stakeholder needs into one perspective, expands planning to completely new perspectives and gives its user new perspectives (Neely, 2001).

The purpose of Prism is to combine five perspectives into one perspective, and thus provide a scorecard that help managers to monitor operations through these five perspectives. These five perspectives are stakeholder satisfaction, stakeholder contribution, strategies, processes and capabilities (Neely, 2002).



**Figure 7 Performance prism (Ryan, 2018)**

First perspective is Stakeholder Satisfaction, it asking question: "Who are our stakeholders and what do they want and need? " The purpose is to define how the organization is able to maximize value creation for its most important stakeholders. This value will defined for different stakeholders and it is different for different stakeholders, for example customers typically want fast and reliable delivery of high quality products and services that offer good value for money, while employees want things like competitive pay packages, training and development, and promotion prospects when on the other hand, shareholders are more concerned about the return on their investment and the organization's profitable growth prospects compared to competitors (Neely, 2002).

Second perspective is stakeholder contribution, it asking question: "What do we want and need from our stakeholders? "In addition to the fact that it is important to understand what the stakeholders need from the organization, it is also important to understand what the organization needs from its stakeholders. It is important to find a balance between the needs of stakeholders and the organization. For example, employees often want a job that gives them meaning, a competitive salary,

advancement opportunities and training, while employers want loyalty, flexibility, efficiency and creativity (Neely, 2002).

Third perspective is strategies, it asking question: "What strategies do we need to put in place to satisfy these sets of wants and needs? "When a balance has been found between the needs of the stakeholders and the organization, the next step is to think about how to prioritize these issues in the company's strategy. The purpose of the strategy is to be a trip at the end of which the needs of both the organization and the stakeholders are taken into account to good as possible. In this strategy, managers must have to decide on the actions to achieve the desired result. So this means that the purpose is to choose the things to be examined, with the help of which the goals can be reached (Neely, 2002).

Fourth perspective is process, it asking question: "What processes do we need to put in place to satisfy these sets of wants and needs? " When the strategy is ready, it should be implemented with processes. Processes should be aligned with the strategy to facilitate the success of the strategy. Organizations most commonly define processes in four categories, they are developing products and services, creating demand for them, and fulfilling demand. To realize these manager will creating plan what process and sub-processes need to be done so all these categories are realized and strategy will come true (Neely, 2002).

Last perspective is capabilities, it asking question: "What capabilities, bundles of people, practices, technology and infrastructure do we need to put in place to allow us to operate our processes more effectively and efficiently?" The operation of the processes requires resources. The most common resources are employees, different types of tools and softwares. The existence of devices and software is not enough and training and an understanding of their operation is also needed. The combination of the information technology and people together represent the organization's ability to create value for its stakeholders through its process activities (Neely, 2002). In summary, the purpose of

the performance prism is to understand what the needs of the organization and stakeholders are, to create a strategy that enables these needs to be implemented and to develop processes that enable the strategy to be implemented. Key to implementation is the ability to connect technology understand and workers.

### **3 Research Methodology**

This chapter introduces the research methodology and considers the choice of the research method. The chapter also introduces the research approach, data collection strategy and data analysis. Last, strategies to ensure sufficient research quality are presented and discussed.

#### **3.1 Research methods**

This thesis research method is qualitative research. Qualitative research is market research based on non-numerical data. This research method focuses on finding out the answers to the questions "what" people think about the subject being interviewed and "why" people think that way. Qualitative research can be used to gather deep insights into a problem or create new ideas for research. People's experiences are often complex and difficult to understand, that's why it is important to use online interviews when collecting non-numerical data. Online interviews are more communicative and descriptive, which makes it easier to understand the answers to the questions what and why. There are different techniques in qualitative research. These techniques are one-on-one interview, group interviews, ethnographic research, case study research, record keeping and process of observation. (Bhat, 2023).

This thesis work qualitative research has been done by using interviews. Interviews are a more intensive and personal technique compared to other techniques. In interviews, the interviewee is able to give detailed feedback and the researcher is able to lead the interviewee in the right direction if he notices an interesting detail. In interviews, the interviewer should use open and follow-up questions. With those methods and questions, interviews provide flexibility for both interviewer and interviewee through two-way communication and participation. These interviews also offer the opportunity to develop a certain feeling of closeness between the interviewer and the participant. In these situations, the interviewee usually feels that they can speak more freely (Tegan,

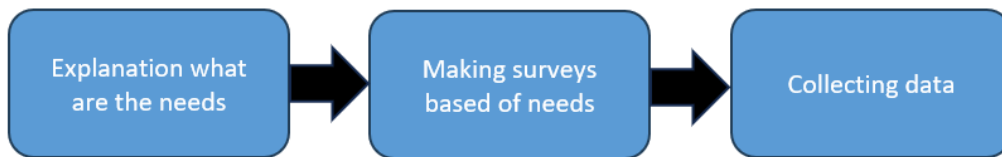
2022). According to Creswell (2017), he also point out that it is important to note that when asking open-ended questions and follow-up questions, it is important to ask questions that do not lead the interviewee on. If the questions lead the interviewee on, it makes the whole interview unbelievable. Also in interviews it is good to target a group of suitable size, the different interviewees bring their own perspectives, experience and interpretation. For this reason, the material is much more versatile, which takes into account several different aspects (Creswell, 2017).

The methods of data collection have been chosen based on the research question of this thesis. In the data collection, have decided on Interviews regarding the need for meters and the collection of data coming to the meters, because the research questions focus on the information that can be found from the people being interviewed. In terms of Power BI visualization, it has been decided to utilize data from studies outside the company in order to gain new perspectives and information about the visualization of KPIs. The questions of the interviews in this study are more semi-structured and unstructured interviews than structured interviews. This is due to the nature of the work, because at the start of the work it was not known what the content and quantity of the desired metrics were.

### **3.2 Data collection**

This subchapter presents the methods by which the data has been collected. This subchapter has been divided according to the interviewed group into the content of the metrics, collecting organizational data in company systems and the visualization the data to meters. Data collection has been carried out by conducting online interviews with the company's managers and labour and by utilizing research related to the topic. Data collection has been started by finding out what the needs are for the meters and the parts that support the measurement. After this, more detailed interviews and studies have been conducted to find out how to fulfil these needs, and finally collecting data together. In Figure 8 data collection process has been showed in simplified.

Data collection has been started by finding out what the needs are for the meters and the parts that support the measurement. After this, more detailed interviews and studies have been conducted to find out how to fulfil these needs, and finally collecting data together. In Figure 8 data collection process has been showed in simplified.



**Figure 8 Simplified collecting process**

### **3.2.1 Needs of meters**

In need of meters interviews purpose is to interview the unit's management, about what the needs are in terms of the whole. After this come interviews about the needs of individual meters, where interviews persons who has most know about the meters main area. First as group interviews, with goup size six to twelve person to get an overall picture, then as individual interviews using open ended questions to extract opinion and concepts from the respondents. The purpose is to first map out the themes in the group interviews, and then, based on the themes, target the interviews to those who know the most about the theme.

### **3.2.2 Needs of data collection**

The collection of data from the data collection has been carried out in two stages. This is because the target company is fragmented in many location of the world, and the data collection processes are not uniform. For this reason, the first step is to examine the strengths and weaknesses of different data collection systems and find out which of

them is suitable for this study. The first step was done by conducting online interviews for the unit's management. The purpose of these interviews was to survey the data collection systems in use at the factory, information about their operation, challenges and advantages. The interviews were unstructured interviews.

The interviews of the second stage were conducted for the company's data analytics team. These interviews were structured interviews. These interviews included targeted questions based on the information obtained from previous interviews about challenges and limitations, as well as open-ended questions about the possibilities of other alternatives.

### **3.2.3 Needs of visualization**

Data visualization research and practical applications have evolved over the years, resulting in a wealth of knowledge and techniques. By searching and building on this previous work, this thesis work can utilize existing knowledge and avoid reinventing the wheel (Kankkunen, 2005).

