A Performance Measurement System for SCO Industrial Base Performance Converting Sales

- A Company Case Study –

Master Thesis

by

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Acknowledgment

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Hanna Trulsson

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2021-11-23 Stockholm

Abstract

Title
A Performance Measurement System for SCO Industrial Base Performance Converting Sales

Background
SCO Industrial Base Performance (IBP) Converting Sales is a department within Tetra Pak Packaging working with order management. The department has today limited access to monitoring support and no performance measurement system is active for tracking performance of the department and their stakeholders. Within this case study, the focus has been to develop a performance measurement system to use as a monitoring tool for measuring, evaluating, and support an increase of performance.

Purpose
Design a performance measurement system for SCO IBP Converting Sales, to facilitate and monitor their order-to-delivery process.

Research Questions
- **RQ1**: How can a PMS be designed to measure and evaluate the OTD process managed by Converting Sales?
- **RQ2:** What objectives should the PMS contribute to, and what are the gaps between these and the organizational strategy?
- **RQ3:** What are the success factors for the OTD process managed by Converting Sales?
- **RQ4:** What are the priority areas for Converting Sales to achieve high performance in the OTD process?

Method
The research procedure is built up as a company case study with a combination of the system- and actor's approach. In accordance with the system approach, the project includes mapping and analysing data to generate a solution to an identified problem, e.g., the problem with limited monitoring support will be solved by developing a performance measurement system. The actor's approach conducted in this case study refers to the researchers analysing, and interpretation of the results generated from the large magnitude of qualitative data.

Conclusion
From literature review a theoretical research model was developed describing the process for designing a performance measurement system fit for the company culture, strategic direction, and stakeholder perspective. Following the model, the definition of high performance for the department was investigated and success factors were formulated from interview results. These success factors were *according to plan and/or agreement; information flow;* and *on-time delivery.* From these success factors three priority areas could be identified, namely *customer satisfaction; time dimension;* and *transparency.* From these priority areas and with regards to how they were described important for the department, the quantitative metric *on-time delivery ratio* was suggested in a two levelled structure. This measure was designed to capture the delivery performance of Converting Sales and their suppliers and distributers. The hypothesis is that this metric can help improve delivery performance, hence, increase the effectiveness of the department. This was suggested as the initial design of the performance measurement system which should be further developed with evaluation, weighted scores, and additional performance measures.

Keywords: *performance measurement system; performance measures; supporting infrastructure; order management; order-to-delivery process*

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1 Introduction

This chapter presents an introduction to the case study research including a brief theoretical background; a presentation of the company; and purpose- and contribution of the case study.

1.1 Theoretical Background

A performance measurement system (PMS) is a frequently used monitoring tool supporting companies when measuring, evaluating, and reaching for improved performance (Neely *et al.* 1995). With the use of a PMS companies can get guidance towards reaching their strategic objectives and support employees in decision-making towards desired results. Within literature, various PMS definitions can be identified, where one commonly cited definition is the one stated by Neely *et al.* (1995) which describes a PMS is *"a set of metrics used to quantify both the efficiency and effectiveness of actions",* In this definition the measures are described as the process of quantifying actions which lead to performance. To cope with the challenge of variance in the definition, the PMS for this study has been defined as following: included features are *performance measures* and *supporting infrastructure;* with the role to *measure performance, influence behavior,* and promote *learning and improvement;* this is achieved through *selection and design of measures, collection and manipulation of data,* and *information management.*

One frequently mentioned purpose for implementing a PMS is the ambition to deliver on organizational objectives with the use of the PMS (Franco-Santos *et al.* 2007). Bititci *et al.* (1997) explain a PMS system can help formulate strategic and tactical objectives for the business, at the same time as facilitating and controlling processes and decisions through appropriate information systems. However, not all PMSs are successful, and a poorly designed system has the potential to harm the business if promoting the wrong behaviors. The challenge is there is no standardized one-fits-all process or framework describing how a system should be developed to achieve desired results. Neither is there a generic set of metrics which should be adopted (Franco-Santos *et al* 2007), since these depend on the organizational structure, culture, and environment in which the company operates (Caplice & Sheffi 1995; Lebas 1995). Additionally, many PMS implementations fail due to fit of the company has not been throughout investigated and potential challenges not enough evaluated (Bourne *et al* 2005). To succeed with designing and implementing a PMS the importance lays in understanding the company, business function, and process for which the PMS should be constructed. The focus should be to understand what performance is, since this is not a generic term with a one-fit-all definition. Rather, it is a case specific attribute which aim to manage actions according to situation specific objectives (Lebas 1995). Therefore, to develop an effective PMS, it is necessary to make sure it fits the environment in which it will operate. If the PMS does not fit, the metrics cannot reflect what is important and will not contribute to increased performance (Franco-Santos 2007; Melnyk *et al.* 2013).

