Tampere University of Applied Sciences

Optimizing performance reporting through implementation of Business Intelligence tools

A case study at Nissan Nordic Europe

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ABSTRACT

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Nowadays, managing business performance is becoming a fairly difficult and complex process due to the massive growth of information gathered from different systems. Accordingly, more and more organizations have been adopting Business intelligence to manage their performance metrics more effectively.

The main objective of this thesis was to identify limitations of the current performance reporting process in the case company and examine how BI tools can be used to resolve these existing challenges.

The thesis is divided into two main parts to address the research topic from both theoretical and empirical perspective. The theoretical framework focuses on different concepts of performance measurement and BI to provide readers with background information on the research topic. On the other hand, this thesis was carried out as a single case study, and qualitative research was chosen as the main method of data collection and analysis. Semi-structured interviews were conducted in order to understand how the organization is managing performance reporting and learn more about stakeholder's expectations for the optimized process. Accordingly, proposing recommendations for improvement would be formed. Also, other research materials were acquired through participant observation and additional sources such as company documents.

The results of the thesis revealed that the current process is facing a lot of inefficiencies in terms of data reliability and processing time. Manual work, data incompatibility, poor performance, and limited collaboration are perceived as the most critical constraints of the current process. Based on key findings, an optimized process shifting from Excel to BI tools was suggested to reduce data processing time and improve data quality. Moreover, the implementation of BI tools can provide more in-depth and diverse analysis, improving data usage in decision-making. To demonstrate this, the author has also proposed several sample dashboards to assist the case company in improving its performance reporting with the new BI tools.

Key words: performance measurement, performance dashboard, key performance indicator, reporting, business intelligence, tableau

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1 INTRODUCTION

This chapter aims to provide readers with a brief overview of the thesis, beginning with the research background. The research objective is then presented, followed by research questions, research scopes, a description of the case company and benefits for different stakeholders. Finally, several key concepts are well explained at the end to help readers get more familiar with the topic.

1.1 Background

In today's unpredictable and competitive business environments, rapid growth in economic globalization and information technology have revolutionized the way companies conduct business, forcing them to predict and respond to increasing volatility and competitive pressures. (Vitt, Luckevich, & Misner 2010). Today, business environments are changing rapidly and becoming more demanding than ever. Following these changes, emerging technology continue to evolve and disrupt the markets. The transition from the industrial age to information age indicates that businesses can no longer rely merely on the management of physical assets or financial assets to achieve sustainable competitive advantage. Instead, companies also need to utilize its intangible assets and take advantage of information technology (Kaplan & Norton 1996, 4.)

This shift has led to an enormous growth of daily generated data in organizations. It can be considered that every business is now becoming a digital business (Daugherty 2014.) According to a 2014 study by Capgemini and EMC, 61% of organizations surveyed stated that data itself is becoming a source of revenues. For most companies, is even considered as equally important as their products or services. The report also revealed that two-thirds (65%) of organizations recognized that they must adopt data analytics solutions to avoid "the risk of becoming irrelevant or uncompetitive". Thus, in terms of value capture potential, organizations that can turn data into insights will open more opportunities for success.

These new opportunities also accompany new challenges. Most companies use performance measurement as a fundamental part of their business, in order to monitor business processes and provides certainty for decision making. However, the traditional performance measurement process is also encountering a lot of a lot of inefficiencies due to the increasing amount of information gathered from different systems. One common challenge most companies are facing is how to manage, analayze and share their own massive amount of data.

As a result, companies are looking for new solutions, which enable them to efficiently manage and process data. In the last few years, there has been a growing development in the field of Business Intelligence (BI) – a system that can transform raw data into useful visualizations. Since then, BI has been developed to extend the domain of performance measurement and increase the efficiency of monitoring business metrics.

During a 6-month traineeship at Nissan Nordic Europe in Espoo Finland as a sales analyst, the author was exposed to different projects varied from data management to budget planning and analysis. However, there was a project related to BI that she spent 2 months creating business requirements to help install a new BI system in the Aftersales department. Thus, after the traineeship, the topic has caught her interest and she has decided to do a research thesis topic on how BI tools can support the company in optimizing performance reporting.

1.2 Research objectives and research questions

The main purpose of this thesis is to examine the current limitations of performance reporting process at the case company and how BI can be applied to further improve this process. This research also clarifies the possible application areas of BI and their advantages within the context of performance measurement at the case company. By providing a new insight into data utilization with BI tools, this study aims to help the target organization benefit more from their data and oversee their performance metrics more effectively. In line with these result outcomes, the main research question (RQ) is formulated as follows:

How to optimize business performance reporting with the help of Business Intelligence (BI) tools?

To address the main research questions, it is necessary to gain a thorough understanding of performance measurement, BI, and the current practices at the case company. Therefore, the main research question has been further divided into three separate parts which can be turned into sub-questions. These sub questions assist by providing the answers to the main research question, and each question will focus on a smaller scope.

IQ1: What is performance measurement and the current practices of performance reporting at the case company?

The opening sub question seeks to lay a theoretical foundation for performance measurement and related concepts to provide readers a comprehensive understanding of the field. Additionally, this question also serves as exploratory research to examine the current practice of performance reporting at the case company and identify development areas.

IQ2: What is BI tool and the current practice of implementing BI tools at the case company?

The second question aims to study the concept, components, and functions of BI system & BI tools based on academic theory. It also highlights the relation between performance measurement and BI. In addition, the current state of implementing BI tools at the case company will be reviewed.

IQ3: What improvement proposals of performance report using BI tool can be made?

Based on collected information and empirical findings from two previous questions, possible improvements for performance reports will be suggested. Moreover, the author will use Tableau – a BI tool and sample data to propose a new insight in performance report that allows a proficient and comprehensive way to manage KPIs for several business user groups.

In terms of research method, a literature review will be conducted focusing mainly on the field of performance management and BI. This thesis will also apply a case

study together with qualitative interviews and participant observation as the main sources of primary data. Secondary data will be gathered from company available documents, books, and articles. More details regarding the research strategy can be found later in the chapter 2.

1.3 Research scope

Since the field of BI is broad and includes a variety of topics and focused areas, it is important that the research scope is clarified at the beginning of the thesis writing process. The topic is narrowed down to focus on the application of BI as a decision support tool to improve the process of tracking and evaluating business performance at the case company. The actual BI implementation process, technical challenges, and technical solutions, therefore, will not be covered in this research.

The findings of this thesis are mainly based on interviews with different stakeholders at the case company and the author's own observation while working there. The scope of the thesis, therefore, is limited to the company case only. However, the results can be applied to other business operations that also want to integrate BI in their reporting process.

1.4 Introduction to the case company

Nissan Motor Corporation is a Japanese automobile manufacturer, founded in 1933. The corporate headquarter is based in Yokohama, Japan. The company's major brands include Nissan, Datsun, and Infiniti. Nissan is currently one of the world's leading electric vehicle manufacturers. The LEAF is Nissan's largest selling electric vehicle, a highway ready plug in electric vehicle with more than 320 000 copies have been sold. (Nissan 2019.)

Nissan Nordic Europe Oy, as a part of Nissan Group, is engaged in import and marketing of Nissan vehicles, and operates in Finland, Sweden, Norway, Denmark and also in Estonia, Latvia, and Lithuania. In the Nordics, the company employs around 185 employees and has its headquarter in Espoo, Finland.
This research is conducted within the Aftersales department at Nissan Nordic Europe (NNE), located in Helsinki, Finland. The organization chart for Aftersales and its functions are shown in figure 1 below.

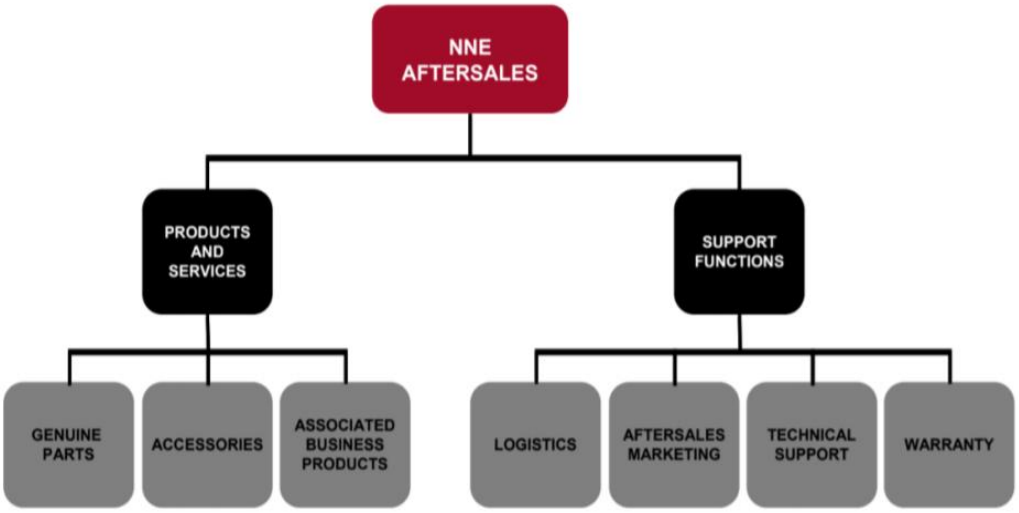

Figure 1. Aftersales organization chart at NNE. (Nissan 2019).

Nissan Aftersales department is divided into main products & services and supporting functions. The main products and services consist Accessories, Genuine Parts, and Associated Business Products. To perform in the highest possible level, the products and services require proper maintenance and support. Therefore, it is important to recognize Nissan Aftersales supporting functions such as Logistics, Aftersales Marketing, Warranty, and Technical Support. These functions make it possible for Accessories, Genuine Parts, and Associated Business Products to work smoothly and efficiently (Nissan 2019.)

The author was doing the traineeship in Aftersales Marketing team with the main responsibilities to support Product Managers and Sales Managers with daily operation and analytical tasks in tracking dealer and product sales performance.

1.5 Benefits for stakeholders

The outcome of this thesis work offers benefits to many potential stakeholders, including the case company, the future trainees, and the author.

This thesis is expected to benefit the case company in numerous aspects. Firstly, it would provide the author's previous manager an insight of how to utilize BI solutions and what functions that BI systems can support in performance measurement. More importantly, together with the analysis of the case company's current performance management process, improving suggestions are formed as references to help managers enhance relevant practices of tracking and managing business performance goals. By integrating BI tools into the performance measurement and reporting process, the analysis team can not only save more working time on routine tasks in data processing, but also perform more in-depth analysis thanks to efficient data query and interactive dashboards. The proposed development is not limited to the Aftersales department but can be used in several business operations at the case company and easily be adapted to other country offices apart from Finland as well.

Regarding the future trainees, this thesis can serve as a structured guideline to help them get familiar with and understand different systems and reporting processes in Aftersales department at NNE.

From the author's perspective, this thesis offers the opportunity to advance her knowledge of BI and its application in performance management, as well as analytical and research skills. Additionally, the author has a chance to approach the way big corporations like Nissan deal with their reporting process in such a complicated structure across a variety of countries and regions. By exposing to Tableau, the author also learns how to use BI and create comprehensive reports to gain insights. In summary, the whole thesis process provides the author with professional competencies to work on more profound projects in the future.

1.6 Thesis structure

This thesis is divided into five main chapters to address the research topic from both theoretical and empirical perspective. The first chapter introduces the thesis background and motivation; research objectives, research questions and research scopes; as well as the case company and benefits for different stakeholders. The structure of the thesis is also explained to provide readers a general overview of the thesis framework.

The theoretical part of this study is collected through a literature review in chapter 2, which provides a solid background for empirical research. This chapter defines key terms and theories connected to the research topic, starting with performance management and performance measurement systems definitions. Theoretical constraints required to ensure the quality of measuring information and frameworks for defining overall performance measurement system are also presented. At the end of this chapter, the focus shifts to BI aspect and related concepts, the context in which the measurement system will be reviewed.

Chapter 3 clarifies the research approach and methodology followed in this thesis. It describes the framework for research design and research procedures, as well as the methods of data acquisition and analysis.

The next chapter contains the empirical part and discussion of the thesis, presenting findings for each sub research question, along with explanations collected from the qualitative research. Specifically, the current practices of performance measurement and BI system at the case company are evaluated and presented. As a result, the chapter ends with a developing proposal for the performance report created to help the case company improve its process of managing performance KPIs.

Finally, chapter 5 summarizes and presents key results of the thesis, together with the recommendations for the target organization. Besides, the chapter presents suggestions for future study and reflection on personal learning of the author. The references used to support this research study and the appendices which contain interview questions will be included at the end of the thesis paper.

2 RESEARCH METHODOLOGY

To effectively address the research question, it is essential to select an appropriate research method for this thesis. This chapter concentrates on presenting the methodology chosen for this research and how it contributes to the research objectives. After the most prominent method has been defined, certain data collection techniques were described in detail. This research will utilize both primary information and secondary information to further support the theoretical framework and its finding. The author gathered secondary data from available resources, together with participant observation during her internship at the case company. Data from two semi-structured interviews was then collected as the main source of primary data.

2.1 Research strategy and design

A strategy in general terms is defined as an action plan to achieve a specific objective. A research strategy, therefore, refers to the whole process of how the research should be conducted to answer the research question. (Saunders, Thornhill & Lewis 2019, 173.) In other words, a research strategy systematically guides the research not only by providing an overall direction or framework for research procedures but also ensuring the right data collection methods are selected. The choice of research strategy is directed by research questions and objectives, the amount of time and available resources as well as the degree of existing knowledge. Saunders et al (2019, 175) suggest that several different research strategies can be adopted and combined in a study. These include experiment, survey, case study, grounded theory, ethnography, archival research, and action research.