One key benefit of utilize existing work is the opportunity to learn from successful visualization designs and methods. In addition, existing studies often provide valuable information about users' perceptions, preferences and cognitive processes related to information visualization (Duke, 2013).

Data collection for the right kind of data visualization was done by utilizing scientific articles and studies on the subject. The articles and studies used in the data collection were reports from previous projects where performance KPI indicators have been built for the production facility.

### 3.3 Data Analysis

The purpose of data analysis is to gather meaningful information from the materials of the interviews to reveal patterns, relationships and trends and transform it into useful information for measurement. Data analysis involves organizing, cleaning, and processing data to identify pattern deviations and correlations. Data analysis helps to make informed decisions, understand complex phenomena, optimize processes, and solve problems (Kelley, 2023).

To analyzing data in this thesis work using data driven content analysis. This means data reduction, grouping and abstraction and purpose is to find the success factors that were critical in terms of operations, and to delineate from needs and success factors things that were not related to performance in themselves and where no actual measurement target could be found. Data driven content analysis purpose is to go through the material several times carefully and look for similarities in the answers. From the similarities are formed in own categories, with the help of which it is possible to outline what things are important to the unit and using them to develop customized metrics for the unit. In doing this, the Qualitative analysis classification tree has been used as an aid, which is explained in the picture below.

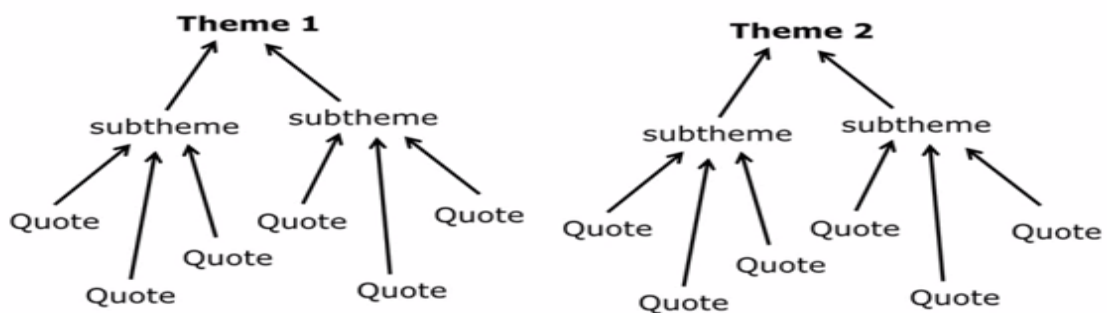


Figure 9 Qualitative analysis classification tree (Schulz, 2023)

Data-based content analysis was chosen as the main analysis method because it offers an objective, evidence-based approach to identifying KPIs. It ensures that KPIs are relevant, measurable, and aligned with the organization's goals, enabling informed decision-making and continuous performance improvement. In the analysis, the purpose is to find KPIs that tell what has happened, and to make sub-categories for these and, if necessary, further sub-categories of sub-categories, to respond to the change in KPI and why the change has taken place. The results of the analysis will be elaborated in chapter 4 and a discussion from their basis furthermore will be done in chapter 5.

## 4 Results

Chapter four is the empirical part of the work. The empirical part of the work is presented in the following subsections. This part aims to describe the implementation of the performance metrics created for the selected target organization as precisely as possible. In this part, the stages of the interview research are discussed, and information is given about the implementation of the research. The chapter contains justifications for the choices related to the research method and the phases of the research implementation. At the end of the chapter, the research results and the observations that emerged in the interview research are presented.

This part aims to describe the implementation of the performance metrics created for the selected target organization as precisely as possible. The chapter goes through current meters, but at the same time possibilities for new or replacement KPI measures are also explored. Regarding different performance measures, we also think about how to get more out of them and how to improve the values of the reference number.

The conclusions of the study have been opened in a separate chapter, where the research results are illustrated and discussed.

The goal of the empirical part was to build an easily interpretable and a simple performance measurement entirety. Based on the interview round, the selected metrics were well justified using the theoretical part of the work as help. The meters were implemented with the Power BI tool. This work produced the first version of the performance meters, which will continue to be refined and tested after this work. At this stage, the dashboard was built based on the goals of the unit's management for the use of the company management and partially the entire staff.

The work data was collected by conducting online themed interviews and using semi-structured and unstructured questions. With the help of the interviews, a comprehensive picture of their needs to support the management of their own area was obtained from the key people of the organization.

The research problem of the thesis was to develop a usable performance measurement tool for use by company management and other personnel. From this, the research of the thesis could be led into questions: what would be the metrics that would be used to monitor and evaluate the realization of the vision, and how a balanced set of metrics could be formed from the perspectives presented. The work was carried out as qualitative research. The research strategy was a constructive strategy, i.e., the aim of the thesis was to build a concrete output, which would be a tool designed and designed according to the considerations and needs defined by the management itself, to support management and balanced perspective thinking.

#### **4.1 Mapping of the current situation**

In this chapter, presenting the current situation of the case company's performance meters, and especially the current situation of the customer support performance measurement. This chapter is intended to answer to the research question first two objectives which are "To identify the metrics needed to facilitate performance measurement via different sub-regions" and "To identify and define the different tools necessary for performance measurement".

The mapping of the current situation was accomplished through unstructured interviews with the unit's managers. The unit has a total of three managers. The interviews revealed that the current metrics were developed a long time ago and probably have never been updated or questioned. It was also discovered that the current meters are designed for two purposes. The first's purpose is to communicate the unit's situation to the company's management. Second, the unit's personnel employed performance metrics, which served as the data for the employee bonuses. The purpose of the metrics is to support the daily operational activities of the unit. For this reason, the measurement results should be updated at least once a day.

The unit is divided into three teams, and the number, use, and location of the current meters are different. however, there are three issues were identified as being shared by

all of them. First is that there are too small number of meters. The current meters cannot accurately monitor the unit's true performance. The second problem was manual filling of the meters. Requirement was to automate the updating of the meters. The third issue was the visualization of the meters, as they are currently just consecutive numbers in an excel table.

The interviews also revealed that projects were implemented in the unit to obtain information that the current metrics did not provide. The number and nature of these projects were unknown to management, and one of the tasks was to determine whether it would be possible to use these in the development of official metrics, avoiding double work. Other units' meters were also advised to be examined, as information relevant to this unit could be found in their meters. It is also worth noting the fact that there have been personnel changes in the unit's management in a short period of time. For this reason, the state of the work was also to call into question the current KPI metrics.

Based on the interviews, the current metrics were divided into three parts, according to the teams. In this work, these teams are named as follows: order handling team, order change team and project managers team. Order handling measurements had been added of an excel table, in which KPI numbers were manually compiled. These meters include the current workload, the number of technical errors, as well as the age of the tasks and the OH rate to be reported to the company's management. Order change metrics were in the Salesforce tool, which was where the majority of the team's tasks were. These metrics included the number of tasks, which were divided into categories based on the Salesforce tool's own categories. Project managers didn't have any existing metrics.

Several ways to data collection have been developed. Due to the company's fragmentation into several different factories around the world, several different data collection solutions have been implemented within the company. The main tools that the unit uses, and from which it need to collect data, are SAP, OMS, Salesforce, and

Outlook. The most common method was to collect data with an automated robot and save it to a SharePoint or OneDrive service. Later, as the thesis work progressed, it also found that the company also has the option of using the data warehouse and the process mining tool to collect data. I interviewed the manager of the company's global analysis team, as well as the team's corresponding persons from data warehouses and process mining about their operation. These tools are still in the development phase, so their use for the needs of this work was felt to be limited when considering the purpose of this work. These data's is visualized using Excel or the Power BI application. The Power BI metrics are published on the company's own Power BI website, where the company's management has access to meters view.