In this case study, the process investigated is an order-to-delivery (OTD) process, which is one of the most critical processes within a company. This process flows through multiple functions and is triggered by a customer sending an order (Amer *et al.* 2008; Forslund, Jonsson, & Matsson 2008). This means, the OTD process impact all other processes in the supply chain process and has a direct connection to customers and is vital for collecting and understanding their requirements (Amer *et al.* 2008). It is also the process which delivers products or services from supplier to end-customer, thus, crucial to achieve customer satisfaction (Brabazon & MacCarthy 2007). Designing a PMS for this process, not only supports a key process within the supply chain but is also a good starting point for increasing supply chain integration. An integration which can contribute to improved performance, collaboration, and competitive advantages (Amer *et al.* 2008). However, limited research can be found

about the process of developing a PMS for the OTD process. Instead, existing literature seems to focus on PMSs intended for strategic or tactical decisions, forgetting the more operational processes as the one conducted for OTD. This limited support creates challenges for business leaders wanting to construct operational PMSs that can improve the company's operational processes, which are crucial to achieve success at a tactical and strategical level as well. Within this case study, this challenge has been approached and a PMS has been developed for a OTD process at Tetra Pak by transforming criteria intended for a strategic PMS to fit a more operational PMS.

1.2 Case Study Company

Tetra Pak is a world leading company within food processing and packaging solutions active in more than 160 countries around the world, see *figure 1.1*. They are a part of Tetra Laval Group which consists of three companies: Tetra Pak, Sidel, and DeLaval, where Tetra Pak is the largest (Tetra Laval 2020), with more than 25 thousand employees and a net sale of above 10,8 billion euros (Tetra Pak 2021a). For more than 65 years Tetra Pak has worked towards their slogan *"Protect What's Good"* to keep food safe and available everywhere. They offer complete solutions from processing to distribution of various food products, always with a focus on customer value and sustainability. Tetra Pak's portfolio consists of cartoon packages, automation solutions, processing-, packaging-, and distribution equipment, as well as multiple complementary services. They are active within various food categories such as dairy products, juices, still drinks and much more, see *figure 1* (Tetra Laval 2020).

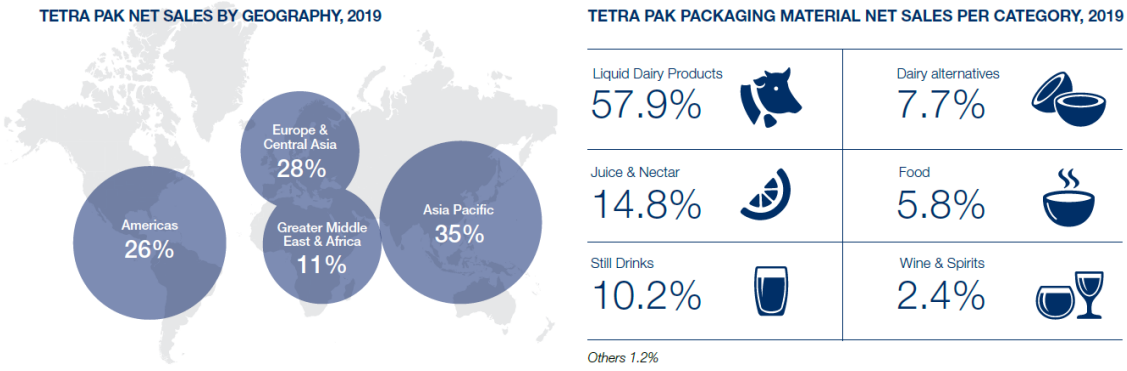


Figure 1. Tetra Pak's net sales by geography and product category distribution. Reprint from "Tetra Laval 2019/2020" (p.11) by Tetra Laval, 2020, Switzerland: Tetra Laval International. https://tlcomprod2.azureedge.net/static/documents/tetra-laval-2019-2020.pdf

In this study a department referred to as Converting Sales will be further investigated. This department is part of a business function named *Supply Chain Operations* (SCO) that are responsible for operational excellence at Tetra Pak, meaning they manage sourcing, production, and delivering of packaging material. The business function has about 9000 employees located in 30 different countries and is divided into four sub-functions: *Additional Materials*, *Base Materials*, *Industrial Base Performance* (IBP), and *Integrated Supply Chain* (ISC) (Tetra Pak 2021b). Converting Sales act as a supporting function to IBP that are responsible for delivering equipment and processes for projects conducted at the different converting factories (Tetra Pak 2021c). IBP has around 250 employees located primarily in Lund (Tetra Pak 2021b), where Converting Sales are also sited.