Of the mentioned research strategies, the case study methodology was chosen as the most appropriate option for this research. According to Yin (2018), a case study is defined as an in-depth and detailed examination of a particular subject, example, or phenomenon (the “case”) within its real-life circumstance. This allows

researchers to closely study the key characteristics, meanings, and implications of the subject and the phenomenon in question (McCombes 2019).

As Yin (2018) also suggests, case studies are designed to fundamentally discover the ‘how’ and ‘why’ questions in greater detail, and to provide new information that is a base for future development. Therefore, the case study approach is most useful when there is a need to propose practical courses of action to improve a certain problem (McCombes 2019). This methodology by definition is well suited for the main research objective as the author wants to examine the current practice of performance measurement at the case company and to seek practical outcomes that would be implemented to improve the process. In particular, qualitative method and participant observations are chosen as the main research methods.

With the given company case and research objective, the research is conducted through three main phrases as described in the following. The first phase involved desktop research where the author searched for and gathered relevant theories regarding BI and Performance Management concepts. Evaluation, comparison, and linkage between theories result in the formulation of the main research question and sub-questions, along with the theoretical framework to guide the empirical research part.

During the second phase, qualitative data is collected through semi-structured interviews. The main purpose of these interviews was to provide information on performance measurement practices at the case company and how the company is adopting BI to track and manage KPIs.

The insights from the interview will be presented at chapter 4.1 to answer IQ1 and IQ2. Additionally, in the next phrase, the author will employ her own observation and analysis while working for the company. Finally, a statistical analysis will be conducted using Tableau- a BI tool to showcase a new KPI report. Comparison between the improved report and the old report will also be presented to demonstrate the capabilities of BI in data processing and analysis. Combining this demo thesis product with the findings gathered from the first and the second

questions, the author can answer IQ3 by presenting suggestions on how BI can be utilized to enhance the current KPI reports.

The figure below shows how the research is designed. Include the Figure 2. Research Methodology Framework (Adapted from Blessing & Chakrabarti 2009).

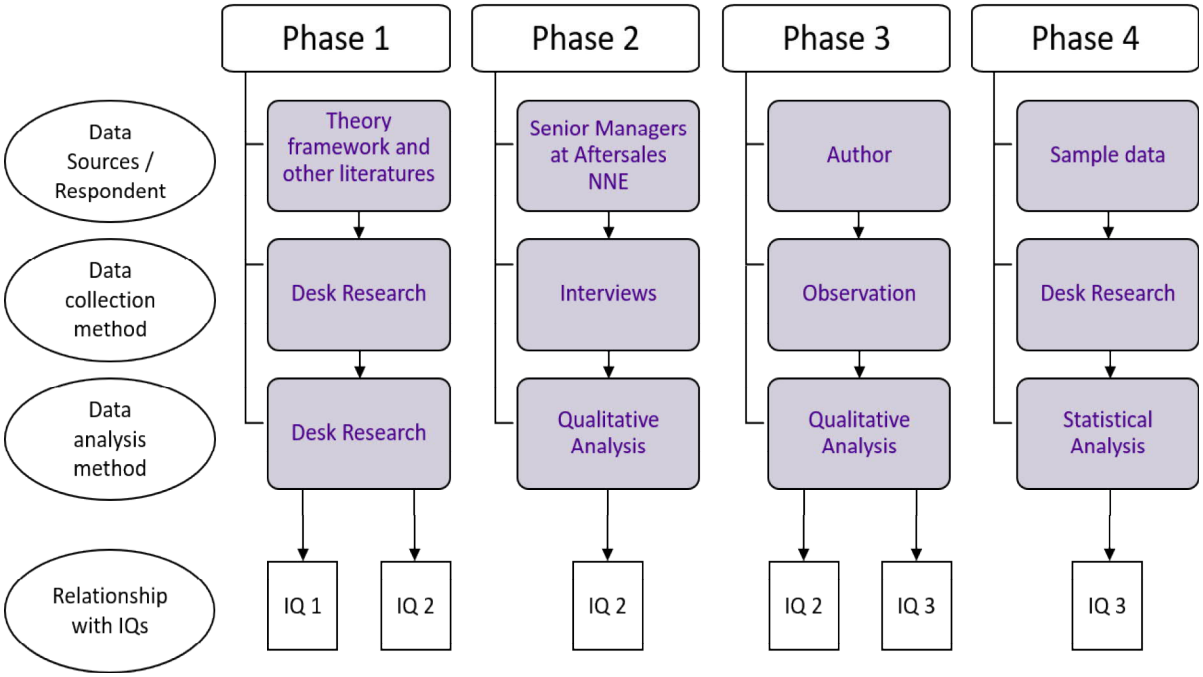

Figure 2. Research Methodology Framework (Adapted from Blessing & Chakrabarti 2009).

2.2 Research methods

Case study research provides the author the possibility to combine many data sources in order to strengthen the findings. (Yin, 2018) Various methods of data collection, including desk research, semi-structured interview, and observation, are therefore combined to enhance the validity and reliability of this research. This section will give more details of the chosen methods.

2.2.1 Desktop research

Desk research or secondary research is a data collection method that involves using already existing data, rather than primary data which refers to information

collected by the researcher. The purpose of this method is to search for relevant information from existing sources, combine analyze them. Therefore, desk research provides relevant knowledge and develops a broader understanding of the research topic (Pickard 2017, 254.)

In this thesis, secondary research is implemented not only to benefit from existing sources but also to establish the theoretical framework for this study. The main data sources include reliable literature, textbooks, research articles, and reports that either is in physical or digital forms.

2.2.2 Participant observation

Observation, particularly participant observation, is a direct method to obtain data where the researcher immerses himself or herself in the research context and gather knowledge of the phenomenon under study through observing and participating in the phenomenon's activities.(Saunders et al 2019, 378) As Saunders suggests, advantages of using participant observations include direct access to the research phenomena as well as high levels of immersion achieved by the researcher. In addition, observations enable the researcher to gain richer insights into the context and increase the understanding of the phenomenon.

Participant observation was selected as another to gather primary data since the author had the chance to involve directly in many processes of the case company while working there as a trainee. In this research, the observations and learnings were conducted in Aftersales department at Nissan Nordic Europe. During the six-month period, the author was directly involved in the performance measurement process where she analyzed data and created KPI reports to support the management team. She also had access to the majority of reports and analyses in the department. The author therefore has developed a good understanding of business processes and operating principles in the case company.

2.2.3 Qualitative Interview

In the case of this research, the author has collected primary information by conducting two interviews during the thesis process. Interview is considered an effective method when it comes to gathering qualitative data concerning people's viewpoints (Saunders et al 2019, 434.)

According to Saunders et al (2019, 437), qualitative interviews are divided into three main types in terms of structure and formality, namely structured interviews, semi-structured interviews, and unstructured or in-depth interviews. However, in this research, only semi-structured interviews are applied. Compared with structured interviews which use questionnaires based on a set of predetermined questions in a standardized manner, semi-structured or in-depth interviews allow for more flexibility in collecting data while still maintaining a high level of accessibility and effectiveness.

In semi-structured interviews, the interviewers prepare a list of specific subjects and questions to be covered in advance, However, depending on the flow of the discussion, the interviewers can choose not to follow the interview structure entirely. Instead, they can change the question list and orders. Additional questions can also be asked, allowing the interviewer to gain a better understanding of the interviewee's perspective, preferences, or expectations. (Saunders et al 2019, 439.) This unstructured approach prepares a sufficient base for the interviewer to follow the main subject while simultaneously gives the interviewees more space to expand their ideas and raise additional subjects as they arise rather than relying only on the defined questions.

Two semi-structured interviews will be conducted to acquire information from the respondents. These interviews aim to understand how the case company is managing performance reporting and how BI has been implemented to support the process at the moment. The interviewees are two senior managers with over 10 years of experience in sales and product management in automotive industry. Discussions from these interviews will be then analyzed to summarize certain key findings which will be presented in the next chapter.

A guideline for semi-structured interviews is formulated in appendix 1.0 that guides the interviews in order to acquire the relevant information for the research question. The guideline will be divided into three parts based on the purposes of the interviews, including stakeholder requirements, process understanding, and BI tools. The interviews will be conducted based on this guideline. However, the author can add or remove some of the questions based on the development of the interviews.

3 THEORETICAL FRAMEWORK

In this chapter, theories related to performance measurement, performance dashboards, and BI will be studied. The theoretical framework presented in this chapter will provide the basic knowledge within the topic of this thesis and serve as the foundation for the analysis and discussions of the empirical findings.

3.1 Performance Measurement concepts

In this subchapter, different concepts of performance measurement and performance measurement system (PMS) are presented. The first section introduces the field of performance measurement in business environment and how companies use it to achieve their strategic goals. After this, the next section describes purposes and characteristics of a performance measurement system and explores some of the existing frameworks associated with PMS. Finally, the scope of performance measurement is narrowed down to performance dashboards and key performance indicators.

3.1.1 Performance Measurement

The concept of measurement is not a new subject, and the use of performance measurement techniques has a long history. The introduction of performance measurement can be traced back to the early 1920s when DuPont company introduced the concept of return on investment and used ”a pyramid of financial ratios” that linked various financial indicators from different organizational levels to return on investment in a hierarchical structure (Neely 2007, 144–145). The Dupont model gave performance measurement a central role in evaluating the performance of a company. As a result, traditional performance measurement in organizations were primarily based on accounting systems, thus addressing mainly financial indicators such as net income, operating profit, return on investment (ROI) or return on equity (ROE). At this phase, the main priority was mainly to monitor organization cost.

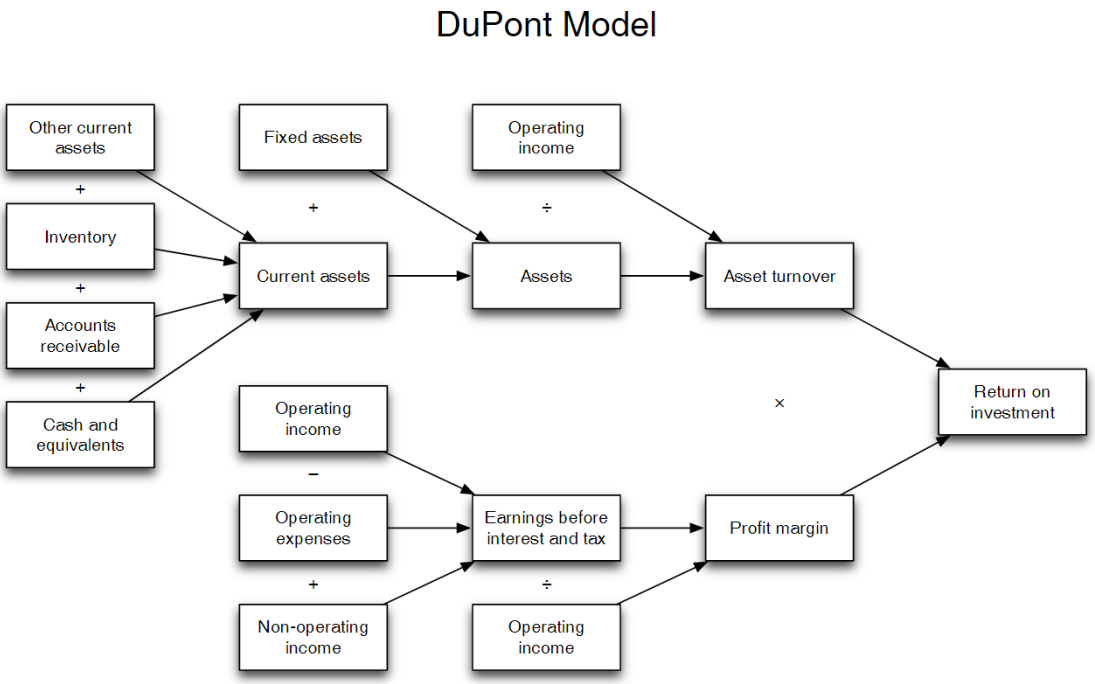

Figure 3. An example of DuPont model (Neely 2007, 144).

However, this traditional performance measurement approach is no longer sufficient in today's complex business environment. Changes in business nature and the impact of globalization made organizations realize that in order to stay competitive, they need to shift from the cost-oriented performance measurement approach to a more integrated and approach. (Neely 2007, 146.)

As a result, there had been an established demand for a different kind of performance measurement that would better respond to modern business conditions by providing a more balanced view and adding a wider range of measures. In particular, the transition in the field of performance measurement took place in 1992 when Kaplan and Norton at Harvard Business School introduced the ”Balanced scorecard” or BCS which suggested the use of both financial and non-financial measures in performance measurement. (Yadav & Sagar 2013, 952.) Since then, several approaches for multidimensional performance measurement have emerged over the years.

Today, performance measurement also involves the implementation of organizational strategies, representing a shift from an operational perspective to a strategic perspective. (Yadav & Sagar 2013, 955) This expanded concept of performance measurement has been widely used by most organizations to ensure that

they can achieve organizational goals and objectives in the long term. (Yadav & Sagar 2013, 956). The most cited performance measurement definition is “the process of quantifying the efficiency and effectiveness of action.” Correspondingly, performance measures refer to “metrics used to quantify the efficiency and/or effectiveness of an action” (Neely 2007, 241.)

Correspondingly, Franceschini, Galetto & Maisano (2019, 9–10) have introduced various reasons why organizations need to adopt performance measurement:

- It provides a structured approach for organizations to “effectively monitor, control, and manage the implementation of strategic business plans and performance”
- It concentrates on what needs to be accomplished, allowing organizations to invest the proper amount of time, resources, and energy in achieving those objectives. It also identifies areas needing attention and provides feedbacks towards objectives so positive improvements can be made in case there are gaps in the performance of those areas.
- It improves both internal communication among different departments and employees, and external communication between organizations and their customers or stakeholders.
- It provides concrete information needed to make decisions, thus reducing intuitive decision making based on “gut feeling” and encouraging constructive critical thinking while solving problems.