Based on the initial interviews the metrics were set two goals emerged from interviews with unit management that the performance meters should be able to implement. Managers should be able to make data-driven decisions with the help of metrics; in other words, the goal is to be able to lead with metrics. Managers also should be able to see the quality of the unit's work, i.e., using meters to see how well the unit performs in terms of errors. Because the respondents did not know if the right metrics and KPI are being used to measure the company's performance. A very important part of the purpose of this thesis work is to find out why some indicators are chosen and how systems or frameworks guide the selection of indicators. This was the point of view from which the design of the meters should start.

## **4.2 Results and analysis of the interviews**

Based on the initial interviews, I decided to divide the interviews into four parts. The needs and work of team's order handling, order change and project managers are completely different, which is why I decided to divide their interviews into their own parts. There were also numerous options for the data collection process, and the company did not have a clear practice for implementing this, so I decided to take this as its own entity as well, to find an optimal solution according to the unit's needs. A few

questions were set about the themes of the interview to guide the theme to stay on topic, but otherwise the interview is very free from the point of view of the intendand due to the open questions. The purpose of open-ended questions is that the researcher does not tie the answers too much to their own preconceptions. The background of the themes is got from the management perspectives obtained from the initial interviews. There were two main themes in the team interviews, with the aim of being able to direct the interviewees to the right topic, and at the same time give space for open answers, without be leading. These theme questions are:

1. Are the current metrics capable of measuring the team's operational situation, include team performance and current situation?
2. What is good measurement density and what are the problems in performance measurement implementation?

#### **4.2.1 Order handling team interviews**

The interviews of order handling team were carried out by interviewing the team leader and four of the team's most experienced employees. The interviews were conducted in two interview rounds. The first round mapped the overall picture and needs, and the second round was intended for clarifying questions when the understanding of the needs was grown up.

The first theme was the measurement of operational business. In other words, how adequate were the current meters perceived to be. In this theme, it became apparent that the current metrics are focused on measuring numbers that are reported upwards, as well as numbers that are used to define team workers bonuses. In the interviews, it became clear that the team also has many other responsibilities, which are currently not measured at all, and it is not possible to estimate how much these require from the weekly working time. The complete collapse of the areas of responsibility was perceived

as the biggest problem of the entire measuring. Another important problem that came up in the interviews was that the amount of work was measured only by the number of confirmed order lines, and the measurement did not notice at all how laborious the order lines are. Three topics came up in the interviews, which affect how long it takes to confirm the order line. These are the errors on the order, the quotations on the order, and the number of variant codes on the order.

Second theme was measurement density and what are the problems in performance measurement implementation. The current measurement density was clear to everyone, once a day. The measurement was carried out manually by collecting data from the SAP and OMS systems in the morning before nine o'clock. This was because the numbers had to be reported to management daily. So, as a minimum, the reporting interval should be once a day and reporting once a day was felt to be good.

The method of measuring the "OH number" of the second main meter was especially perceived as a problem. The number was considered problematic because it measured the team's success, but the level of the OH-value was felt to be more influenced by external factors than the team's performance. The availability of meters was also perceived as a problem. The situation of the meters was pitch into in a meeting held once a week, but otherwise interviewees felt that the information is not available to the employees. In the team leader interview, a contradiction in measuring time goals also came up. Current situation is that three different times were measured, but the upper management only followed one time goal. The interview revealed a clear need to harmonize the team's own metrics with the company management's metrics. Third clear problem seems to be volume of the workload. The variation in workload growth or drop is several tens of percent, and there was no prospect of a future workload. The interviews also revealed that manual data collection is carried out at different times on different days. Which weakens the comparability of readings between different days.

As an analysis, it can be stated that the narrowness of the meters was perceived as a problem. The current metrics do not tell the real performance, as well as the lack of areas of responsibility. Also, problem seems to be that the meters must be updated daily on manually and manual work requires time and exposes to errors. This means that the metrics do not tell the objective truth about the team's performance. The real performance is obtained by starting by looking at the numbers of the metrics, and then having a 10–20-minute conversation about the reasons behind the numbers in the team meetings. So, after this will we get the real situation of the team. In summary, based on the interviews, it can be stated that for order handling teams, the goal is set to have a dashboard that automatically makes information available to the entire team, and is able to tell the team's workload and performance as objectively as possible.

#### **4.2.2 Order change team interviews**

The interviews of order change team were carried out by interviewing the team leader and three of the team's most experienced employees. The interviews were conducted in two inter-view rounds. The first round mapped the overall picture and needs, and the second round was intended for clarifying questions when the understanding of the needs was grown up.

The first theme was the measurement of operational business. In other words, how adequate were the current meters perceived to be. Order change teams answers also showed that the ability of the current metrics to measure the team's performance was lacking. The problem was felt to be that the work tasks of order change team were mixed with the work tasks of team A in the meters. One of the tasks of this team is to make order changes which found in Salesforce cases. Also, order handling team make these cases and responsibility is divided as follows, order handling team performs the order changes if the order change is related to an order that has not been confirmed, and order change team if the order has been confirmed. In the meters, however, these were measured as a single entity, and this needed to be changed.

Another recurring problem was the number of errors. The interviewees felt that it would be important to be able to distinguish more precisely the changes that are made due to an error, and to be able to better categorize the reasons why these errors occur. The interview also revealed that previous projects have already been done to define errors. In these projects, it has been found that most of the errors are related to variant codes (VC). An excel macro has been built for the breakdown of errors, which retrieves information about errors from the notifications opened for them from the SAP system. However, the answers showed that excel macro was perceived as insufficient. The Excel macro was not able to divide errors according to variant codes. The categorization of errors by country also did not work, as the measurement of errors used the sending country, not the buyer's country, where the error is originated.

As an analysis, it can be stated that team B's biggest needs in the development of measurement were better separation and distribution of Salesforce cases, as well as better monitoring of errors from the point of view of causes and direction.

#### **4.2.3 Project manager team interviews**

The interviews of project manager team were carried out by interviewing the team leader and two teams' employees. The interviews were conducted in two interview rounds. The first round mapped the overall picture and needs, and the second round was intended for clarifying questions when the understanding of the needs was grown up.

The interviews revealed that the project manager has virtually no metrics to monitor their performance. First, the interviews asked questions about how to measure the efficiency of the project managers. Based on the interviews, the interviewees did not know how to define the things that could be used to measure their effectiveness. This is due to the nature of the work of project managers, as it contains enormously changing situations that are challenging to measure.

In the interviews, it became clear that in terms of the project managers' performance, metrics would be needed to monitor the amount of work. Project managers are employed in situations where the completion and delivery of engines does not go according to plan and requires project managers to clarify work.

#### **4.2.4 Interviews about data collection**

Clarifying data collection was felt to be important because several different methods are used to collect data and it was felt to be important to find out which of them is the most important from the point of view of customer support. Regarding data collection, the interviews were carried out in two parts. In the first, Motors' own development team was interviewed about their solutions in terms of data collection. After the interviewer had gathered information about the current situation, ABB's global data analytics team was interviewed about alternatives, and an attempt was made to find solutions and new opportunities from a perspective that considers the problems and challenges of the first interviews. Three employees from Motors' development team who were involved with data collection were interviewed. From the global data analytics team, its manager and three employees were interviewed, one of whom worked in the development of data collection processes, one in the development of Power BI metrics, and one in data analysis tasks.

The interviews of the development team were based on open questions, where the only guiding factor was to understand the possibilities of data collection for the customer support unit. Three themes were set for the interviews of the development team, which are:

1. Customer support needs daily real-time data about the operational situation. How to make this successful from the point of view of data collection.
2. Customer support measurement is continuous improvement. How quickly can additions to data collection be made?

3. Customer support metrics are placed in the Power BI system, how compatible is the data collection with Power BI?

The interviews of the data analytics team were carried out in semi-structured interviews. These interviews included predetermined questions followed by some probing questions to elicit information from the respondents. The predetermined questions were compiled based on interviews with the Motors development team.