Converting Sales is a team of four employees and is led by the Portfolio Manager (Tetra Pak 2021d). They manage and coordinates OTD processes for in-house purchases and installations within 400-500 projects each year which amount to a net value of around 160 million euro every year. With an early involvement in projects Converting Sales can not only support but also improve the efficiency and accuracy of the OTD process, making sure orders are carried through and delivered according to

expectations from both factories and project managers (Tetra Pak 2020). However, starting this case study research, no exiting monitoring support or performance evaluation was in place for the department. Developing a PMS for Converting Sales therefore included many opportunities, especially since the department coordinate such a key process as the OTD. By measuring and support improved performance of this process the opportunity is an impact on the complete supply chain can be achieved and increased supply chain integration initiated (Amer *et al.* 2008). To create a PMS for Converting Sales' OTD process was therefore valuable not only for the department, but for the complete supply chain in which they operate.

1.3 Problem Formulation

Two challenges constitute the basis for this case study research, one concerning theory and one the case study company. Within theory, the identified problem is the gap in existing research for how a PMS can be constructed for an OTD process. Within the available studies, the focus seems to be on developing PMSs adopted at a high level in the company, contribute to direct strategic or tactical decisions. However, business units coordinating operative processes such as the OTD, plays an important role for the success of the company and evaluating the performance for these departments should be promoted. With no support for business units wanting to develop a system supporting this evaluation, the risk is it will not be a successful development process. This can cause a poorly designed PMS, which is a known problem even for strategic PMSs which has a lot of available research to use as support during the development phase. Aa a result a poorly designed PMS can promote the wrong behaviors which can cause harm on the business instead of supporting the employees in the correct direction. Concludingly, the lack of information on how to design a PMS suitable for the OTD process and other operative processes, creates challenges for business leaders when reaching for improved performance as for the case studied in this project.

The second challenge regards the lack of monitoring support and performance evaluation of the OTD process conducted by Converting Sales. This means, the department has limited knowledge of how the process perform and how it can be improved. To cope with this issue, a PMS including a set of quantitative, non-financial measures, has been requested by the department. However, many challenges come with designing a PMS for the OTD process at Converting Sales. The problem arises due to routines are not standardized, information management insufficient, and collaboration between supply chain departments not effective enough. Additionally, considering the limited information available in existing research of how to successfully create a PMS for a OTD process, the department meets a big challenge when attempting to create such a system. To succeed it is important to understand the environment in which Converting Sales operates and define their unique definition of performance as well as to identify success factors contributing to this performance.

1.4 Purpose

Designing a performance measurement system which can support increased performance for an operative department managing an order-to-delivery process.

1.5 Focus and Delimitations

The focus of this company case study is to develop a PMS for the OTD process carried out within *implementation projects* by SCO IBP Converting Sales. However, activities performed before a purchase order is created, such as quotation, will not be included in the study. Neither will activities carried through after a delivery is completed, such as invoicing, be examined.

Converting Sales manage OTD processes within different types of projects, as well as for spare parts, but only the OTD process conducted for *implementation projects* will be included in the study.

The study will be focus on developing a PMS including quantitative non-financial measures for this OTD process, excluding financial as well as qualitative measures. Recommendations for further implementation of the PMS will be listed, but the actual implementation is not carried through during this master thesis.

1.6 Research Questions

The research questions formulated for this study are organized in descending order and are stated below. The first research question RQ1 aims to deliver upon the overall purpose of the study, while RQ2-RQ4 intends to cover the process for answering this question. Therefore, before RQ1 is answered RQ2-RQ4 must first be resolved. In the same way, RQ3-RQ4 should be acknowledged before RQ2 is resolved, and RQ4 before RQ3. By attending the research questions in this order, from the bottom up, the process of fulfilling the study's purpose is perceived facilitated.

- **RQ1:** How can a PMS be designed to measure and evaluate the OTD process managed by Converting Sales?
- **RQ2:** What objectives should the PMS contribute to, and what are the gaps between these and the organizational strategy?
- **RQ3:** What are the success factors for the OTD process managed by Converting Sales?
- **RQ4:** What are the priority areas for Converting Sales to achieve high performance in the OTD process?