In the cycle of never- ending improvement, performance measurement is considered a fundamental part of business management as it can help business users and management teams gain a proper understanding of the company’s performance to make sure that the company is going to the right direction according to the business strategy map. (Parmenter 2019, 39; Tonchia & Quagini 2010, 3.) With performance measurement, organizations can control the overall business operations and align daily activities to strategic objectives. In other words, to be able to manage and improve business performance, organizations must be able to measure it. (Tonchia & Quagini 2010, 3.)

3.1.2 Performance Measurement systems and framework

Performance measurement in organizations is usually performed using a performance measurement system (PMS). PMS is the system that puts performance measurement into practice by incorporating a set of performance measures or tools that provide relevant information to support management processes and the control of business performance. (Neely 2007, 149–150). A PMS is also defined as “an information system that managers use to track the implementation of business strategy by comparing actual results against strategic goals and objectives.” (Simons 2014, 669.)

Franco-Santos et al. (2007, 787) identified a lack of clarity in the PMS definition that creates confusion and limits the potential for generalisability and comparability in studies of performance measurement. In response to these issues, the authors reviewed various different existing PMS definitions to highlight a set of key characteristics for a PMS, classified into three levels, as follows:

- The features: different properties or elements of the PMS
- The roles: purposes or functions that the PMS serve
- The processes: series of integrated actions to form the PMS

When it comes to the features of a PMS, Franco-Santos et al. (2007, 789) argue that a PMS consists of only two necessary elements, namely: a set of “performance measures” and a “supporting infrastructure” used to collect, record and communicate the required information on these measures. Performance measures include both financial, and non-financial indicators while the supporting infrastructure consists of processes to convert raw data into needed information. It can vary from being a basic structure of data recording and analysis (for example, Microsoft Excel) to a more advanced information system such as enterprise resource planning.

In addition, to help organizations and business users to understand the main functions of the PMS, Franco-Santos et al (2007, 790) summarized these roles into five principal categories as follows. (1) The first category is *“measure performance”* role that involves the process of monitoring and assessing the progress of the performance achieved. (2) Secondly, *“strategy management”* role covers

the process of deploying strategic initiatives by planning, formulating, and implementing different strategies as well as providing alignment between processes and objectives. (3) The third category is *"communication"* which involves different aspects of internal and external communication. (4) The next role *"influence behavior"* is intended for directing behavior through comprises the roles of directing behavior through rewards or compensation, as well as managing and controlling relationships. (5) The fifth category is *"learning and improvement"* function which covers the process of conducting feedbacks and providing learning opportunities to improve future performance.

These five distinct categories demonstrate the importance and interdisciplinary nature of a PMS. It should also be pointed out that the design and structure of any PMS may differ depending on the role that organizations want to focus on.

In their findings, Franco-Santos et al (2007, 792) also suggested twelve different processes in a PM system, however, there are only three key processes argued to be necessary: *"measure design and selection" ,"data capture"* and *"information provision",* These processes are considered the minimum requirements for any PM system, regardless of how they are conducted. According to Franco-Santos et al (2007, 792), if a business does not have a specific process for designing metrics used to evaluate its performance, a process for collecting data to calculate its selected performance metrics, a process to distribute the results of the measurements(even with a simple spreadsheet), then, it could be argued that this company does not have a PM system in place yet.

Since performance measurement is becoming a fundamental part of organizations, there has been an increasing need for more integrated, comprehensive, and dynamic performance measurement systems. As a result, various kinds of performance frameworks and models have been developed to overcome the limitations of traditional PMS which only focus on cost drivers that are measured in financial accounting. These frameworks are designed to provide a flexible and systematic approach for collecting, analyzing, and reporting on performance. More importantly, different than the traditional PMS, these frameworks manage to make the performance measurement system more "balanced" by incorporating both financial and non-financial measures.

The most well-known performance framework used to be the BSC that was first developed by Robert Kaplan and David Norton back in 1992. Since its inception, numerous modifications of the concept have been introduced due to the variability of organization's needs in measuring performance. According to Neely (2007, 146–152), four most common reference approaches for performance frameworks were: 1) Balanced Scorecard (BSC), 2) Critical few method, 3) Performance dashboard and 4) Total Quality Management (TQM). There are several other well-known PM frameworks that utilize the balanced approach, for example, Performance Pyramid (1991) or Performance prism (2002).

Each of these frameworks has its own key features, strengths, and weaknesses. However, a review of all previously mentioned performance measurement frameworks is beyond the scope of this study. This thesis concentrates mostly on performance dashboard and partly on BCS since they are directly applicable to the case company's performance measurement process.

Performance Dashboard:

A performance dashboard is a managerial information system used to track both financial and nonfinancial measures as indicators of successful strategy deployment. In France, companies have developed and used this similar dash-board-based performance measurement system known as the Tableau de Bord for more than two decades. Performance dashboard aims to support business users and management team in managing and measuring key activities needed to achieve business goals (Neely 2007, 148.) The next chapter will explore the usage of performance dashboard in more detail.

Balanced Scorecard

The balanced scorecard (BSC) is a framework to "translate strategic business objectives into a set of performance indicators across four balanced perspectives: financial, customer/stakeholder, internal business processes, and learning and growth"(Neely 2007, 147) Primarily, the BSC allows the management executives to look at the well-being of their business. Each perspective is closely related to

organizational strategy and serves as a direct link between performance objectives and the flow of measures from these perspectives, creating an integrated performance measurement system for business users (Neely 2007, 147–148.)

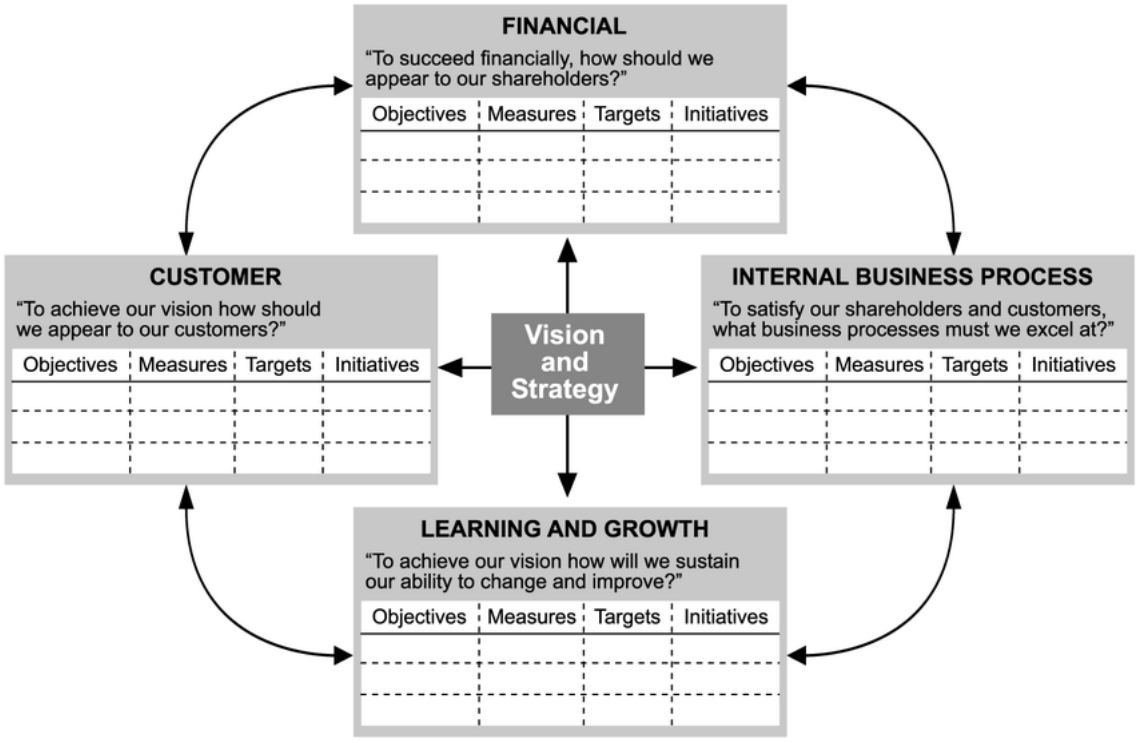

Figure 4. Four perspectives of the Balanced Scorecard (Kaplan & Norton 1996, 9).

There are two main strengths of the balanced scorecard approach. First, it "summarizes in one management report many seemingly disparate elements of a company's competitive agenda". Second, it reduces sub-optimization when managers only focus on one particular process or unit rather than the whole business. Instead, the BSC help managers to consider all key measures that are mutually critical to the organizational success. (Kaplan & Norton 1996, 9–10)

3.1.3 Performance Dashboard

Eckerson (2010, 4) identifies performance dashboards as an integral part of performance measurement system. In recent years, performance dashboards have been used by executives, managers, and business users as an effective way to monitor important business metrics and gain insights to resolve problems at a

glance. A performance dashboard therefore is described as “a layered information delivery system that parcels out information, insights, and alerts to users on demand so they can measure, monitor, and manage business performance more effectively.” (Eckerson 2010, 10). As Few (2013) pointed out, the key objective of dashboards is to present the most important metrics at a glance, together with variances that require instant action. The use of performance dashboards helps an organization to make better-informed decisions, focus on strategic priorities, and even predict business outcomes.

According to Eckerson (2010, 10–13), there are three main applications included in a performance dashboard: monitoring application, analysis application, and management application. The monitoring application provides companies with accurate and relevant information on the performance of core operational processes that drive the business on a day-to-day basis. One essential component of the monitoring application are alerts that notify users when a specific target falls below a predefined condition, allowing companies to quickly respond to potential problems. The analysis application enables business users to explore and analyze various levels of data across multiple dimensions in an attempt to determine the root cause of a particular issue or discover hidden trends and patterns that may otherwise remain undetected. Lastly, the management application allows users to communicate information across the organization, improving alignment, collaboration, and decision making.

Based on the area of functionality, performance dashboards are typically classified into three main categories:

1) Operational (mainly targeted at frontline workers for operational tasks)
2) Tactical (mainly targeted at middle manager for more in-depth analysis)
3) Strategic (mainly targeted at executives to monitor business processes)

Operational dashboards focus on tracking and managing operational processes of an organization. They are often used at the departmental level where production or workflow takes place to reflect and monitor the ongoing processes towards a specific target. In other words, business owners rely on operational dashboards to measure the effectiveness of their employees’ progress, and to be notified of problems when they arise. Compared to other types of dashboards,

operational dashboards need to be updated more frequently, ranging from daily to near real-time, so business owners can make timely changes to keep the operations running smoothly.

Strategic dashboards, as the name suggests, are used for monitoring the implementation of strategic initiatives. This type of dashboard provides the executive team with a high-level overview or summary-level data of business performance against strategic goals over a timeframe: monthly, quarterly, or yearly. They can consist of significant KPIs related to the overall health of the organizations from many aspects such as marketing operations, financial, customer, or procurement. By tracking how various business functions are performing, the executive team can identify issues and potential opportunities for business expansion and improvement. Strategic dashboards can also be known as “scorecards” since they are closely related to the Balanced Scorecard methodology.

Lastly, **tactical dashboard** tends to concentrate on the analysis application more than monitoring or management. These dashboards usually present complex data and offer drill-down functionality that gives users the ability to compare current against historic data, identify trends and opportunities through data insights, and determine why processes are working in certain departments. (Eckerson 2010, 17–18)

As figure 4 illustrates, the application or functionality of the three types of dashboards corresponds to needs of users.

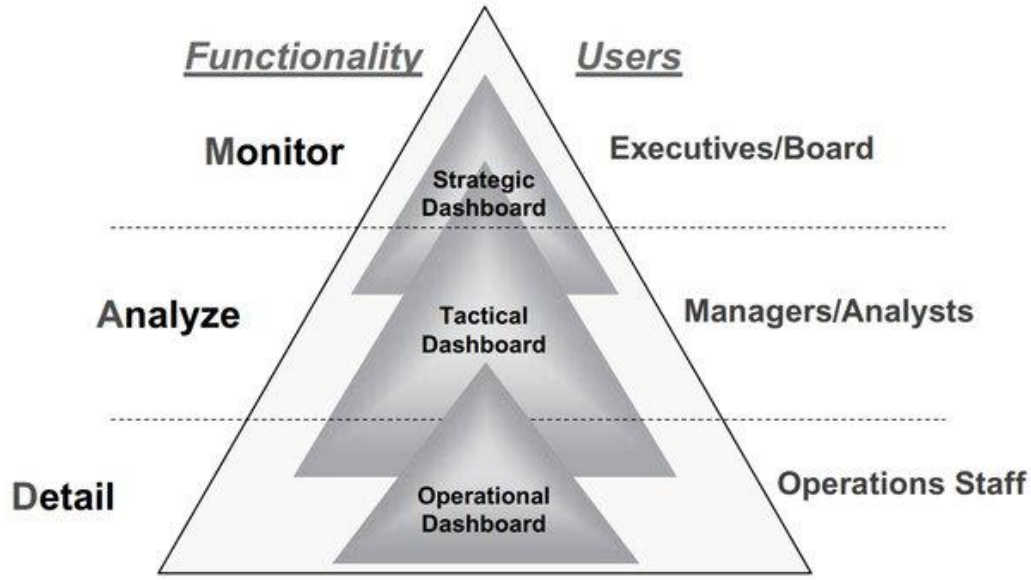

Figure 5. MAD Framework - Correspondence of the dashboard types and user functionality (Eckerson 2010, 14).