The development team solution is to use automated collection system to download data in sap to C-file. This data is downloading in transaction shape. After this c file information will automate downloading in SharePoint system, where information is available to the Motors employees. The data collection of several other Motors Power BI meters was already carried out through the SharePoint file, so experience in using SharePoint as a data source had been accumulated. From the point of view of Customer Support's needs, the interviews revealed two critical problems with the use of SharePoint in data collection. These are the bugs and the gathering of new information.

In the interviews, it became clear that there are often breaks in the automatic operation of data collection, after which the members of the development team manually transfer the updated files to SharePoint. Different interviewees gave slightly different estimates of how often these interruptions occur, but the average estimate based on these interviews is about four times a month. One interviewee also noticed that interruptions usually occur precisely in the connection between C-file and SharePoint. Another important point in the interviews was the demandingness of the changes to be made to the data. To add new information to the data, a new column for this information must be added to the transaction. Getting new information into the transaction depends on the location of the information, but generally the estimate of the duration of the change is several months. Regarding Salesforce data, Motors had no practice in collecting data. The data was manually uploaded from Salesforce directly to Power BI.

As an analysis, it can be stated that it has not been purposeful to monitor the daily operational activity of the SharePoint files due to interruptions. These are better for tracking metrics like monthly reports. Also, from the point of view of continuous improvement, getting new information into the collection creates challenges. Based on the analysis of both team interviews and development team interviews, it can be concluded that the biggest obstacle to the success of continuous improvement and data-based management is getting new information into the metrics.

In the interview with ABB's global data analyst team, I focused on finding solutions to local data collection problems. From this point of view, three themes were formed for the interviews.

1. How can ensure access to data so that the unit is able to make data-based decisions about the operational situation on a daily basis?
2. How can data collection be made easier so that the slowness of development is not an obstacle to the continuous improvement?
3. How to automatically get data from Salesforce into Power BI.

In interviews with the Global Data analytics team, it became clear that there are two other options for data collection. Snowflake as a data warehouse and Celonis as a process mining tool. Large amounts of data had already been collected in the Snowflake data warehouse. The interviewees believed that the Salesforce data that found in snowflake could cover the needs of our own unit in terms of Salesforce data just by changing the filtering. From the SAP data side, the challenge in using snowflake was our specific needs. Snowflake's data source was used by all of ABB, and thus only data that benefits several units is collected there.

Based on the interviews, two options were given for this. Either build your own data unit for the customer support. The schedule for this was estimated to be about half a year,

because snowflake's development team had a backlog in the number of requests. Or wait for an update of snowflake from factory-specific data sources to be built, after which our own development team would be able to build Snowflake's data collection system for the needs of our unit. The schedule estimate for this was during November 2023.

### **4.3 Results and analysis**

This chapter introduces how the company's strategy and critical success factors are led to performance metrics and a whole is created that enables data-based management. In this chapter, concrete solutions for different metrics are presented, as well as considering their meaning and essentiality for the target team. The goal of the chapter is to present a solution to the thesis research question "How to conduct performance measurement in customer support using Power BI?" This chapter is divided into three parts because there are three teams in the unit with individualistic needs, and thus the dashboards are built for each team separately according to their needs. The dashboard was distributed in the same way as it was defined before the interviews, i.e., to order handling, order changes and project managers.

#### **4.3.1 Development of order handling metrics**

The order handling measurement system was developed based on the answers from the interviews. In the development of the dashboard, the previous dashboard of order processing was used as a basis. The suitability and correctness of the original metrics were questioned, and the dashboard was expanded to give an objective picture of the team's performance and enable data-based decision-making.

The new metrics selected for order handling are:

*Oh-start number*, which tells you how many orders have not been confirmed and production can start immediately. The Oh-start number is the number required for the management meters, so keeping it is mandatory. However, in the analysis of the

interviews, it was found that the OH- number does not reflect the team's performance, because the number is affected by external factors. Because of this, two supporting indicators were developed alongside the OH number. First tells how many new orders have entered to the OH number and the second how many orders in the OH chapter require an engineer's check, before which order handling cannot confirm the trade.

*Number of unconfirmed orders*, which tells how many orders have not been confirmed. A target level was added to this number, which is used to monitor whether there is a need to call hourly collectors to work or hold overtime.

*Over week or under week old orders*, which tells how many of the orders have been waiting for confirmation for less than or more than a week. The previous color-coding system was abandoned. Based on the interviews, color-coded late meters were recorded on the dashboard, but the values of the numbers had no effect on the work. Orders over and under a week old are based on the goals set by the management. By setting the goal of confirming orders in less than a week, a clear OTD-metric was also obtained, with which management can easily monitor whether prioritization is needed with the oldest orders. In addition to the team, the sales units' effects to the confirmation. In order to be able to distinguish whether an unconfirmed order is more than a week old due to the sales company or the team's performance, orders that are more than a week old and awaiting action by the sales company were separated.

*Confirmed orders*, which tells how many orders has been confirmed. This is the single most important indicator of how well the team has performed. In this measure, the problem was found to be that there are huge differences in the workload what need to do before order handling can confirm order. Incorrect orders and order reviews are particularly time-consuming. In order to be able to understand the real performance, a support meter was made for the confirmed orders, which tells the number of incorrect orders. In order to mark incorrect orders, the instructions were changed so that a notification must be opened for all incorrect orders, where the reason for the error is

explained. The order review is in the investigation of the unit's management, and they did not want a separate measure for this until the investigation is ready.

*New orders*, which tells the number of new orders. This meter helps to tell how much new workload has come. In the research about the correctness of the meters, it became clear that the value of this meter did not tell the exact number of new orders, especially in situations where there were connection problems, the meter value could give a clearly distorted picture of the situation. As a solution, the data collection of this meter was moved from the OMS system to SAP's VA05 transaction where the same problem do not exist.

*Orders not under the work*, which tells how many of the unconfirmed orders are not working. This metric meaning is also to support the understanding of workload. If the number is high in relation to the total number, it indicates that the work queue has few challenges, and if the number is low in relation to the total number, it indicates that there are many challenging orders in the work queue.

*Oldest order*, which tells the oldest order in the work queue according to the booking date. The purpose of this is to signal to the management, if there are too old orders in the work queue, so it is necessary to act.

*Technical errors*, which tells you how many orders are in error due to the system. Based on the interviews, correcting these daily is important.

*Assembly line* tells which assembly line motors are in the unconfirmed orders. Based on the interviews, which motors are on which assembly line is one of the most common questions asked from the unit's management. With this meter, it is also possible to prioritize work directly on a certain line, which was not possible before.

*Double orders*, tells how many orders have entered the system as doubles. This does not directly affect order handling performance, but if a double order is produced, expensive waste is created, which was considered important to avoid based on the interviews.