1.7 Contribution

The contribution from this case study research can be split into two areas: *theoretical contribution* and *practical contribution.*

1.7.1 Theoretical Contribution

The theoretical contribution with this study is within the area of PMS, and more precisely, PMS for OTD processes. A gap was identified in existing research since the majority of the reviewed studies focus on developing a PMS applicable at a company's strategic level. Limited research could be found for developing a PMS on an operational level, such as the OTD process, creating a gap in existing research. To contribute within this area, this master thesis aims to develop a PMS for an OTD process, contributing to additional research within the subject. Further, by highlighting the gap, the study contributes with knowledge about the need for further research within mentioned area.

1.7.2 Practical Contribution

The practical contribution is especially large for the company included in the case study, which will generate a direct practical benefit. From this master thesis a PMS will be developed, suitable for Converting Sales, a department at Tetra Pak. This PMS will be based on specific need identified for this department; hence, the PMS will bring direct value to them. The expectations are that the PMS can contribute with deeper understanding about possible process improvements; promote improved information flow; highlight success factors and priority areas to achieve improved performance; and through monitoring support facilitate the OTD process conducted by Converting Sales. Additionally, this study can contribute with value to similar departments that are standing before comparable challenges, active at Tetra Pak or other companies.

2 Methodology

Within this chapter a description of the research approach and method is presented. This to create an understanding of how the research has been carried through, at the same time as pointing out the validity and reliability of the study.

2.1 Research Approach

Performing research, it is of importance to use right methodology to establish a good structure and enable relevance of the research. Arbnor & Bjerke (2009) suggest three different approaches involving a slightly diverse procedure. The three approaches are: analytical-, system-, and actor's approach and which to use depends on case characteristics but also on the researcher's holistic view of the project (Gammelgaard 2004). Within this project the overall approach will be the system approach, but procedures with similarities to the actor's approach has also been applied. The system approach adopts a view where systems such as processes, targets, and feedback are seen as parts and where the sum of all parts does not have to be equal to the sum of each part individually, due to synergy effects (Arbnor & Bjerke 2009). Within this approach the target is to develop a solution to a known problem by examination of the included parts e.g., the systems (Gammelgaard 2004). For the actor's approach reality is described as a social construct where results are dependent on how the researcher analyze the data (Arbnor & Bjerke 2009). This approach is usually adopted since organizations, departments, and cases tend to have different needs which are better understood through interpretation (Gammelgaard 2004).

Reviewing the relevance of the system approach, the procedure consists of mapping and analyzing data to generate a solution or model for solving a problem (Gammelgaard 2004). This is similar to the procedure within this study where collected data has been analyzed and the results used to construct an PMS suitable for the concerned department. In this case, the problem can be identified as "missing a performance measurement system" and the solution has been to construct one. However, the analysis consists of the researcher's interpretation of the results, since this was necessary to develop a solid solution for the investigated case. This is in line with the actor's approach where the solution is based on how the researchers construe the result (Arbnor & Bjerke 2009). Another characteristic of the system approach is the ambition to improve the examined case, hence, it is not just an observation but an initiative to enable enhancement within the concerned unit (Gammelgaard 2004; Arbnor & Bjerke 2009), an objective which is well in line with the purpose of constructing a PMS for the investigated department.

The data suggested for a system approach should be both qualitative and quantitative, while the actor's approach include exclusively qualitative data (Arbnor & Bjerke 2009). Within this study the collected data is primarily qualitative, meaning it is based on interviews and description of the processes rather than numerical and measurable data (Höst *et al.* 2006). However, some quantitative data was included to support the findings gained from the qualitative data. Regarding units of analysis, focus will be on the process for which the PMS is constructed; stakeholder groups and their interests; as well as the performance which the department aim to achieve. Both systems and people have been viewed as unit of analysis within this research, since both parts has an impact on how the PMS should be constructed.

Concludingly, based on overall objectives and characteristics of this project the overall research approach was chosen to the system approach but with inspiration from the actors' approach for selected part.

2.2 Research Method

Gammelgaard (2004) and Arbnor & Bjerke (2009) both describes the case study methodology to be the most suitable method when adopting to a system approach. This is also a preferable method when the objective is to understand how an organization or department work (Höst *et al.* 2006), which is part of this research. Höst *et al.* (2006) further describes a case study is preferable when searching for a deeper understanding, which indicates a case study to be preferable when using the actor's approach where deeper understanding and knowledge are promoted.