Given the discrete applications linked with them, each type of dashboard has its own set of functionality considerations and communicates specific types of data. However, these dashboards should complement each other rather than be used exclusively. For example, executives mainly use strategic dashboards to review the overall health of the organization, but they also look at tactical or operational dashboards occasionally to better understand what is happening on a smaller scale. Similarly, operations staff primarily use operational dashboards for operational processes, although they view tactical dashboards when they need to check in-depth analysis of a specific issue. Accordingly, in order to maximize the reporting capability, organizations can and should deploy all three types of dashboards as each concentrate on different functional areas or business problems (Eckerson 2010, 18)

As Few (2013) indicates, the basic challenge when it comes to dashboard design is to clearly present all relevant information into a single screen without clutter or distraction. A dashboard that displays too much data can easily lead to information overload and increase the risk of losing user attention Therefore, before designing a dashboard, it is important to understand its target audience and the scope of their requirements.

In addition, an effective dashboard must present information in a clear, accurate, and user-friendly way with as little guidance as possible. It should include a top-level display with summarized data so users can keep track of business performance in one look, without explanatory information. The visual components are intended to easily present an overview of key metrics and highlight deviations that require actions. However, if desired, users can still have access to additional details by drilling down, for example, to the level of customer, product, or transaction. Above all, the fundamental goal of dashboard design is not to make something visually pleasing, but to give users insights into their business performance by communicating the meaning of data effectively. (Eckerson 2010, 249; Wolf, 2016)

3.1.4 Metrics and Key Performance Indicators

It is important for an organization to identify key success factors that help grow a business on an upward trend. These identified success factors must be able to be measured reliably so that the organization can improve its performance based on metric information. Metrics and Key Performance Indicators (KPIs) are viewed as fundamental parts of performance dashboard. While these two terms appear to be rather similar, there is a noticeable difference between them. A metric is a measurement that is critical to track and monitor business activities, or any data point that is useful to the organization, such as a “number of new customers” or “total sales”. Some metrics, known as Key Performance Indicators (KPI), are seen as more essential than others. (Eckerson, 2010, 198)

According to Eckerson (2010, 198), a KPI is a special type of metric to demonstrates how well companies or individuals are performing in relation to their strategic objectives. Organizations use KPIs to determine whether they have reached pre-defined targets and to develop strategies for improvement. By implementing indicators for measuring their own performance, businesses can also save more time for essential activities and reduce time spent on unimportant tasks (Rasmussen et al 2009, 20)

In other words, “a KPI is a metric, but a metric is not necessarily classified as a KPI.” (Rasmussen et al 2009, 23.) Metrics only track the performance business activities, whereas KPIs track whether key business objectives are on track. Even though an organization may have various metrics, it typically has only a few KPIs. Compared to KPIs, metrics also add value to organizations in terms of providing insights into different business processes, but they are not the most essential measurements that aligned to the business goals

A major characteristic of most KPIs is that they are closely tied to a specific target to benchmark the current progress against that target. Therefore, the vast majority of KPIs are presented as ratios, percentages, or averages that allow business users to compare between an actual figure and a predefined target figure for a particular time period. Also, they are usually associated with indicator graphics, for example traffic light, to display at a glance how far the performance is below or above the pre-determined target (Rasmussen et al 2009, 24)

KPIs can be categorized into past, current, or future-focused measures regarding the functionality. Current measures are measured 24/7 or daily, while future measures record future actions targeting the next day, week, month, or even year. (Parmenter 2019, 10). The measurement results can be used to steer the personnel's activities in the desired direction in order to achieve the set goals or the level of activity. For this reason, it is important that the metrics are designed and implemented in a way that is appropriate to the organization’s operations and usable in the organization’s management decision-making.

In terms of functionality, the metrics and KPI should present the information relevant to the development of operations. Additionally, the data used for calculating metrics and KPIs must be up-to-date and reliable. If the data used by the metrics is not accurate enough, the information provided by the metrics can seriously affect the actions of decision-makers. Up-to-date data helps all business users to draw the right conclusions from the information presented by the metrics and to correct their own actions at the earliest possible stage. In addition, to ensure the reliability and accuracy of the data used by the metrics, it must be ensured that the units of measurement or calculation formulas used do not distort the data used by the meter. (Eckerson 2011)

3.2 Business Intelligence

In the previous subchapters, theories related to performance measurement, PMS, and performance dashboards as well as metrics have been presented. In the next following subchapters, the author will provide readers with the concepts of BI, what BI system is and what BI tool offers to the companies to support and improve the KPI reporting process.

3.2.1 Definition of BI

According to McKinsey Global Institute (2016), the volume of data has grown rapidly in recent years due to the increasing amount of information generated from individuals, digital platforms, wireless sensors, and billions of mobile devices, along with the improvement of data storage capability. However, becoming increasingly “rich” in data does not necessarily result in a better understanding of their business or improvements in operational performance. (Vitt et al 2010, 2.) It is argued that organizations that can quickly respond to the market changes and opportunities with effective use of data will gain a significant competitive advantage.

In this information era, BI has emerged as a popular trend to a variety of organizations and industries. The original term “Business Intelligence” was developed by the Gartner Group in the mid-1990s, but the concepts of BI were developed much older. The roots of business information management go back to the 1970s, when reporting systems were two-dimensional and lacked the capabilities for more advanced analytics. These were called MIS reporting systems, which stands for Management Information Systems. (Sharda, Delen, Turban & King 2016, 9.). Today, the concept of BI is widespread and thanks to the new advanced technology, it is possible to utilize it in most companies.

Despite an increased interest in BI area, there is no commonly accepted definition of the term. In the past decades, BI has been a buzz word most generally used

to specify products or approaches that aim at helping organizations make better decisions (Vitt et al 2010, 5). According to Azvine , Cui, Nauck, and Majeed (2006), BI is “all about how to capture, access, understand, analyze and turn one of the most valuable assets of an enterprise- raw data into actionable information in order to improve business performance.” While BI is generally considered a versatile concept, it can be characterized into three different perspectives: “*making better decision faster, converting data into useful information and using a rational approach to management* (Vitt et al 2010, 8.)

These definitions demonstrate that BI can be viewed from many perspectives and that it means different things to different users due to its versatility. Some people view BI as the tools required to analyze information, while others emphasize the process by which information is combined and processed. However, the primary purpose of BI is to enable interactive and even real-time data availability, editing capabilities, and thereby speed up and improve company decision-making (Sharda et al 2016, 14).

3.2.2 BI systems

BI is expected to have extensive content and the ability to drill into data as needed, which is why the core architecture must be efficient so that the BI system can generate the necessary reports in a short response time. A BI system is generally not a single application but consists of different closely related components. These components allow users to select and analyze data, make aggregations and most importantly display results in an easy to understand way (Hočevar & Jaklič 2010) Similarly, Sharda et al (2016, 14) define BI system as a multidimensional term that combines architectures, databases, analytical tools, applications, and methodologies.

According to Howson (2014, 27), most BI systems include four main components: operational and source systems, ETL solutions and processes, the data warehouse, and the BI user tools. The BI system architecture and the interaction between its components are presented in figure 5 below.

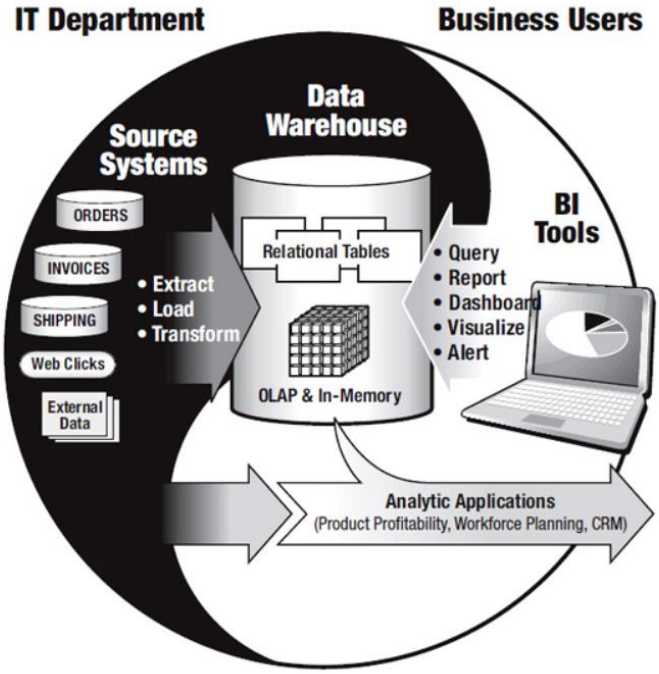

Figure 6. Major components in the BI system (Howson 2014, 31).

Source system

The first part of the BI infrastructure is the acquisition of information that supports the line of business applications. Usually, data is downloaded to BI systems from many different sources, which are typically known as operational systems, transaction processing systems or enterprise resource planning (ERP) systems (Howson 2014, 28) Figure 4 below illustrates four fundamental operational systems in a company: manufacturing system, sales system, supply chain system and accounting system.

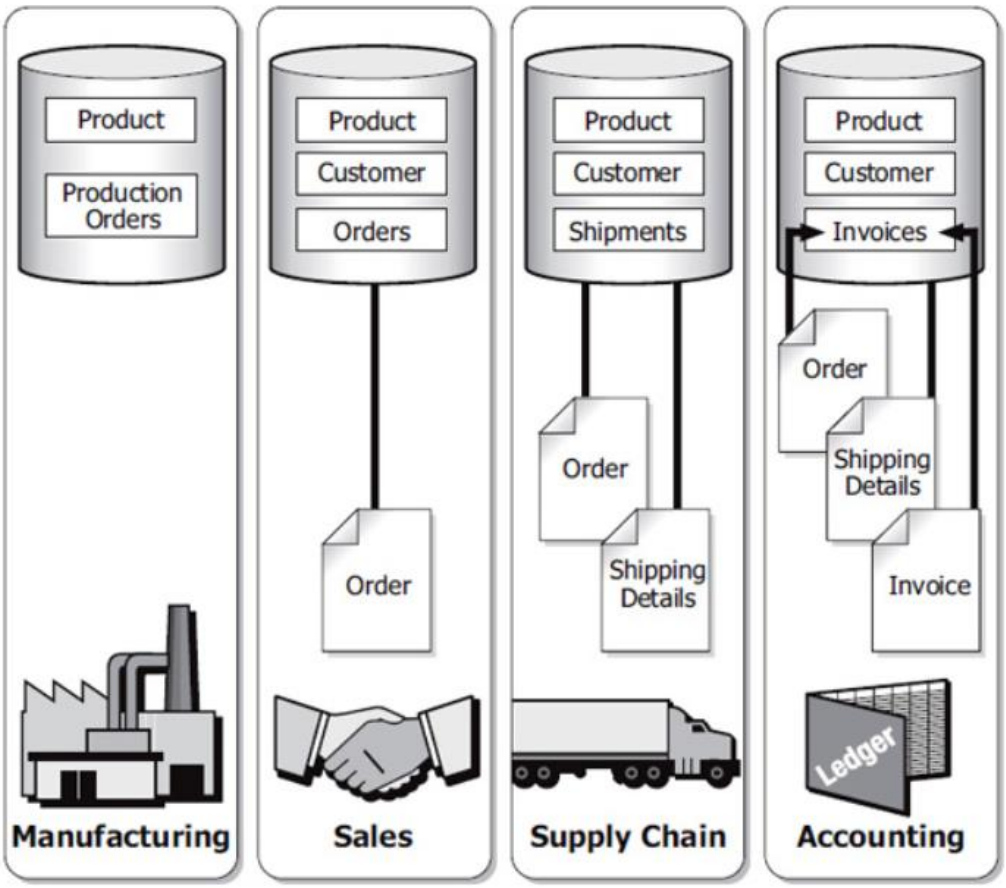

Figure 7. Operational systems record data from operational tasks (Howson, 2014, 28).

The manufacturing system records information related to products and production orders that specify the quantity of raw material used and finished products. The sales system tracks order information such as customer information, sales transaction, or order history. The supply chain system manages information regarding suppliers and order fulfilment details. Lastly, the accounting system then invoices the customer and collects payment once receiving the order and shipping details (Howson, 2014, 28–29) In addition, information can come from external sources such as data from distributors, advertisers, or market research firms. This can also be click-stream data from weblogs or data from social media platforms.

In general, the source systems consist of various forms of data: both structured, and unstructured data. Structured data refers to data that is comprised of a clearly defined format, such as tables or spreadsheets and is therefore straightforward

to analyze. Unstructured data, in contrast, is made up of information that is not organized in a pre-defined manner, for example, plaintext files or pictures and other multimedia information. (Ranjan 2005, 62)

Ideally, ERP systems would reduce duplicate data entry in order to improve data quality. However, in large corporations, the problem of information management is usually the fragmentation of data into several different databases, which may contain partially overlapping and even contradictory information. For example, the same customer may have different names in different databases, and figures measuring the same thing may give different results in different information systems. In addition, operational data sources lack both metadata (a description of the data itself) and aggregated data, which is essential for detecting long-term trends. The solution to these problems is the integration of data into a data warehouse (DW) that is a better environment for data retrieval compared to the traditional ERP systems.