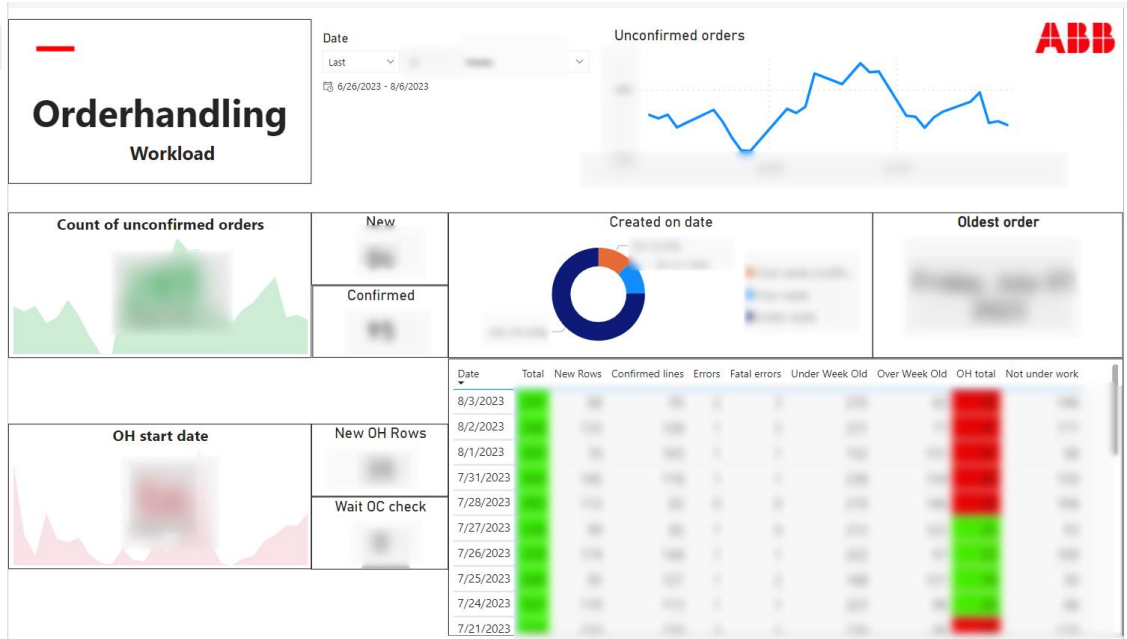
In addition to these, order handling has several responsibilities, which are certifications, spare parts orders, after sales orders, manually opened orders, plate orders, proto-orders, mod orders, consignment orders and export control activities. It is intended to build measurement to measure the amount of all of these. However, when the work is completed, proto-orders, mod orders, consignment orders and export control activities data collection is still in progress. These functions are handled via e-mail. Based on the interviews, handling via e-mail is impossible in terms of data collection and challenging in terms of systematization. In the interviews, it became clear that the problem was felt to be that requests coming via e-mail can easily go unnoticed and it is difficult to tell if someone else has already acted on the request. Based on the interviews data collection is to facilitate the transfer of these functions from e-mail to Salesforce. Salesforce enables data collection and facilitates systematization. However, this requires a Salesforce update in order to categorize the responsibilities. Based on the interviews, the update can be possible done by the end of September 2023.

After the interviews, the biggest challenge in planning the construction of the meters became the large number of order handling responsibilities. According to the Kankkunen (2005), eight to twelve meters is an appropriate number to measure performance, because a larger number distracts from the essential. In terms of clarity, it would be important to find a few main KPIs to track.

As a solution to this problem, based on theory, it was decided to build a separate main page in Power BI, from which you can see the KPIs defined as the most important information what to follow and get a direct clear picture of the operational situation of order handling. As well as help with pages that can examine to find out the basis of performance. Based on the interviews, four main KPIs were selected, which are the number of unconfirmed orders, OH-number, oldest order and OTD.

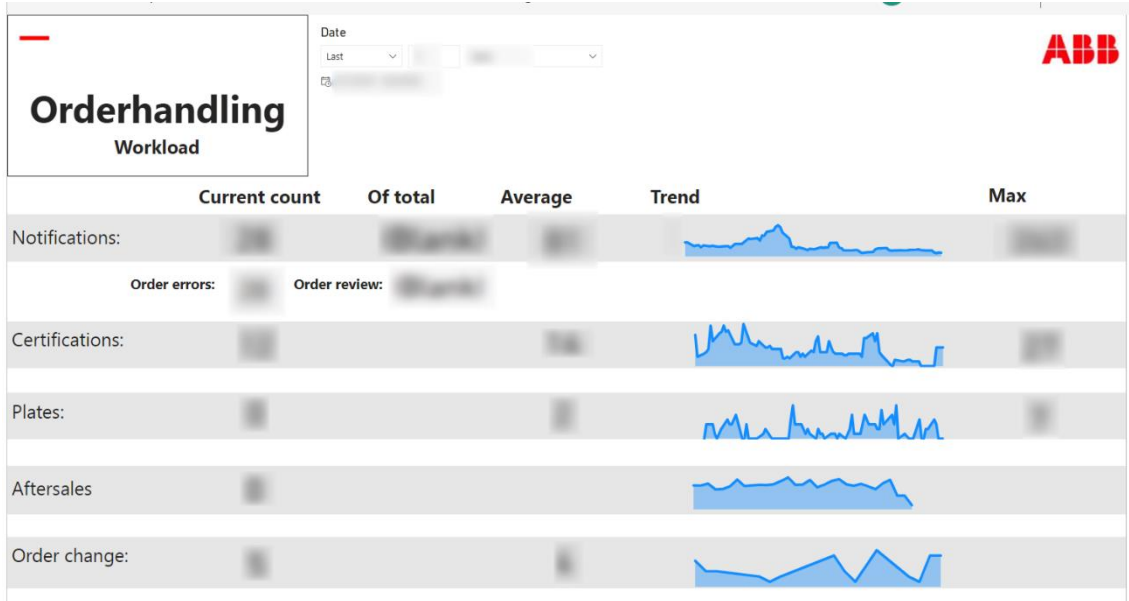
The design of the visualization was based on theory. According to Duke (2013), the human ability to illustrate visual images is limited. Often in BI tools, people tend to make visualizations that are too full or complicated, which leads to misunderstandings. The meters are placed in the same place as the other Power BI meters of the motor factory. For this reason, visualization of other pages was considered to make the pages similar in style. Based on the interviews, it was decided to measure performance every day.

From this starting point, the home page of the dashboard was designed so that the KPI values are the first to catch the user's eye. The home page is intended to give an informative and clear picture of the situation in Order Handling (Figure 10). The purpose of the main page is to present the situation of KPIs both quantitatively and is it on target. The numbers on target are in green and those not on target are in red. On the main page, the purpose is to be able to superficially follow the trend, in which direction the workload has gone, and to see the situation of the most important performance-related measurements after the KPIs. The meters are placed in the same place as the other Power BI meters of the motor factory. For this reason, visualization of other pages was considered to make the pages similar in style.



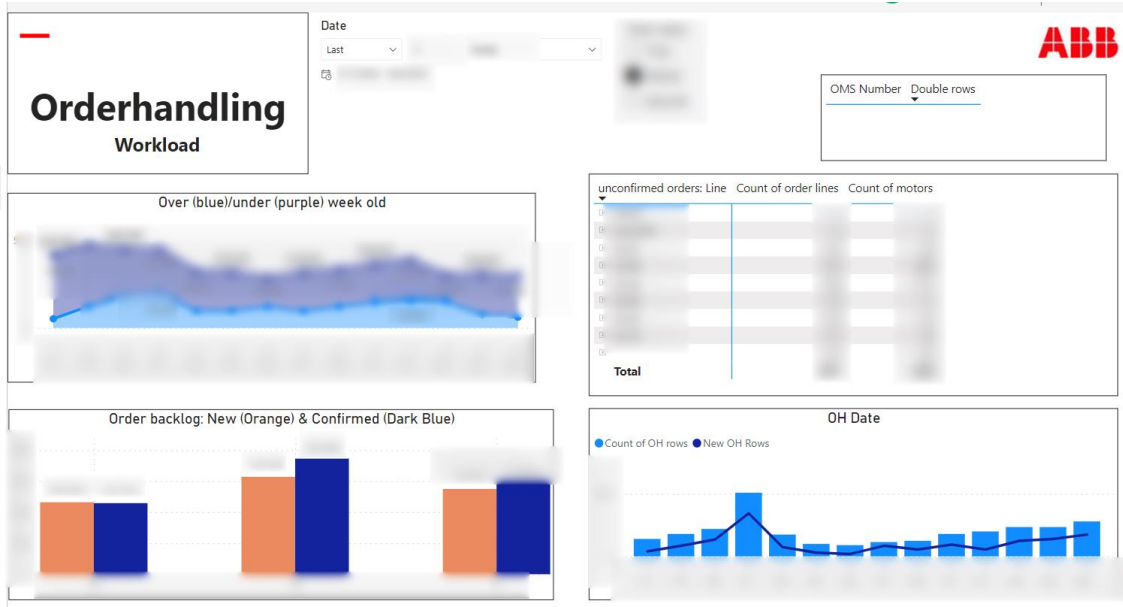
**Figure 10 Order handling main page in power BI**

A support page (figure 11) was built on the main page, which is important to follow, but which are not as critical in terms of performance as the metrics on the main page. The metrics of this page consisted of the situation of the order handling other responsibilities. The pages present the current situation, as well as the trend, i.e., what has been the average situation, as well as the maximum situation, as well as the possibility to monitor changes in the employment of the responsible shifts.