One author frequently mentioned related to case study research is Robert K. Yin, president of COSMO Corporation with experience from conducting case study research. Due to his experience within the field, Yin's book '*Case Study Research: Design and Method*' (2014) will act as key literature within this chapter. In his book Yin (2014) describes five methods which can be used: *experiment, survey, archival analysis, history,* and *case study*. He argues three conditions stand behind the selection. The first condition concerns the research questions and how they are formulated where questions formulated as *"how?"* and *"why?"* is suitable for a case study. However, a question formulated *"what?"* is also suitable for a case study since any of the five methods could be applied to this type of questions (Yin 2014). For this study the research questions are formulated "*how"* and "*what"*, thus, case study was considered a suitable approach.

The second and third condition relates to the extent of control that the researcher have on behaviors and in what degree the focus is on contemporary events. A case study is best suited when the research is focused on current events and the behavior cannot be controlled or influenced by the researcher (Yin 2014). This is applicable for this study since investigating current processes and event, where the investigation prolonged without the author causing impact on the results.

Concerning the fit of using a case study methodology to the system approach, as well as the fulfilled conditions, a case study methodology was chosen for this master thesis. As this choice was established, further questions regarding whether to use a single- or multiple case study occurred. Yin (2014) argue a multiple case study is preferable if resources and time is available. However, due to time limitations a single case study was conducted throughout this master thesis.

2.3 Research Process and Design

Developing a process for this master thesis, inspiration was collected from the iterative case study process described by Yin (2014), see *figure 2.1* below. Yin (2014) describes the case study built upon six steps: *plan, design, prepare, collect, analyze*, and *share*. From this, together with evaluation of the case characteristics, the research process for this study was established as shown in *figure 2.2* below.

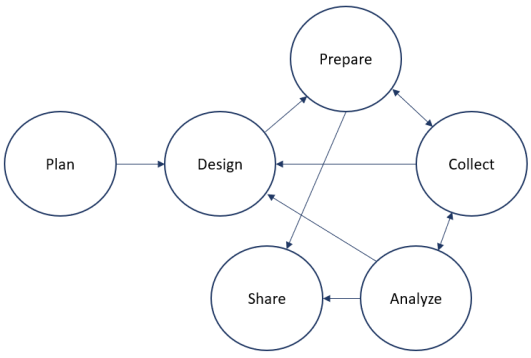


Figure 2.1 The process of a case study research (Yin 2014)

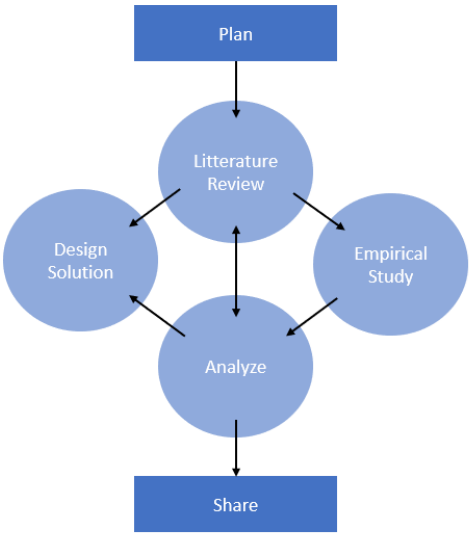


Figure 2.2 Case study process for this research

2.3.1 Plan

When planning a project Yin (2014) state a clear methodology for the research should be settled, as well as appropriate research questions. Höst *et al.* (2006) argues a case study methodology accept flexibility with the the research questions, allowing the researcher to adopt and change them as the study prolongs. Meaning, even though the initial research questions should be formulated at the planning phase these questions might be edited as the study moves further.

The initial research questions formulated for this study were relatively broad, giving rise to difficulties conducting a narrow and qualitative study. Additionally, the focus of the questions was wage since it did not fully focus on the initial problem of the case, e.g., develop a PMS. Instead, the focus was split into two areas: mapping the process and developing a PMS. To narrow the study and keep the focus towards constructing a PMS, new research questions were developed, and the final modification gave rise to the questions presented in *chapter 1.6 Research Questions.*

Another key document brought from the planning phase was the project plan. According to Höst *et al.* (2006) a project plan should include information about what and when activities should be carried through, as well as settlement of reconciliation points. More specifically, this is a detailed description of the research execution. Within this project a GANTT chart was developed in Microsoft Excel and used as an iterative project plan throughout the whole project. Important activities and deadlines were described and planned from the beginning, while smaller activities occurring as the project prolonged and new tasks occurred. This helped the researcher with an overview of current and future events, as well as to what extent the time frame was being followed.