ETL process

Within the BI life circle, data is collected using the ETL (Extract - Transform - Load) process where the desired data is first extracted from various operational sources and then transformed to the correct format by correcting possible typos and duplications. Finally, at the end of ETL process, the clean data is automatically loaded into the Data Warehouse or other data repositories. The “transform” process of ETL normally takes the most time of the entire process, especially when multiple separate systems are involved. (Howson 2014, 32)

Data warehouse:

Many businesses just got introduced to BI want to install a BI tool directly against the operational system without the use of data warehouse as it seems like a faster approach. However, it is not recommended since data warehouse is usually the base of BI solutions. Howson (2014, 34) describes data warehouse as “a collection of data extracted from many operational systems, loaded into a data storage, then transformed to make the data consistent and optimized for analysis in BI tools”. In other words, a data warehouse act as a kind of data bank that stores

both external and internal data from multiples sources or data purchased from third parties. It serves as a repository of information where all the data relevant to the management of an organization is located and from which the information necessary for the effective management of the organization is retrieved.

While operational systems mostly focus on creating and modifying data, data warehouse is particularly designed for data retrieval and analysis. Due to these different purposes, data warehouse allows for faster queries than traditional operational systems. Moreover, data warehouse provides businesses the ability to summarize real-time data by time (month, quarter) or by other hierarchies such as product groupings which are not available in transaction systems. (Howson, 2014, 35) Most importantly, data warehouse requires the transformation of data into a common format in order to enhance data quality and consistency as well as to reduce data duplication.

The data in the data warehouse is physically stored in individual tables with relational connection. Most data warehouse include two types of relational tables: fact tables and dimension tables. Fact table typically contain the measurement along the attributes of a dimension table and numeric information that needs to be analysed, such as sales, profit, or inventory. Dimension tables, also known as lookup or reference tables, are tables that provide measures from different perspectives, such as customers, product, time, or geography. (Howson 2014, 37)

BI Tools:

Once data has been integrated into the data warehouse, the final step of a basic BI infrastructure is BI tool. The data in the data warehouses is in read-only mode, meaning that this data cannot be edited by front-end users. BI tool can be used to query data from the data warehouse and transform raw data into various reports or visualizations. Detailed information about BI Tools will be presented in the next sub chapter.

3.3 BI tools

3.3.1 Functions of BI Tools in Performance Measurement

Generally, the primary goal of most BI tools is making information easily accessible and easy to understand so business users can access data more quickly and make better decisions to guide the business. Although the use of BI technologies may vary by industry, there are three core functions that most BI tools provide: **Business Query and Self-service Reporting**, **Visual Data Discovery,** and **Dashboards** (Howson 2014, 51)

Business Query and Reporting is the first main function that BI tools offer. Querying represents the action to request specific information from a database or a combination of data tables. In the past, this process to get all the needed data was time-consuming since business users must wait for IT teams to handle their requests. However, due to the increasing demand in modern workplaces, it has become crucial for business users to create queries and report themselves without much support from IT. (Howson 2014, 53). This problem can be resolved with the adoption of BI tools that allow users to quickly and easily create queries to get data without requisite technical skills. Data can be collected from multiple sources such as internal operational (ERP, CRM) or other online databases. Figure 8 demonstrates different data sources a BI tool can offer. As can be seen from the view, users have the ability to import data from a variety of sources, ranging from Excel/CSV file to online systems such as SAP HANA, MySQL, or Salesforce.

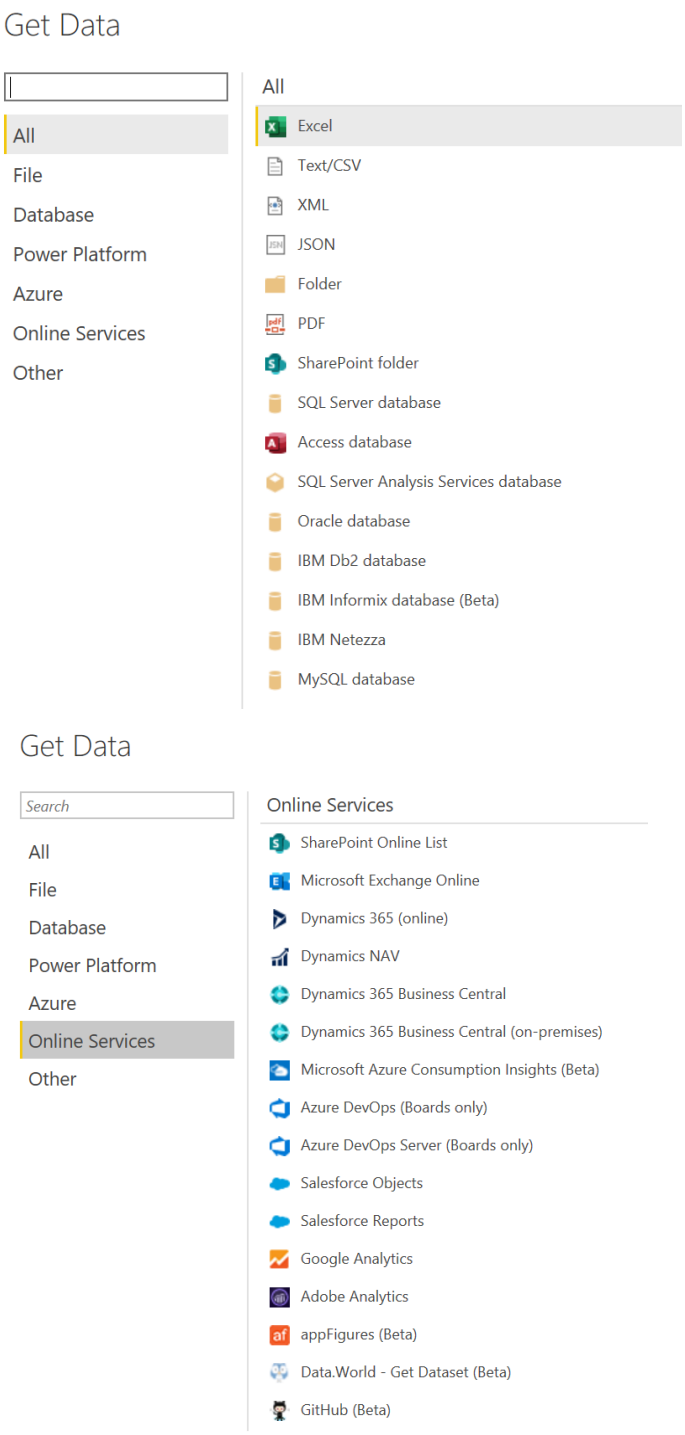

Figure 8. Different data source selections in BI (Power BI, 2020).

The second main function of BI tools is **Visual Data Discovery.** With the exponential growth of data in terms of volume and variety, it has become crucial that information is efficiently visualized in an easily processable form. The purpose of this is to help business users gain meaningful insights they might not acquire from spreadsheets. (Sherman, 2014). Moreover, As Howson (2014, 56) stated, visual data discovery “moves the focus of BI from the “what” to exploring “why,” “where,”

and “when.” Users may not know precisely what information they are looking for and instead will navigate and drill within a data set to uncover particular details and patterns”. As the needs of business have changed over time, BI tools have also been designed with more visual functionality and interactivity such as sorting, filtering, comparing, or drilling down data to different layers. For example, business users can choose to view data from different viewpoints by switching the dimensions. They can also select a specific dimension for deeper analysis. This allows users to find and explore information quickly and effectively, according to their needs or the question they want to focus on.

Figure 9 shows a dashboard created in Tableau that apply visual data discovery practice. By entering different values or filtering data from this visualization, users can explore different sales commission model for a particular group of salespeople of their choices.

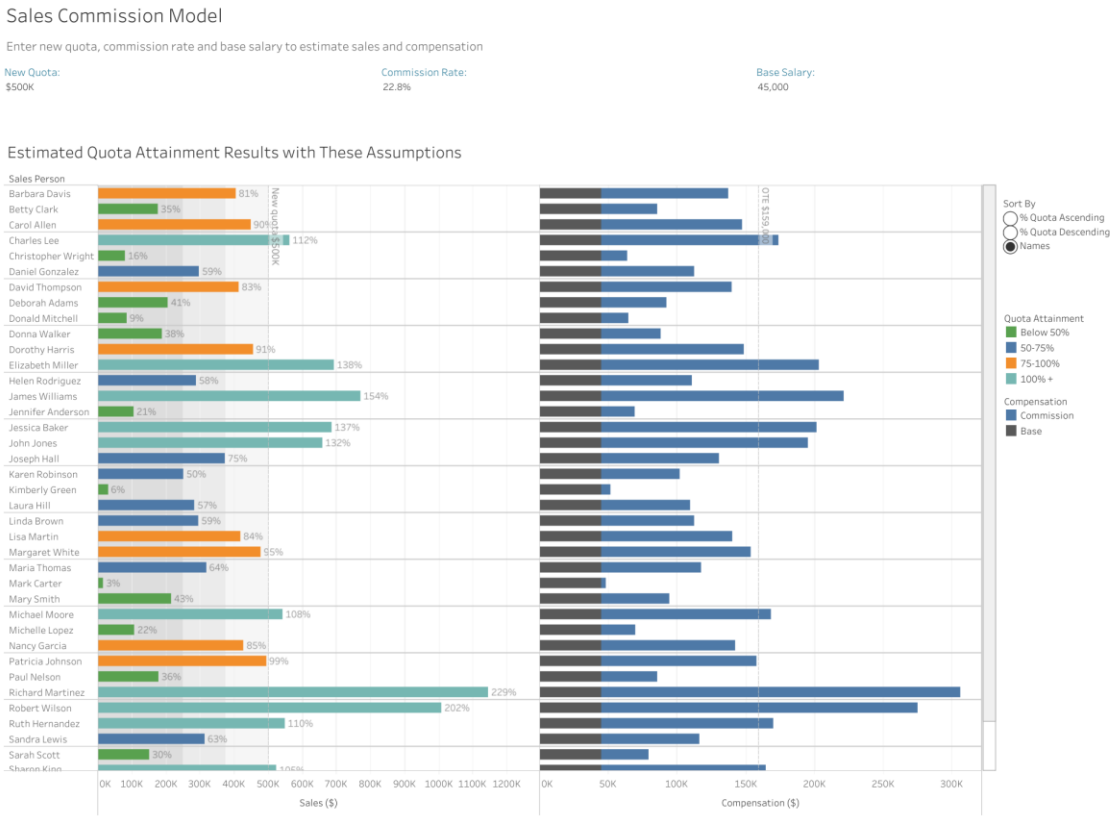

Figure 9. Exploring different sales commission models with the use of visual data discovery feature (Tableau Software, 2020).

The third major component of BI tools is **Dashboard** which is also the most common feature. As mentioned in chapter 3.1.3, a dashboard is used to analyze a massive amount of information to allow users to discover trends and insights. In

performance measurement, businesses can use these dashboards to understand their current performance and determine what future adjustments are needed. According to Stodder (2014) from TDWI Research, more and more companies are looking to expand their analytical capability through the use of interactive dashboards, including mobile solutions. Nowadays, most BI tools support the next generation dashboards, which offer greater interactivity and smarter visualizations along with the possibility to provide real-time insights combined from multiple sources. (Howson 2014, 61). BI dashboard is replacing traditional reports and becoming the new standard of displaying data to effectively measure the status of business performance and KPIs. In addition, mobile version of BI dashboard provides a means for accessing data or monitoring KPIs at any time or any location.

3.3.2 Tableau

As the last chapter has described BI tools' functionality in more detail, this section will provide a general introduction to a self-service BI tool – Tableau. This is the main BI choice that the author will use to create proposals of performance dashboards presented in the later chapter.

Tableau is a BI product of Tableau Software, an American software company founded in 2003. The company was acquired later by Salesforce in 2019. Compared to traditional spreadsheets, Tableau is able to process and transform huge data sets much faster and more effectively. With drag-and-drop interface, Tableau offers users multiple ways to create metrics, build dashboards, and perform ad hoc analyses with a few simple steps. It can also connect and load data from a variety of data sources including internal database such as SAP HANA as well as cloud systems like Amazon Web Services, Oracle Database or Google Cloud. Additionally, the product allows users to share dashboards or data sources with other authorised users. Simply by publishing reports via Tableau Server, users can then view the interactive reports from any browser including mobile apps, customize them as needed, and create them as their own view. (Tableau, 2020)

4 EMPIRICAL FINDINGS AND DISCUSSSION

This chapter provides the research results by presenting the author's key findings collected from the qualitative research, internal documentation and the author's own experiences while working for NNE. Generally, the research objective has been achieved as all research questions have been answered thoroughly according to the research design. First, the current practice of performance reporting at NNE Aftersales will be studied to uncover some restrictions that lead to the inefficiency of the process. Next, the current implementation of BI will be reviewed. Lastly, the author will present developing proposals relative to performance reporting at the case company.

4.1 The current performance measurement at NNE Aftersales

To understand how NNE Aftersales department are measuring business performance, a current state analysis was conducted through qualitative interviews, company internal documents as well as the author's observation while working at NNE. The section aims to provide a clearer imagine of the current process and identify limiting factors that can be optimized for improvement.

Following Nissan global calendar, the fiscal year for reporting at NNE Aftersales starts at the beginning of a quarter– in this case, on April 1 and finishes on March 31. NNE Aftersales has developed various performance reports to evaluate business performance in terms of sales, production, or dealership. These performance dashboards are reported monthly and quarterly while a year-end closing report is conducted in March. As mentioned, the common reporting needs for the department are generally monthly and quarterly reports. On the other hand, sometimes there is also a need for one-off ad hoc reporting based on different analysis scope from different teams.