**Figure 11 Order handling support page in power BI**

The third page consisted of performance analysis. On this page, the unit's management and employees can check the historical development from the perspective of performance. Assembly line information was also placed on the page, because that information is not important from a performance point of view, but it provides important information for prioritizing the lines.



**Figure 12 Order handling performance analysis power BI page**

#### 4.3.2 Development of order change metrics

The order change team measurement system was developed based on the answers from the interviews. The performance measurements were divided into two different tabs. The first one presents the current operational situation of the order change team, and the second one allows user to view historical data.

The new metrics selected for order change team are:

*Count of cases*, which indicates the number of open cases in the order change queue or in the authors' own queues. The figure shows the current workload.

*Average answer time*, which tells how long it takes on average for sales unit open new case to be taken over by someone changing the status "new" to something else. The figure illustrates the performance.

*Count of case number by case sub type*, tells the number of open cases, divided by the type of request in the case. Based on the interviews, the current classification of cases

was felt to be insufficient. Based on the interviews, made a new classification of the cases. Figure 13 shows the new types of cases. These changes have not yet been updated to salesforce, but the changes have been accepted by all units.

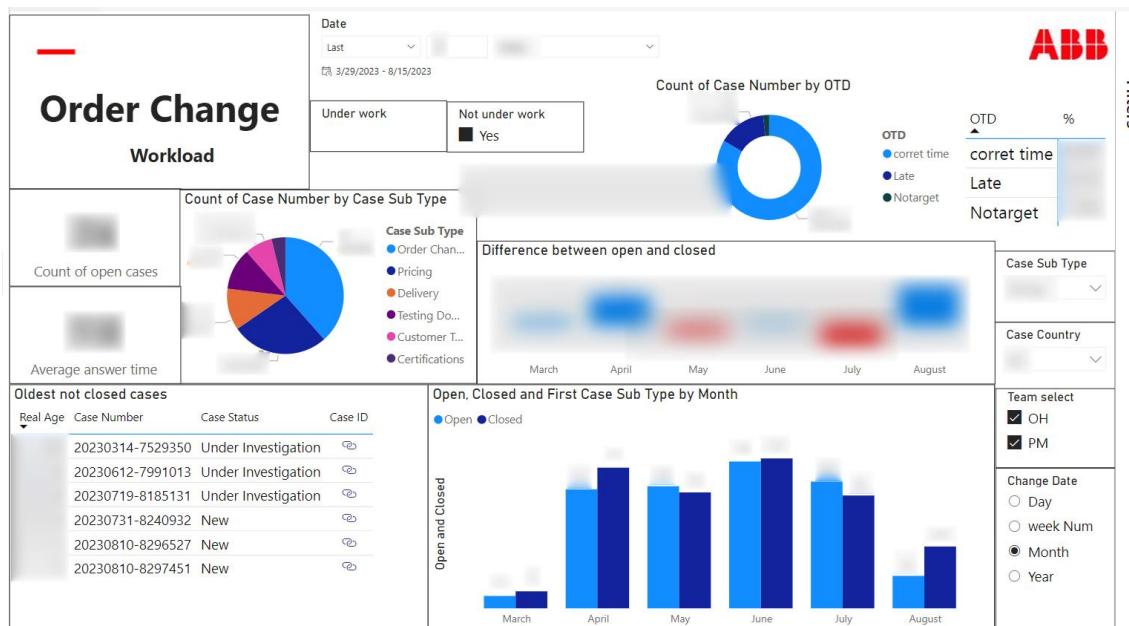
	Case type	Sub case type
New case types and sup types	Commercial Support	Add New Product / Increase qty
		Back Charges / Liquidated Damages / Penalties
		Cancel line item / Decrease qty
		Change Address
		Change Complete Shipment
		Change Material
		Change Shipping Method
		Changes in Milestones
		Credit Notes
		Customer Testing
		Delivery
		Expediting Order
		Export Control
		Missing Order Ack. / Order Confirmation
		Order Cancellations
		Order Change
		Order Change Management
		Order Conditions
		Order Status
		Postpone Order
		Pricing
		Testing Documents
	Various Administrative	
	Commercial Support (unconfirmed orders)	Customer Testing
		Delivery
		Export Control
		Order Cancellations
		Order Change
Missing Order Ack. / Order Confirmation		
Pricing		
Testing Cocusments		

**Figure 13 New Salesforce case categories.**

*OTD value*, which tells how many cases are resolved on the time. All cases have not a time target, and these are named under "no target" bar. The figure illustrates the performance.

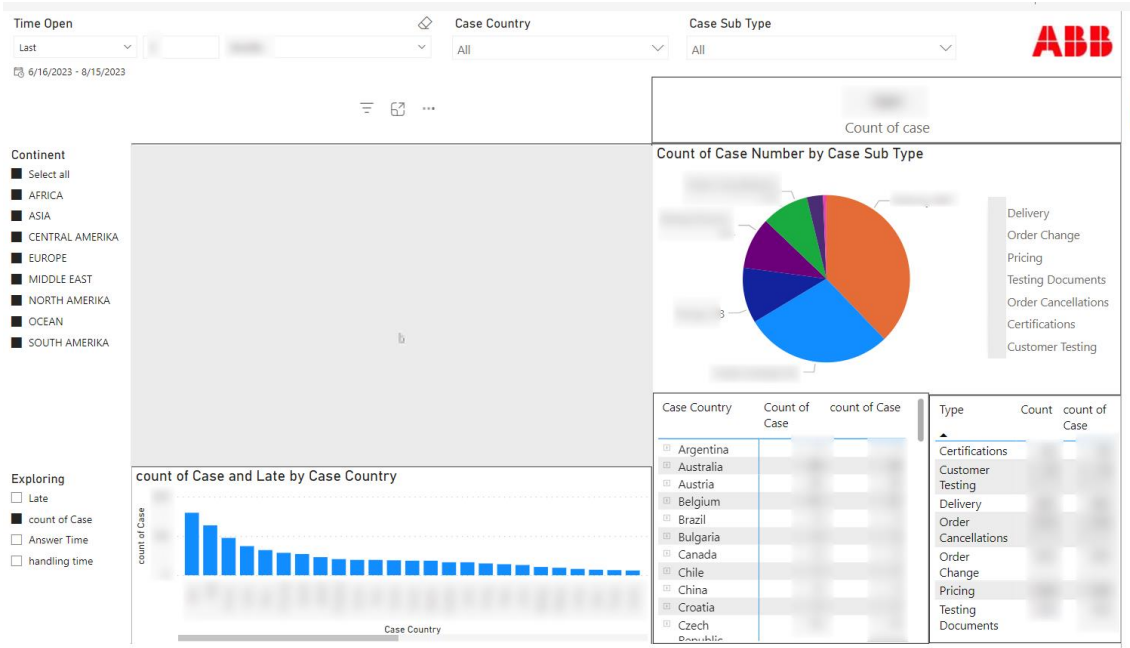
*Oldest cases*, which tells how long it has been since the cases were opened. The purpose of this is to monitor that if the cases start to be too old, the team manager can ask questions and support in finding a solution.

*Count of cases by time*, which shows the number of new cases in relation to confirmed cases and illustrates whether the workload has been increasing or decreasing.



**Figure 14 Order change workload based on Power BI**

Based on the interviews, it became clear that it is also necessary to monitor the situation from a historical point of view regarding sales changes. To be able to make an analysis of the performance of the sales changes and based on this to develop operations and give feedback to the sales units. Two review perspectives were created for this. One is to monitor development by case type and the other to monitor per country. The number of cases, the number of late ones, the duration of case processing and the average response time were chosen as categories for the analysis. The analysis tool is shown in Figure 15.