2.3.2 Literature Review

One important part of a master thesis project was to conduct a literature review. This review constitutes the theoretical framework for the research at the same time as ensuring the author had enough knowledge within the field and was updated regarding existing research (Höst *et al.* 2006; Rowley & Slack 2004). Yin (2014) describes the literature review as part of the design phase and highlight the importance of conducting one before any data collection is initiated. The priority is to understand what is being studied e.g., the theory, before starting any investigation. To carry through with a structured and qualitative literature review it is important to understand how a successful literature review is accomplished (Höst *et al.* 2006). One article with purpose to mediate such knowledge with an extra focus towards students writing a thesis is '*Conducting a Literature Review*'

written by Jennifer Rowley and Frances Slack (2004). Due to the relevance of this article, it will be used as key literature within this chapter *2.3.2 Literature Review*.

The major parts of the literature review carried through within this project is divided into two areas: searching for literature and writing the literature review. A description of each part and how it was conducted is described below.

Searching for literature

To succeed with the literature review, two strategies in the process of searching for literature is presented by Rowley & Slack (2004) and has been applied throughout this study: *brief-search* and *citation pearl growing*. A brief-search refers to searching for documents within a database using different key words (Rowley & Slack 2004). This is a quick method which was applied as an initial stage of the literature review. Multiple combinations of key word were adopted, and the results were scattered. In some cases, a few promising articles were found but later neglected due to relevance was not perceived strong enough; research did not live up to expectations; or the authors was unknown hence validity could not be guaranteed. However, some strong and relevant document were found during this phase which has been used as the building block of documents used in the literature review. The most successful searches were done within the database *Web of Science* and the result is summarized in *table 2.1* below.

Table 2.1 Summary of literature collected from *brief-search.*

Key words	Sorting	Reference	Position	Citations
"Performance Management" and **"Performance Measurement System"** Number of hits: 11 215	Relevance	Bititci (1997)	2nd	267
		Lebas (1993)	9th	232
		Folan & Browne (2005)	12th	214
		Bititce *el al.* (2006)	19th	119
	Times cited	Neely *et al.* (1995)	9th	957
		Beamon (1999)	10th	935
		Kaplan & Norton (1993)	17th	664
"Business Performance" and **"Performance Measurement"** and **"Definition"** Number of hits: 132	Times cited	Franco-Santos *et al* (2007)	3rd	241
		Chae (2009)	26th	115

From the literatures collected through *brief-search* the *citation pearl growing* took place by identifying other relevant articles through references presented in the studied articles. A total of 24 articles were finally used in the literature review and set the basis for constructing the theoretical framework. The full list is presented in *Appendix 1: Literature Review.*

Writing the Literature Review

Rowley & Slack (2004) describes five essential steps while writing a literature review: (1) *scanning documents, (2) making notes, (3) structuring the literature review, (4) writing the literature review,* and *(5) building the bibliography.* These steps have been adopted in a parallel and iterative process throughout this research. Following is a brief description of each of the included steps:

Scanning Documents is by Rowley & Slack (2004) described as a process where documents are collected and grouped depending on theme of the article. This was conducted at an initial stage of the literature review where several articles concerning different themes were collected and summarized in a Microsoft Excel file. Many of the collected articles were later excluded due to the irrelevance of its theoretical area.

Making notes refers to marking phrases or writing them down in order to save key messages from the literature to use as citation. This helps the reader to collect and summarize the most important conclusions, messages, and themes from studied articles (Rowley & Slack 2004). Conducting the literature review for this case study a combination of marking and writing down messages was applied. While reading an articles marks were made to facilitate identification of the most relevant parts of the study if returning on a later stage. Additionally, the key take-aways were summarized in the Microsoft Excel file where all screened literature were listed. A list which was meant to be updated throughout the complete process. However, as the case study prolonged less focus was put on the file and updates were not documented. To improve the literature review, this part could have been carried through in a more sufficient way. Beyond the lack of updates, the information about each literature was perceived as too brief and a suggested improvement is to, beyond a more frequent update, include more key take-aways from each article. This would make a return to the literature review easier, a return which today was considered rather complicated.

The third step concerns *structuring the literature review,* a stage where key theoretical areas are determined, and articles grouped accordingly (Rowley & Slack 2004). For this case study, four main theoretical areas were established as particularly relevant for the study, namely *performance measurement systems, performance measures, organizational fit,* and *data collection.* These were the themes for which the studied literature was grouped, see *Appendix 1: Literature Review.*

Writing the literature review refers to the actual writing once the structe has been determined (Rowley & Slack 2004). The writing was carried through at an initial stage of the case study from which the theoretical framework was constructed. However, the writing of the literature review was constantly improved and iterated throughout the complete process as new relevant findings were collected.