In particular, the current performance reporting process consists of a total five main steps as demonstrated in figure 10 below

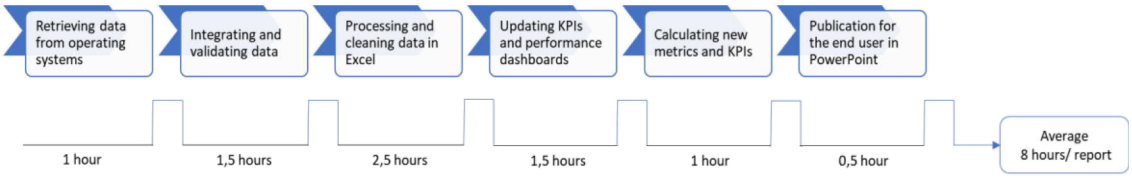

Figure 10: The current process of performance reporting at NNE Aftersales.

Most of the data and information required for performance reports is collected from company's Enterprise resource planning (ERP) system - SAP and Aftersales department's own database. Data can be extracted from different SAP modules, but mostly comes from Sales Distribution (SD) and Material Management (MM) modules.

At the beginning of the month, the regular reporting process begins once data has been updated in the mentioned operating systems. Data is then extracted to csv or Excel files and multiples files are combined together into a single file. Afterward, the data from this file is manually coped and transferred to another Excel file containing the already available dashboard. Usually, each dashboard has a pre-built template that includes several Pivot tables and charts. These components along with complex calculations for different KPIs and analysis can make the file heavier as the data grow over time, resulting in longer processing time, unresponsiveness, and the likelihood of the file crashing. Next, the pivot table and charts also need to be updated manually to include new month's data and exclude unused data.

Finally, reports are copied to a commonly shared network folder, and then distributed to product managers and country managers through a link via email, which is the most common format for delivering reports to the end user. In addition, important KPIs and visualizations from those performance dashboards are then exported from Excel to PowerPoint and presented during monthly/quarterly meeting.

4.1.1 Strengths

Despite its drawbacks, the current reporting process is considered a good starting point for performance measurement. NNE Aftersales department has already selected a set of most essential KPIs and utilized them in already existing performance dashboards. Most of these KPIs are carefully defined and directly aligned with overall strategic goals of the department, helping the teams to focus on measures that matter the most.

Available performance dashboards are also well designed with easy-to-read graphics and visualizations that can offer general insights to support upper managers in tracking business performance at a basic level. In addition, each performance dashboard in Excel has a very detailed guideline on required data sources, report elements and how to update the report. This ensure that individuals who are not familiar with the reports or know how to set up complex formulas in Excel can still understand these reports or understand how the included KPIs are calculated.

However, there are still many limitations with the current process which would be discussed in the next section. Proposals to improve performance dashboards with the use of BI tools would also be provided later.

4.1.2 Limitations

The current state of performance reporting at NNE Aftersales department was examined from the middle level management perspective. In the interviews, product managers were asked to share their views on the current reporting process, issues in relation to it, as well as their suggestions.

The interviews confirmed the assumption that the existing performance reporting is not effective enough to support upper management team in making informed decisions. Almost all interviewees were not satisfied with the current process and believed it was somehow ineffective. As a result, the interviews have also pro-

vided a variety of potential constraints that prevent the current performance reporting process from reducing processing time and enhancing data reliability. Figure below presents the limiting factors their influenced areas, which are based on stakeholders' needs.

Factors	Influenced areas		
	Reducing processing time	Enhancing data quality	Digitalizing
Manual work	X	X	X
Data incompatibility	X	X	X
Limited control and collaboration	X	X	X
Poor performance	X	X	
Delay	X		
Lack of interactive features			X
Lack of visualization			X
Unclear definition		X	
Under standardized template	X		

Figure 11. Summary of potential limitations.

Among the factors mentioned in the interviews, the most influenced ones are identified as critical constraints preventing the optimization of NNE Aftersales performance reporting process. The criteria for choosing the factors are based on the correlation of stakeholders' needs. The most critical constraints will be discussed in detail as follows:

Manual work

As how the current procedure is working, the development of a report requires enormous manual effort. The person who is in charge of KPI reports has to manually download tons of data from many different databases and systems, combine different files into a new one, and then use the pivot table function in Microsoft Excel to integrate data and calculate KPIs or update the report. Also, the KPIs that has been calculated will be transferred to PowerPoint template manually.

This manual process is not only costing valuable working time, but it is also containing high risk of human errors. Errors can easily occur when copying and pasting a large amount of data from different sources into the summary workbook. Even a single incorrect number or a broken calculation can distort the result greatly, as the error will cascade the whole data set.

Additionally, in most cases, Excel pivot tables do not automatically update when adding new data. Instead, user need to refresh pivot tables manually in order to display the most current information. This may pose a risk of unintentionally distributing outdated information once that manual update is forgotten. As a result, these arising problems could affect the accuracy of KPIs results in monthly performance reports. If data conflict happens, it can be extremely challenging to find and correct the errors, especially with a huge data set. This leads to the case that the report is last longer to complete.

Data incompatibility

Along with the manual nature, another major challenge of the current reporting process lies in the ability to integrate all the necessary data into a single spreadsheet. A wide range of data sources without strong relationship has led to incompatibility among multiple databases. In some cases, the correlation is done manually by excel template. The use of data processing applications, for example Microsoft Access, becomes essential in order to merge and synchronise data. However, the preciseness of synchronised data is still in question due to lack of transparency in data processing. Therefore, users of KPIs reports sometimes need to reproduce the correlation and calculation from raw data to assure the accuracy of these processed data. This also causes overlapping work and longer processing time.

Limited Control and Collaboration

The collaboration within the Aftersales department is crucial with a variety of daily tasks: budgeting, sales forecasting, sales campaign planning or managing inventory. However, with the current performance reporting process, it has become challenging for different teams to share, collaborate, or control performance

dashboards effectively. One major drawback of Excel reporting is that, while several users can access and edit the report, tracking all the changes is difficult. Excel's lack of collaboration tools has led to issues such as overwriting files or making duplicates. Also, final users are unable to track who made which changes and when, preventing them from contacting the right person when needed. This gets even more complex with the increasing number of different reports and new users since it can especially be challenging when trying to find who is entering corrupted data.

In addition, the most common method to distribute reports in the current process is through email. With so many files and emails being sent around, sometimes it is difficult for business users to keep track of them all. Furthermore, errors can also happen easily without a control system in place. For example, recipients can even end up being sent duplicating reports or outdated report versions without notice.

Poor performance

Due to the need of calculating multiple KPIs, most current performance dashboards contain a large number of sheets, formulas, and pivot tables. These factors can slow down the reports considerably. In fact, the larger a file gets, the heavier and slower the report will be. This is a frustrating issue that happens frequently to almost all interviewees. In some cases, it can take up to fifteen minutes just to open a report. Some users even have the files crash or freeze inevitably when running complicated calculations.

Another major drawback of the current reporting system is that Excel has a row limit in processing very large datasets. To keep the size of them manageable, most performance reports are limited to a certain amount of 2-year data. This issue sometimes restricts the ability to gain more in-depth insights by comparing values across longer time periods, spotting trends over time, or forecasting sales based on historical data.

Others

The rest of limiting factors presented in figure 11 share a common point which have less influence on the requirements but rather on the expectations of the KPI reporting process optimization. Therefore, they could be considered as optional recommendations, which will be taken into consideration after the most critical constraints have been solved.

4.2 Implementing BI systems at the case company

At the time of this work, NNE Aftersales has agreed on the implementation of BI tool Tableau with the supplier company, but a more detailed schedule for the introduction has not been drawn up, and the scope of implementation has not yet been precisely planned. At the beginning of the implementation process, the project team has collected business requirements and identified the end results that the department hopes to achieve by implementing BI. The main purpose is to reduce data processing time, minimize the risks of losing information when processing data manually, and improve the ability to make better-informed decisions. The implementation is expected to benefit the department in the long run, as the analytical process would be more efficient.

Since the case company does not have enough resources and technical expertise in the field of BI, the next steps of the implementation will be handled with the help of an IT consulting company. The department has also decided to develop a new data warehouse to have data stored in a central unit. It can be seen that the most critical process during this phase is data preparation and validation to ensure that there is no data issue when integrating information from different systems to the new infrastructure. As the project is still ongoing with the third-party company, the technical aspect of the implementation plan will not be mentioned in this section.

4.3 Developing proposals for performance report using BI tools

After considering the most prioritized constraints in terms of optimizing the current process of NNE Aftersales performance reporting, the author has formulated a

suggested process. The application of BI tool, particularly Tableau, will be the core concept of the new process with the ultimate goals of shortening the processing time and enhancing data reliability.

The major change recommended by the new process is the application of Tableau into data processing. While the major steps of the process would remain unchanged, KPI dashboards and reports will be developed in Tableau to minimize manual processing and automate the process. Data is automatically transferred from various source systems to the data warehouse and then connected directly to Tableau. Afterward, the integration and calculation of KPIs will be conducted by Tableau functions automatically. In the end, these centralized reports will be published to Tableau Server and shared with all related stakeholders.

Consequently, working time would be reduced significantly as summarized in table figure 12

Steps	Current Process	Optimized Process
Collecting data from multiple systems	1h	20m
Integrating and validating data	1,5h	0
Processing and cleaning data	2,5h	30m
Updating KPIs and dashboards	1,5h	0
Calculating new KPIs	1h	30m
Reporting and publishing for the end users	0,5h	10m
TOTAL	8h/ report	1,5h/report

Figure 12. Comparison of processing time between current process and optimized process.

According to the optimized process, the time required to develop a new report has also improved radically. In specific, the processing time per report would ideally reduce from around 8 hours to approximately 1,5 hours, which is over 70%. A similar reduction rate can be applied to more complex reports that require more than 8 hours as well.

Most importantly, each business user can have faster and direct access to the needed data wherever they are, without much support from IT team. This also

allows managers to quickly identify problems or make better decisions with easily obtained information. Unlike Excel, Tableau also offer direct accesability to the database on the background just by right click to any available dashboard or chart. This will be useful in case users want to dig deeper into the data set to uncover more information.

In the meantime, data reliability is increased due to two reasons. Firstly, it removes the manual steps of processing and integrating data from a wide range of data sources, which withholds a high risk of errors. Secondly, one information source used in all levels decreases the chance of information conflicts and increases the chances of timely identification of data errors. The quality of decisions is also improved due to the quality of the information provided.

Another main suggestion for the new process is that each report should include a preview page at the beginning (as shown in figure 13). This opening page gives general information required for a report such as report contacts, data sources and report contents. This will help to improve the report collaboration and sharing between different teams. For example, users can see the last updating time of the report or track which changes have been made. They can also easily find the contact information of responsibility person if needed.

Figure 13. Report opening page.

In addition, Tableau can be used to support the creation of real-time, interactive dashboards with more in-depth analysis. Based on sample data, the author will use Tableau to present some examples of performance reports which can be found in the following section. Due to confidentiality reasons in compliance with the case company's instructions, the sample data is not proportional to the real numbers. These showcases are only used as improving proposals to support Aftersales department in adapting to the new reporting tool.

Example Workbook 1

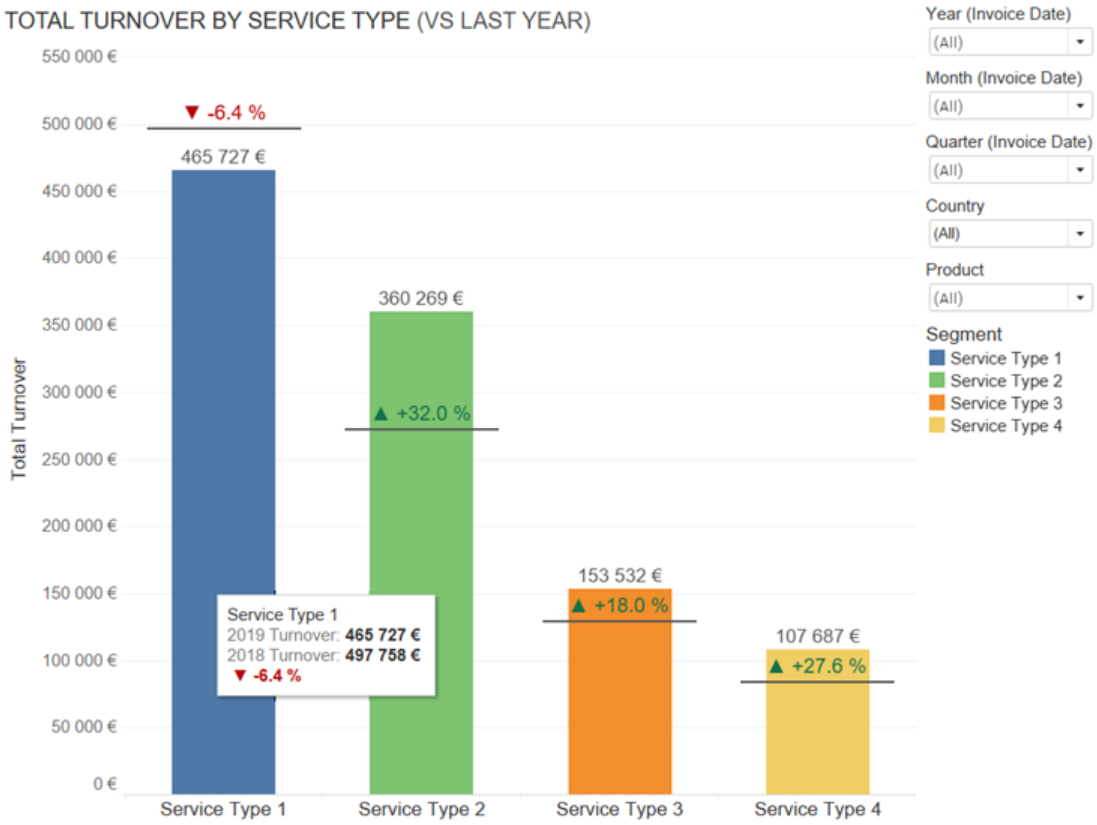

Figure 14. Total turnover by service type. Values are not proportional to actual sales.