**Figure 15 Order change historical performance based on Power BI**

### 4.3.3 Development of project managers metrics

The project manager team measurement system was developed based on the answers from the interviews. Due to the nature of the work, it is not possible to build a metrics for the project managers' performance. For this reason, the meters were built to support the activities of project managers. The performance measurements were divided into three different tabs. The first presents the situation of motors being late. The second set of metrics that the project managers monitor in their daily operational work and the last set of financial figures for reporting ahead.

The new metrics selected for order change team are:

*Number of late*, which tells the total number of overdue motors at that moment. Project managers are supposed to help keep delays as low as possible.

*New delayed*, which tells how many new engines have arrived late compared to the previous day.

*Delivered yesterday*, which tells how many of the delayed engines have been forwarded. This and the new delayed are meant to show a change in late. The delay itself has already been measured before this work. However, based on the interviews, measuring late alone was felt to be too narrow. The delay figure tells only the change in delay. Even if many motors were removed from the delay and it could be seen as a success, it will not be noticed only by the change in the delay, if a large number of new motors will be late. New delayed and those who left are meant to open the situation of being late more widely.

*Late in euro*, which tells the value of being late from a financial point of view.



**Figure 16 Order in late based on Power BI**

The purpose of the second page is to present the project managers' workload. As it became clear in the interviews, there are many tasks in the work of project managers that cannot be measured, so unlike the measurement system for order handling or order changes, this does not give a full objective picture of the workload of project managers.

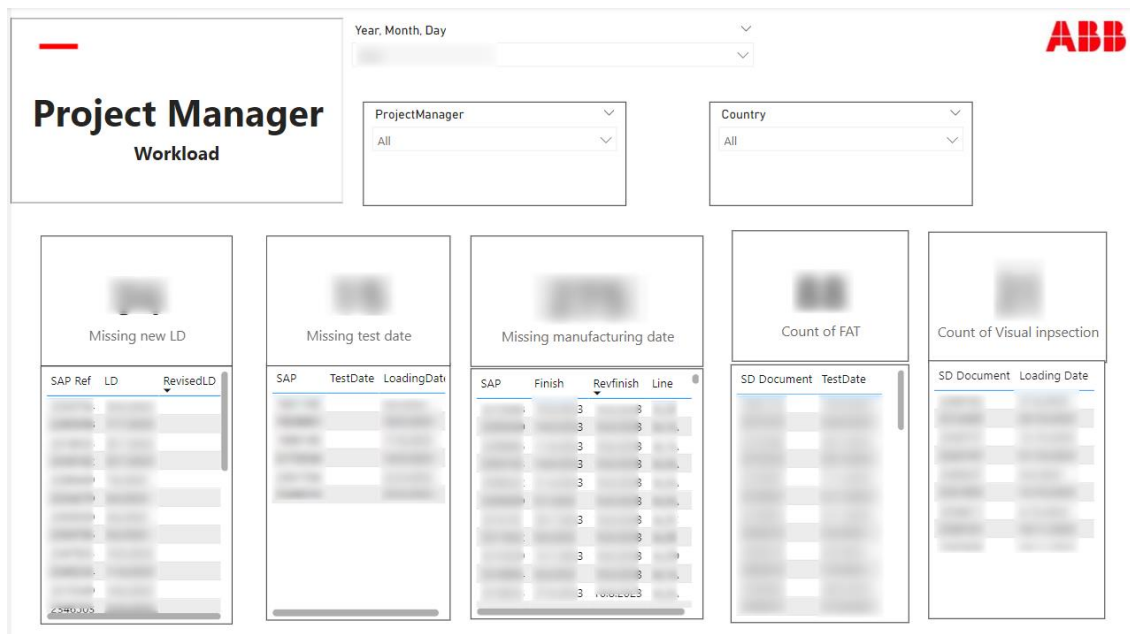
*Missing new Loading Date*, which tells how many motors have a loading date in the history, and no new loading date has been set, or the new loading date will also be late.

*Missing test date*, which tells which motors are missing a test date and the motors includes a test.

*Missing manufacturing date*, which tells how many motors have a manufacturing date in the history, and no new manufacturing date has been set, or the new manufacturing date will also be late.

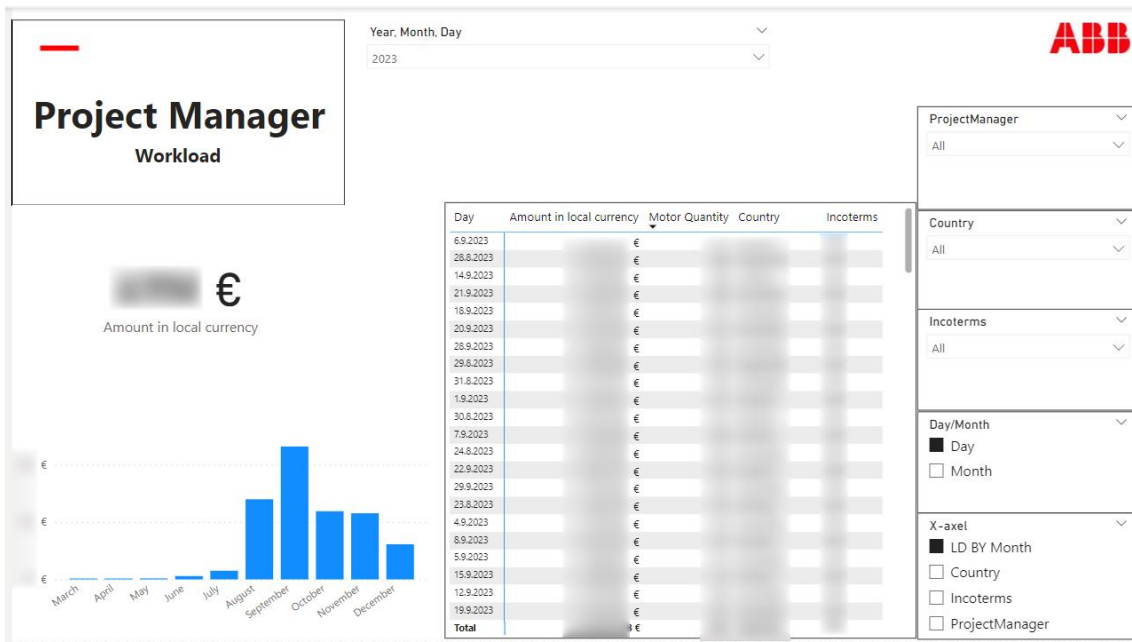
Count of FAT, which tells how many FAT meetings the project manager has. As well as the day when the FAT is held.

Count of visual inspection, which tells how many visual inspection meetings the project manager has. As well as the day when the visual inspection is held.



**Figure 17 Project managers workload based on Power BI**

The last page presents unfinished motors from a financial perspective. The financial figures can be viewed according to the purchasing country, according to the responsibilities of the project manager, according to incoterms and according to the number of pieces. The page also illustrates the future cash flows according to the period.



**Figure 18 Unfinished motors from a financial perspective based on Power BI**

#### 4.4 Reliability and validity

In the qualitative research, data reliability and validity are one of the most important measures of data quality. The assessment of reliability and validity from the perspective of the credibility of quantitative research is important to be able to improve the credibility and quality of the results. Reliability and validity can be used to ensure that the results of the interview research offer insights, accurately represent the participants' experiences and broader information (Thyer, 2010).

#### **4.4.1 Reliability**

The reliability of the measurement means the repeatability and non-randomness of the measurement result. It is assumed that the interviews are conducted under somewhat similar conditions, the research is reliable if the result is almost the same each time (Thyer, 2010). Lack of reliability is due to random or accidental error. If the measurement results are not reliable, making hypotheses or conclusions about the relationships between variables becomes more difficult, unreliable, and uncertain in quantitative research (Ihantola, 2011).