The last step refers to *building a bibliography* which should be conducted throughout the complete process. This is a list were all studied literature is summarized and should be constantly updated as articles are read (Rowley & Slack 2004). The bibliography conducted in this case study is presented in the section referred to as *Bibliography.*

2.3.3 Empirical Study

The empirical study refers to the data collection of the project and can be carried through in various ways, where interviews, observation, and archival analysis are frequently used techniques (Höst *et al.* 2006). Yin (2014) argues in order to collect data in a qualitative way there are four important aspects which must be considered: *use multiple sources of evidence, create a case study database, maintain a chain of evidence,* and *exercise care when using data from electronical sources.* Aspects which have been considered while choosing, planning, and conducting the data collection process. To use multiple sources, interviews was selected as the primary technique for data collection, supplemented with meetings and archival documents. Furter, the interviews conducted during the empirical study is divided into two phases where the first phase consists of a 14 exploring interviews and the second phase of a validating workshop. A description of each phase is presented below.

Interview phase one

Yin (2004) argues that before starting the interviews it is important to carry through with a proper preparation, this to ensure the process can run smoothly. The purpose of the preparation is for the researcher to develop all the necessary knowledge and material. This involves interview guides, protocols, confidential agreements, or other documents which help make data collection structured and qualitative (Yin 2014). For this case study, the preparation phase resulted in a case study protocol which was developed with purpose of properly describe how the data collection would be carried through, see *Appendix 2: Case Study Protocol.* Further, an interview guide was developed presented in *Appendix 3: Interview Guide.*

Yin (2014) describes that to qualify the study; a pilot case is useful. This can help detect if any improvements should be applied to the documents developed in the preparation phase (Yin 2004). To cope with this, the first two interviews within this case study were seen as partly pilot interviews. After these had been carried through the interview guide was somewhat modified before continuing with the rest of the interviews.

A total of 14 interviews were conducted where the interviews were *semi-structed* including both *open-* and *closed questions*, where *open questions* allow the respondent to answer more freely, and *closed questions* has specific answers to choose from (Höst *et al.* 2006). The ambition with the *open questions* was to collect explorative information and better understand opinions regarding the subject. The reason for including the *closed questions* was to narrow the focus and making sure data would not be too comprehensive. Additionally, to keep the workload at a manageable level, no transcription was carried through, and neither was the interviews recorded. Instead, notes were generated during interviews and key take-aways were summarized after the interviews. This was perceived as a sufficient method where the most important opinions were gathered and included in the result. To increase validity of the data collection, transcription could have been conducted to enable for a more throughout analysis of the answers. However, it was not considered necessary for this case study since the target with the data collection was to generate an overall opinion about what is seen as high performance. This means, details that could have been identified through a deeper analysis was perceived not valuable enough to include in the research.

An observation during the interview phase was after the first 9 interviews had been carried through, a state referred to as data saturation was achieved. Data suturing refers to when no new information is gained through data collection, and more data only confirms what has already been concluded (Faulkner, and Trotter 2017). A total of 14 interviews were conducted throughout the empirical study, but the data suturing was reached after 9, meaning data collection could have stopped after this point (Faulkner, and Trotter 2017). This was further confirmed since data collected after the 9th interview continued to point out already concluded results, confirming data suturing had been reached.

Interview phase 2

After the 14 interviews were completed, analysis was carried through, and the most relevant findings summarized. Once the results could be established a second interview phase began, including a workshop with the team member working at the studied department. This was done to validate results found and guarantee objectives and performance formulated from the results were in line with opinions within the department. During the workshop suggested measurements could also be further discussed to guarantee they were applicable and valuable for the department.

2.3.4 Analysis

To conduct a well-structured analysis an overall analytical strategy should be determined before conducting the data collection (Yin 2014). Four general strategies presented by Yin (2014) are *relying on theoretical propositions, working data from the "ground up", developing a case description,* and *examining plausible rival explanations.* Within this case study the overall approach is similar to the *relying on theoretical proposition* where the data collection plan is based on findings from theory and also sets priorities of what should be analyzed (Yin 2014). For this study the theoretical framework conducted from literature review constituted the basis for how the study was carried out, see *Chapter 3.5 Theoretical Research Model.* From this model the priorities for the analysis were also decided which facilitated the preparation and execution of the interviews.