Figure 14 presents the total spare part sales classified by four main categories. This chart can help business users compare the sales performance of four different service types at a glance. YoY (Year over year) variances are also calculated to analyze the growth rate for each service type. In addition, the dashboard includes different drill down options that allow users to select information by region, by product type, or by time period.

Example Workbook 2

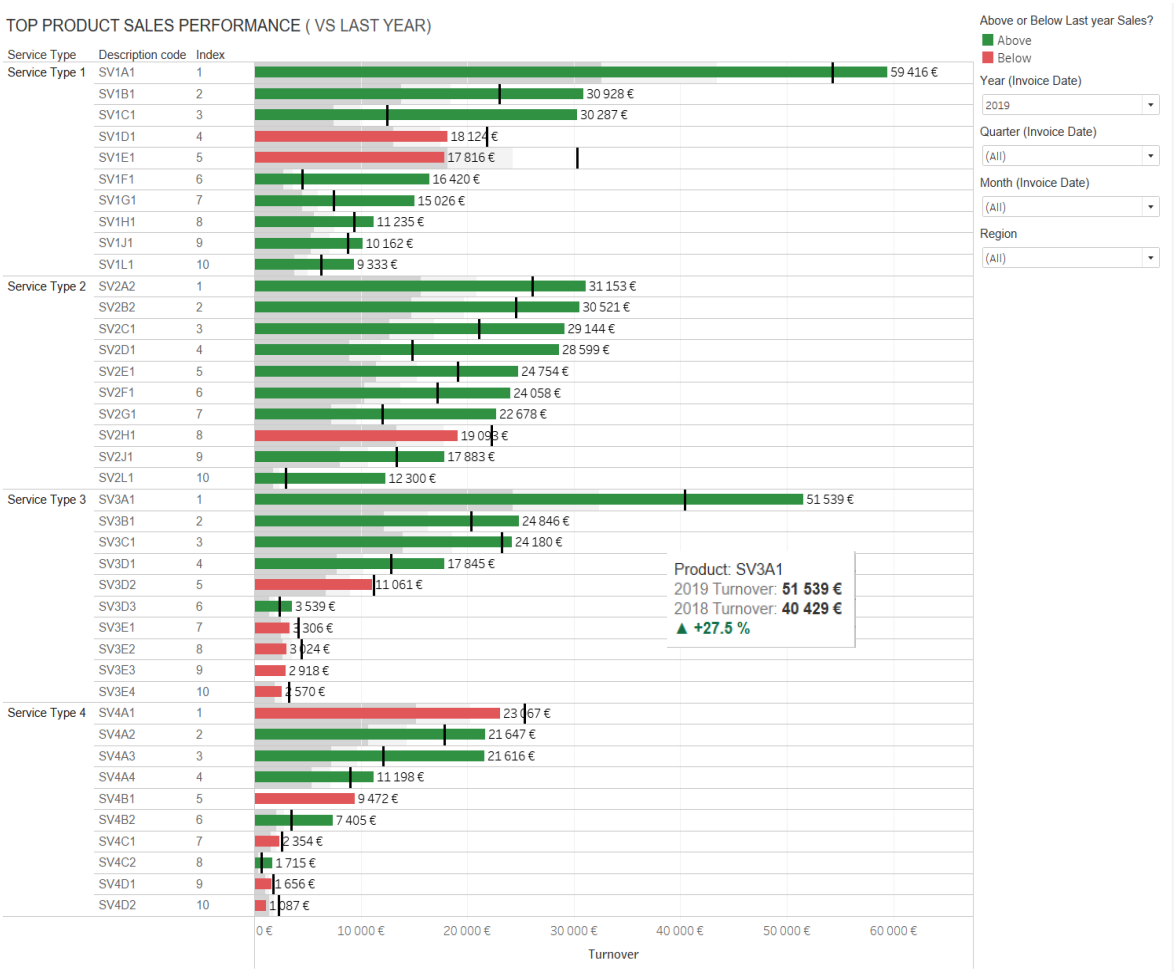

Figure 15. Top product sales performance. Values are not proportional to actual sales.

Figure 15 shows actual performance for the overall sales against historical sales of top ten products for each service type. Similarly, this chart can be helpful for monitoring progress toward a goal, such as tracking product performance against the sales target. The actual sales figures of 2019 are shown by the length of the bar chart, while the bold line represents the historical sales of 2018. The red/green colour of the bar charts displays whether the sales of a specific product are greater/less than last year sales. This enables users to quickly locate values that are underperforming.

Example Workbook 3

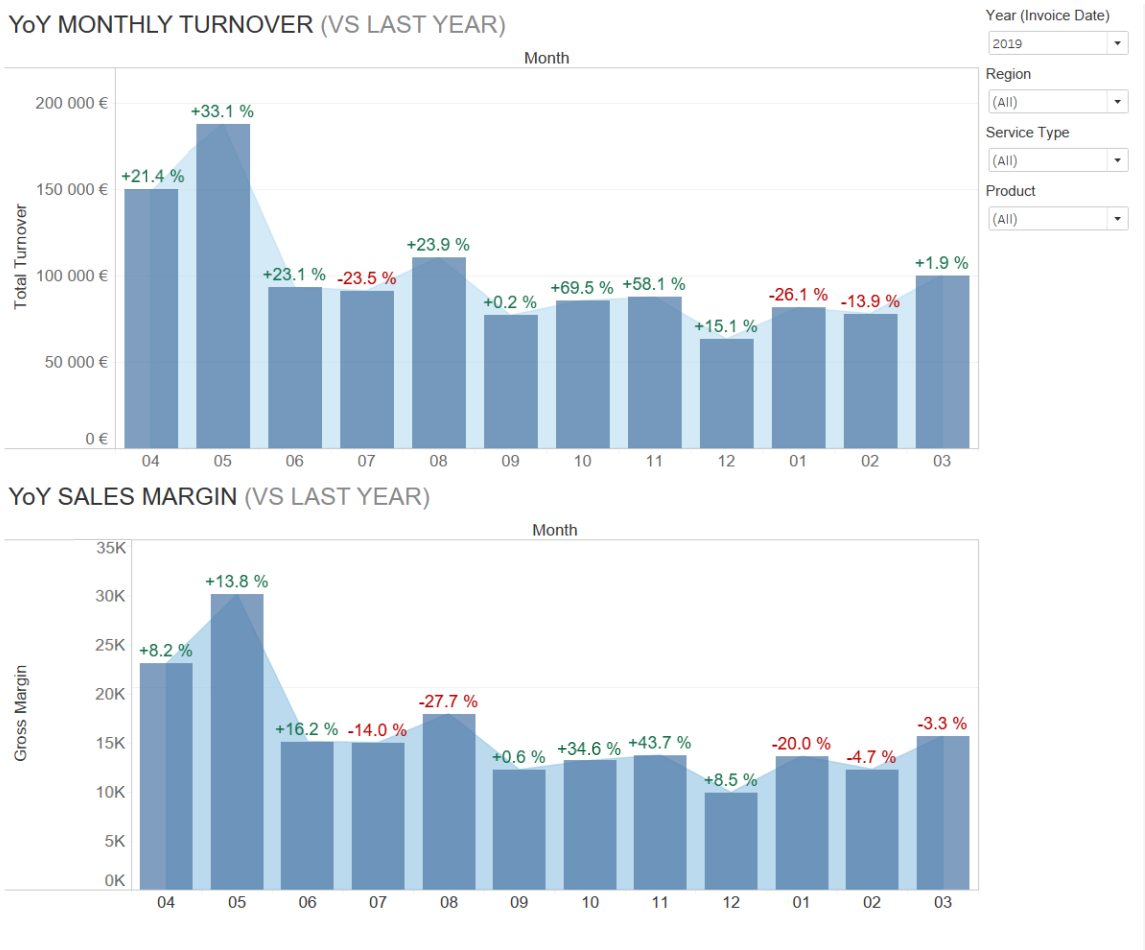

Figure 16. YoY monthly turnover and margin. Values are not proportional to actual sales.

After examining the sales performance of top products compared to last year's performance, figure 16 will show the YoY percentage change in turnover and sales margins by months. The YoY growth rates are calculated for the period of twelve months during a fiscal year. Accordingly, the period can be changed to quarters as an alternative to months, for example, third quarter of 2019 compared to third quarter of 2019. These YoY performance charts allow NNE Aftersales department to spot trends over time and see if business performance is growing from month to month, quarter to quarter, and year to year. Users can also easily recognize if certain months or quarters are higher or lower in regard to turnover, profit, or profit margin. In addition, YOY calculations are particularly important to

determine seasonal trends of some Nissan part and accessory products. For example, some products may peak in the spring/ summer while some others may peak in winter season.

Similar to other visualization built in Tableau, these charts include a filter panel with different drill down options (by region, by service type, by product part number, …) This feature enables users to select and measure multiple business performances of specific service types/ products, not just the overall performance.

Example Workbook 4

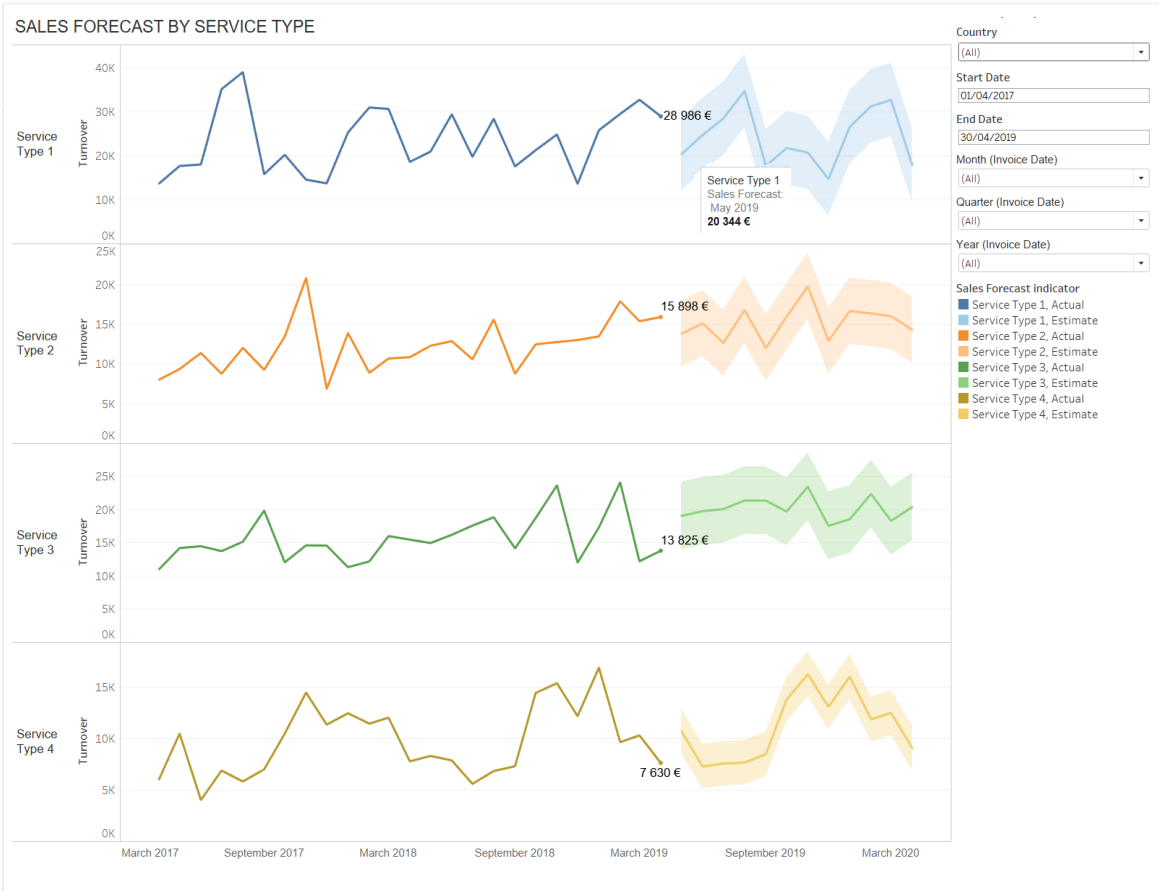

Figure 17. Sales forecast by service type. Values are not proportional to actual sales.

Next, figure 17 shows both actual and forecasted revenue for each service type. The estimated future values are calculated based on historical time series data using the built-in forecasting functionality in Tableau. The areas with lighter shades of the color represent the sales forecasts, while darker lines represent

historical sales. In the above dashboard, the forecasts are only calculated until the end of April 2019. However, the chart will automatically expand once new data are loaded to Tableau. Users can select different suitable forecasting models or change the seasonality of the algorithms to get the desired results. Users can also customize yearly, quarterly, monthly, or weekly forecasts by specific regions or products based on their needs.

With the use of BI tools like Tableau, NNE Aftersales department can improve the ability to forecast sales trends, future demand, and inventory requirements. BI tools are capable of automatic data collection to show the most up-to-date data. By having timely and accurate information from multiple sources in one central dashboard, managers and business users can project future estimates more precisely and reduce the risk of poor inventory planning. Additionally, unlike Excel where the current performance dashboard is restricted to only 2 years of data in one single file, BI tools can query billion rows of data that can be used to produce more highly accurate forecasts.