This research is interviewing research about measuring the performance of one company, so the results would probably be different if the research was done in a different company. In any case, the sample of the study and the extent of the data is broad and broadly covers the entire Customer Support unit, and thus the results would not have differed significantly if the same study had been conducted by a different researcher. Of course, there is always the possibility of different opinions and ways of interpreting the results achieved, so the conclusions could have been different. This means that the research sample covers the needs of one company and cannot be directly applied to other companies.

Threats to the reliability of this research are researcher bias, contextual bias and changes over time. The researcher of this work has worked for almost two years in the unit where the research is conducted, so the researcher's own attitudes and beliefs about the needs of the work are a risk to the reliability of the research. According to Creswell (2013), the researcher's own personal views, values and perspectives can influence the collection, analysis, and interpretation of qualitative research data. To avoid this problem, researchers should be aware of their biases and take steps to minimize their impact on the research process. Such actions include, for example, conducting interviews with open-ended questions and being aware of the researcher's attitudes.

Another threat is context bias. The context given in the terms of reference for this study is very broad. According to Creswell (2013), too broad a context in which the research takes place can affect the participants' answers and the interpretation of the results. It is therefore necessary to provide a sufficiently precisely defined context so that the research results remain within the desired limits.

The third threat is changes over time. Awareness and understanding of the unit's performance needs has developed and will develop in the future, which leads to the fact that if a similar study were to be conducted in the future, the results could be significantly different. According to Creswell (2013), researchers should consider the possibility of this development and consider their effects on research results.

#### **4.4.2 Validity**

Validity is a research attribute that related to how well the conclusions drawn from the evaluation of the data of the research participants reflect genuine findings among similar individuals outside the study population. The accuracy with which a method, tool or methodology measures the object of the study is called the validity of the study. Validity is an important aspect in the research design of every study, as well as in developing techniques and recording results (Robon, 2008).

This study focuses on the needs of one company, so the findings in other companies could have been completely different. However, the results of this study strongly support the theoretical framework and are very similar compared to other studies. So, it can be assumed that the results of this study would also be similar in a larger study covering several companies. However, the survey's response to the target company can be seen as valid, since the scope of the survey concerned a wide range of stakeholders. The study was also carried out using a survey, which are according to Kuzmanić (2009) a generally acceptable and valid way to collect data in qualitative research.

Gathering data is a threat to validity. The interviews were conducted in video format, where the interviewer took notes of the answers. Here, there is a risk that something affecting the result may go unnoticed during the interviews. Maxwell (1992) points out that researchers should record interviews accurately and completely. In particular, the researcher should ensure that the words and phrases documented are the words and phrases of the person being observed, and not shorter forms recorded by the observer. Interview tapes and video recordings can help confirm descriptive information, but they cannot eliminate all threats.

Another threat is the reactivity of interviews. That is, how much the researcher's presence can affect both the environment and the observed people (Maxwell, 1992). The author of the thesis is familiar to almost all interviewees, and it is impossible to assess whether this influences the interviewees' answers. However, the researcher should be aware of this and what kind of effects it might have on the observations.

To increase the validity of this study, the study could have interviewed employees from business units outside of customer support as well. This would have broadened the perspective and deepened the understanding of performance needs. Interviews with other units would have given a perspective on the performance of customer support from the point of view of people who depend on the unit's operation but are not part of it.

## 5 Conclusion

The purpose of this thesis work is to answer to the RQ1 which is presented in chapter one, "How to conduct performance measurement in customer support using Power BI?". The aim of this RQ1 was to design a performance measurement system for ABB's customer support unit. The aim of the study was to use different metric models and theories to form perspectives, metric categories and metrics based on the company's strategy. In this study, the company's strategy is reflected specifically by the perspectives of the meter set and the meter categories. The things named in them are exactly the things that the company feels are important and with which the company strives towards its goals.

During this study, the Performance Indicator was created to define the needs, so that the Performance Indicator can give an objective picture of the operational situation of the unit, as well as enable continuous improvement. The performance measurement system was also mostly built. Based on the interviews, there was a consensus that performance measurement should be started as soon as possible and the information it produces should be critically analyzed. After this, managers and employees should always find the factors affecting the improvement of the performance and thus start continuous improvement using data-based decision.

The performance metrics created in the work helps to concretely detect the strengths and weaknesses of unit execution. This gives the management and employees the opportunity to follow the development of the operational situation with the accuracy of the day. With the help of a wide and precise set of indicators, it is also avoided that the results are not based on opinions, but on jointly agreed figures. Based on the interviews, the metrics should have two goals. Clearly specify the most important key figures, the monitoring of which is considered important, and show all the work related to operational activities. Based on the interviews, the fact that not all areas of responsibility are measured was perceived as valuing them unequally. In the case of unmeasured areas of responsibility, there was a reflection on is all work is equally important, because the

unmeasured performances were not noticed, and no feedback could be given on their performance.

This work was able to respond well to the original assignment. However, the built measurement systems still need parts that were deemed important to add to the measurement system, but the current situation do not allow adding them, or the schedule for adding them is too long that they were left out of this work. Based on the employee interviews, the employees had very limited understanding of measuring, or even where to find the meters, if they existed. In response to this, the metrics was placed on the public Power BI server for the employees, where the operative situation is always visible to the employees and receiving daily feedback for the employees becomes automatic. The opportunity for employees to monitor the operational situation is intended to support and improve managers' personal feedback, not to replace it.

First missing part is adding full data collection to the Snowflake data warehouse. Currently, Snowflake only uses global data, and for collecting local data, it was temporarily decided to use SharePoint to transfer the data. Snowflake is undergoing an update that enables the transfer of unit-specific data to Snowflake's data warehouse, after this change the ability to transfer local data collection to Snowflake's data warehouse becomes possible. For local data, it is recommended to transfer the data collection to snowflake when it is possible. It is recommended to collect the data in a table whose columns have the same names as in the table found in SharePoint. An identical table enables the source of information to be changed, without having to make new visualizations or measurements in Power BI.

Second missing need is predicting future demand. Based on the interviews, it was felt important to be able to measure the demand for the future workload. The huge change in workload was perceived as a problem. Due to the huge variability of the workload and its unpredictability, the unit has a limited ability to stay on target. Although the need for measuring the future demand was identified, its implementation is not possible with the

current operating methods. The challenge is especially the situation with order handling. Order handling is at the beginning of the operation from the factory's point of view, and thus other functions of the factory do not give indications of future demand. Another challenge is that sales units have different operating principles with accepted orders. This makes it impossible to get realistic data on future orders. In order to be able to predict future order accumulation, a system should be developed that records the orders of all sales units, and common rules of the ways should be agreed upon for operations.

Third missing need is building order handling table to show full objective operation situation. This means measurement table need fill to show all order handling responsibilities situation. Right now, all responsible not found in Power BI, because some responsibilities are handled by using Outlook and in data collection perspective it is impossible to collect data from there. Missing responsibilities are PLMOT, request about GTS documents, subcontracting sets, and some proto and mod orders. For PLMOT motors and parts, a project has been started, for their ordering to be transferred to the OMS system, and GTS document for requests to Salesforce cases. GTS Document are going to under "Export control" choice. Based on interviews, subcontracting sets, and some proto and mod orders cannot be transferred out of email at the moment. However, the goal should also be to transfer these to salesforce either by using new choices or by creating completely new ones for them.

The fourth missing need is to improve the quality of orders. In the interviews, one big problem was the huge employment impact of order errors and changes. With the current method, it is possible to see the number of errors, but not to deepen the knowledge of what causes these errors, so that they could be addressed. During this this work, error classification was added, by categorizing the errors into variant codes. However, this is not enough to analyze the root cause of errors. In order to solve this problem, another thesis has already been started, the purpose of which is to prepare new categories, which will help us to see the root causes of errors. As well as looking for trends, the most common mistakes.

Fifth missing need is measuring amount of order reviews and what are the reason to those. There has been started a project to looking all parts of order reviews to understand are all parts important to do. For this reason, it was decided to leave this addition after the inspection.

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