Example Workbook 5

WHAT-IF SALES FORECAST
(50% Growth, 8% Churn)

			Q1			Q2			Q3			Q4		
			April	May	June	July	August	Septem..	October	Novemb..	Decemb..	January	February	March
Norway	Service Type 1	Sales	11 227 €	9 766 €	8 578 €	6 280 €	11 195 €	9 716 €	15 441 €	13 680 €	13 984 €	6 727 €	10 507 €	11 326 €
		Sales Forecast	15 494 €	13 477 €	11 837 €	8 666 €	15 450 €	13 409 €	21 309 €	18 878 €	19 298 €	9 283 €	14 499 €	15 630 €
	Service Type 2	Sales	2 864 €	1 960 €	1 227 €	930 €	1 349 €	1 072 €	1 274 €	2 939 €	1 159 €	1 128 €	921 €	699 €
		Sales Forecast	3 952 €	2 704 €	1 693 €	1 284 €	1 862 €	1 479 €	1 758 €	4 055 €	1 599 €	1 557 €	1 271 €	964 €
	Service Type 3	Sales	406 €	775 €	400 €	234 €	368 €	417 €	264 €	512 €	222 €	617 €	412 €	387 €
		Sales Forecast	561 €	1 069 €	552 €	323 €	508 €	575 €	364 €	706 €	306 €	852 €	569 €	534 €
	Service Type 4	Sales	8 045 €	9 188 €	6 898 €	4 513 €	7 918 €	7 118 €	7 427 €	6 433 €	4 289 €	4 702 €	4 501 €	8 851 €
		Sales Forecast	11 103 €	12 680 €	9 519 €	6 228 €	10 927 €	9 822 €	10 249 €	8 877 €	5 919 €	6 489 €	6 211 €	12 214 €
Sweden	Service Type 1	Sales	15 059 €	10 962 €	9 002 €	3 343 €	9 105 €	8 013 €	11 452 €	11 758 €	10 103 €	16 740 €	13 931 €	13 278 €
		Sales Forecast	20 781 €	15 127 €	12 422 €	4 613 €	12 565 €	11 058 €	15 804 €	16 226 €	13 942 €	23 101 €	19 225 €	18 324 €
	Service Type 2	Sales	3 265 €	3 040 €	1 679 €	746 €	1 758 €	1 739 €	2 349 €	1 729 €	1 319 €	2 138 €	1 529 €	2 486 €
		Sales Forecast	4 506 €	4 195 €	2 317 €	1 030 €	2 426 €	2 400 €	3 242 €	2 386 €	1 821 €	2 951 €	2 110 €	3 431 €
	Service Type 3	Sales	201 €	781 €	1 355 €	241 €	277 €	237 €	382 €	569 €	116 €	158 €	475 €	313 €
		Sales Forecast	277 €	1 078 €	1 870 €	332 €	382 €	327 €	527 €	786 €	160 €	218 €	655 €	432 €
	Service Type 4	Sales	5 204 €	6 018 €	4 623 €	3 530 €	4 411 €	4 612 €	5 016 €	6 940 €	3 013 €	3 439 €	3 624 €	4 211 €
		Sales Forecast	7 181 €	8 305 €	6 380 €	4 871 €	6 087 €	6 364 €	6 922 €	9 577 €	4 158 €	4 745 €	5 002 €	5 811 €
Finland	Service Type 1	Sales	4 722 €	6 019 €	4 408 €	5 309 €	4 707 €	4 829 €	4 213 €	6 286 €	6 063 €	3 222 €	3 253 €	3 218 €
		Sales Forecast	6 517 €	8 306 €	6 083 €	7 327 €	6 496 €	6 665 €	5 814 €	8 675 €	8 366 €	4 446 €	4 489 €	4 441 €
	Service Type 2	Sales	5 943 €	6 110 €	3 636 €	2 816 €	4 459 €	5 098 €	8 636 €	7 972 €	5 110 €	7 803 €	3 408 €	3 791 €
		Sales Forecast	8 201 €	8 432 €	5 018 €	3 887 €	6 153 €	7 035 €	11 918 €	11 001 €	7 052 €	10 768 €	4 703 €	5 231 €
	Service Type 3	Sales	3 089 €	3 539 €	1 768 €	2 071 €	2 315 €	1 807 €	3 137 €	2 125 €	1 127 €	1 652 €	2 106 €	1 922 €
		Sales Forecast	4 263 €	4 884 €	2 439 €	2 858 €	3 194 €	2 493 €	4 328 €	2 933 €	1 555 €	2 279 €	2 906 €	2 652 €
	Service Type 4	Sales	1 564 €	1 525 €	857 €	1 119 €	1 317 €	1 767 €	967 €	1 603 €	1 350 €	788 €	1 098 €	932 €
		Sales Forecast	2 158 €	2 105 €	1 183 €	1 544 €	1 817 €	2 438 €	1 334 €	2 213 €	1 864 €	1 087 €	1 515 €	1 286 €
Denmark	Service Type 1	Sales	6 612 €	7 766 €	5 247 €	2 814 €	7 594 €	6 652 €	6 391 €	3 588 €	3 997 €	7 768 €	6 066 €	6 227 €
		Sales Forecast	9 124 €	10 718 €	7 241 €	3 883 €	10 479 €	9 180 €	8 819 €	4 951 €	5 516 €	10 720 €	8 371 €	8 594 €
	Service Type 2	Sales	9 941 €	12 436 €	7 945 €	6 277 €	11 807 €	12 332 €	27 627 €	47 394 €	24 827 €	24 468 €	19 799 €	20 295 €
		Sales Forecast	13 719 €	17 162 €	10 964 €	8 662 €	16 294 €	17 018 €	38 125 €	65 403 €	34 262 €	33 766 €	27 322 €	28 007 €
	Service Type 3	Sales	698 €	727 €	487 €	346 €	406 €	476 €	643 €	433 €	577 €	659 €	525 €	679 €
		Sales Forecast	963 €	1 004 €	672 €	477 €	561 €	657 €	887 €	598 €	796 €	910 €	724 €	937 €
	Service Type 4	Sales	758 €	1 004 €	812 €	771 €	812 €	1 181 €	999 €	867 €	515 €	403 €	592 €	849 €
		Sales Forecast	1 046 €	1 385 €	1 120 €	1 064 €	1 121 €	1 630 €	1 379 €	1 197 €	711 €	556 €	816 €	1 171 €
Baltic	Service Type 1	Sales	2 784 €	1 485 €	3 114 €	1 311 €	3 110 €	2 150 €	1 050 €	1 409 €	1 461 €	865 €	290 €	678 €
		Sales Forecast	3 842 €	2 050 €	4 297 €	1 809 €	4 292 €	2 966 €	1 449 €	1 945 €	2 017 €	1 194 €	400 €	936 €
	Service Type 2	Sales	615 €	604 €	733 €	601 €	673 €	1 218 €	1 739 €	2 094 €	1 063 €	454 €	735 €	641 €
		Sales Forecast	849 €	833 €	1 012 €	830 €	929 €	1 680 €	2 400 €	2 890 €	1 467 €	627 €	1 014 €	884 €
	Service Type 3	Sales	2 461 €	3 792 €	1 949 €	1 371 €	1 358 €	2 085 €	1 412 €	1 898 €	1 893 €	1 169 €	2 088 €	1 775 €
		Sales Forecast	3 397 €	5 233 €	2 689 €	1 892 €	1 874 €	2 878 €	1 948 €	2 619 €	2 613 €	1 613 €	2 882 €	2 449 €
	Service Type 4	Sales	428 €	788 €	151 €	45 €	579 €	538 €	537 €	338 €	444 €	534 €	387 €	587 €
		Sales Forecast	591 €	1 088 €	209 €	62 €	798 €	743 €	741 €	466 €	612 €	737 €	535 €	810 €

Year (Invoice Date)
(All)
Product
(All)
Description code
(Multiple values)
Churn Rate
8,00%
New Business Grow..
50,00%
Measure Names
Sales
Sales Forecast

Figure 18. What-if forecast by service type. Values are not proportional to actual sales.

Finally, to further enhance the sales forecasting, figure 18 examines what-if analysis broken down by sales regions and service types. This estimated data table can help users explore various forecasting scenarios that can be used for better sales planning. In the above table, users can change “Churn Rate” and “New Business Growth” values from the filter panel the see how those changes will affect the estimated sales outcomes.

Sales measures can be replaced with profit, quantity, inventory or any measures of the user’s choice. This is a relatively simple scenario but according to different needs, users can generate more complicated scenarios by providing and testing different inputs. Also, by using Tableau to create dashboards, different teams can identify the measures and collaborate on the forecast logic together.

5 CONCLUSIONS

This final chapter concludes the thesis by presenting a summary of the key findings. Later, the thesis ends with a reflection on the author's personal learning and self-development during the whole thesis process.

5.1 Key findings and recommendations

The main goal of this thesis was to study the current performance measurement process at case company, the potential of BI in management reporting, and how BI can be applied to improve the current performance dashboards. In summary, the main research question- *"How to optimize business performance measurement with the help of Business Intelligence (BI) tools?"*, together with four sub-questions, was thoroughly addressed and answered based on the study results. The main findings of this thesis are summarized as follows:

Regarding the ***sub research question 1****,* multiple concepts of performance measurement system have been studied to gain more understanding of the field of performance measurement in business practice. In general, today's rapidly changing business environment requires that organizations put more focus on the effective use of performance dashboards and KPIs to control overall business operations and align daily activities to their strategic goals. In addition, current practices of performance measurement at NNE Aftersales were researched and analyzed to define limiting factors and suggest solutions to improve the efficiency of the process.

Based on the results of the interviews and the author's own observation while working at the case company, it can be stated that the current Excel performance reporting is time-consuming and does not meet stakeholder's expectations in terms of data quality. The most serious problem with the current practice is that it includes a lot of manual steps, which greatly reduce data processing speed and increases the risk of human error. In addition, the row limit in Excel is another challenging issue when processing large data sets from multiple systems and

data sources. Also, Excel's lack of collaboration tools has prevented different teams from sharing performance dashboards or tracking all the changes to prevent overlapping work. As a result, the implementation of BI system is needed to reduce data processing time and enhancing data reliability.

To address the ***sub research question 2***, concepts related to BI system, BI tools as well as their capabilities have been reviewed to provide readers with essential background knowledge on the topic. Several BI applications in terms of performance measurement are also presented. Followed by the theoretical part, the interview research has shown that the Aftersales department is already running a project to implement a new BI system. However, the project is currently in the early stages of implementation as the data warehouse infrastructure is still under development. When the implementation is completed, BI would be a promising solution to support the Aftersales department in processing huge data sets from different data sources.

For the ***sub research question 3***, an optimized process is suggested based on the core concept of applying Tableau into the current reporting process at NNE Aftersales. With the change in the new process, the total time spent on one performance report would be reduced approximately from 8 hours to just 1,5 hours. Accordingly, there would be much more working time left for more important tasks such as sales analysis or demand planning, not just manually crunching data. While the deployment of BI system would certainly require a lot of effort at the beginning, the value of saving time will be significant in the long run. In addition, using BI tools for performance dashboards can eliminate most of the manual process, increasing data quality as well as the reliability of reports. BI tools such as Tableau can collect data and update dashboards automatically. This provides the case company the most up-to-date data about current business performance. This allows the team to facilitate better decision-making, manage real-time metrics, and react more quickly to sudden changes.

Furthermore, the author has used Tableau to create several performance dashboards that include some of the most fundamental metrics and KPIs used in NNE Aftersales department. The proposed charts and dashboards can be used as referrals or reporting ideas for the future to help the case company further improve

their performance dashboards once they have the new reporting tool in place. Compared to the old version in Excel, these performance dashboards created in Tableau are more accurate, dynamic, and easy to filter information while providing more insights.

To conclude, this thesis has fulfilled its main purpose as the main research question was answered to resolve the problems founded in the current process. It can be stated that the implementation of BI tools in performance reporting can greatly reduce data processing time, minimize the risk of human error, and therefore improve data quality as well as reliability of reports. Moreover, BI tools can also provide users with greater data analytics and visualization capabilities, making it easier to spot trends or evaluate actual against targeted performance. Finally, once performance reports are created using BI tools, they can be viewed, shared, or edited within the department, enabling data collaboration between different teams. Although the introduction of BI solution will require a lot of resources, especially in the initial stage, the value that it brings will become essential for measuring daily business performance in long term.

5.2 Reflection on personal learning process

This thesis has been a valuable learning experience for the author. First of all, when forming the theoretical part, the author has gained a comprehensive understanding of Performance Management and BI field. Also, the author has learned to apply data analytics and visualization best practices with the use of BI tools. This is particularly valuable considering the fact that the author would like to develop her career in the area of business analytics. At the same time, the author's researching, summarizing as well as academic writing has been significantly improved during the whole thesis process.

As final words, the author would like to express gratitude and appreciation to managers at the case company for their inputs in the research interview. Last but not least, the author would like to thank her thesis supervisor for all the knowledge, constructive feedback, and continuous support to help her complete this thesis.

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APPENDICES

Appendix 1. Interview Question Guideline

		Interview Questions
IQ1	What is performance measurement and the current practices of performance reporting at the case company?	1. Can you please briefly describe your role
		2. Can you explain the current reporting process?
		3. What are the difficulties that you encounter throughout the process?
		4. In your opinion, what are the limiting factors of the current process?
IQ2	What is BI tool and the current practice of implementing BI tools at the case company?	5. What do you know about BI?
		6. What is the status of integration project for BI system at your department?
		7. Do you think that BI tool can help to im-prove the current process of KPIs reporting?
IQ3	What improvement proposals of performance report using BI tool can be made?	8. At which stage do you think the process can be improved?
		9. What are the most influenced factors that should be prioritized? Why?
		10. What are your expectations of the optimized KPIs reporting process?
		11. What is your demand to develop performance dashboards