Yin (2014) explains that the analysis within a case study is dependent on the researcher's style and interpretation of gathered data. This is in line with the author's approach where interpretation is a big part of the analysis, at the same time as being applicable with the system approach since the analysis is dependent on how the data is mapped (Gammelgaard 2004). Höst *et al.* (2006) argues a qualitative analysis differs from a quantitative due to the qualitative data includes words and descriptions where mean values or variance cannot be calculated as for the numerical quantitative data. A technique used for the qualitative analysis was the *edited method* where the target is to develop categories of subjects created from key words collected from the gathered data. It is also described as a method where the researcher's interpretation of patterns and content within the collected material plays a major part (Höst *et al.* 2006), which further proves the compatibility with the research approach. This method was carried through within this case study according to the following four steps:

1. Data collection
   Gathering data according to the empirical study described previously.

2. Coding
   The most important findings from each interview were collected and summarized in tables. This step was similar as the starting point suggested by Yin (2014) where the data was screened in various ways in search of keywords, patterns, and insights.

3. Grouping
   The coded material was later grouped to determine in what extent keywords were mentioned by the respondents. This was to evaluate patterns and to understand what is most important for the respondents as a group. This type of comparison of findings is described as crucial for a system approach to be considered valid (Gammelgaard 2004).

4. Conclusions
   As grouping was completed conclusions could be made. As the patterns were clear a result could relatively easy be drawn from the collected data.

2.3.5 Design Solution

Within this step a connection between the collected data, analysis, and research questions were used to form a solution for the studied case (Yin 2014). This was carried through according to the theoretical research model and needs identified for the department. The construction of the PMS was developed during a few weeks in an iterative process parallel with the analysis. This to enable changes in collaboration with the team members to construct a valuable and rigid solution that can be implemented after the case study is completed.

2.3.6 Share

The last step, *share,* includes a clear and communicated conclusion. It is also the phase where choice of audience plays a major role since it defines how the result should be presented (Yin 2014). For this study, the chosen audience is employees at Tetra Pak and the Faculty of Engineering at Lund University, and the report has been written accordingly. Beyond this report, a summarizing article was written, and presentations conducted for both Tetra Pak and the Faculty of Engineering at Lund University.

2.4 Research Quality

To evaluate the quality of the study the concepts of validity and reliability will be discussed during this section. Yin (2014) describes four different tests to ensure these concepts are fulfilled, namely *construct validity, internal validity, external validity,* and *reliability.* How this study lives up to these are described below.

2.4.1 Construct Validity

Construct validity is a test to ensure accurate operational measures are adopted when carrying through with the study. To achieve this, one tactic is to use multiple sources of evidence when collecting data for the case study (Yin 2014). This has been done within this master thesis by collecting data from several sources such as interviews, archival documents, and meetings. Another important aspect to ensure to construct validity during data collection is to develop a chain of evidence (Yin 2014). For this project, such a chain of evidence is presented in *Chapter 4 Empirics*. A last tactic to increase the possibility to construct validity is to share the draft of the case study report with one main informants (Yin 2014). Within this case study the manager of the investigated department has been constantly involved in the procedure and all drafts of the report has been shared with him. The manager can also be viewed as a key informant since he has an active part in potentially implementing and managing the PMS developed during this study.

2.4.2 Internal Validity

To ensure internal validity the focus is on how the analysis of gather data is carried through. Yin (2014) describes four different tactics which can increase the internal validity of a case study, these are: *do pattern matching, do explanation building, address rival explanation,* and *use logic models.* Within this master thesis the analysis tactic is like *pattern matching* since keyword were collected, coded, and grouped from the interviews. Due to the chosen technique the case study is presumed to live up to the criteria for internal validity.

2.4.3 External Validity

The external validity concerns if findings generated from the study is applicable outside the case study. This is dependent on what type of research questions were used and how early in the progress these were settled. Preferably, to achieve a high potential for external validity, the research questions should be settled before the research design phase. This to ensure the accurate theories are being studied (Yin 2014). However, for this case study the research questions have been updated constantly in

parallel with the construct of data collection, analysis, and theoretical framework. This might decrease the external validity which can be assumed relatively low, also due to the narrow focus of the chosen case study. To increase the external validity, the research questions could have been established earlier in the process to increase relevance of the gathered theory presented in *Chapter 3 Theoretical Frame of Reference.* Additionally, the theoretical model developed for this case study could have been tested on various departments and businesses. In that way the focus would not be as narrow as it is today, and external validity could increase.

2.4.4 Reliability

Evaluating reliability of a study the questions is whether another researcher following the same procedure would end up with the same result. This means, if carrying through with the same case study the same findings and conclusions would be made. To increase the possibility for this, a case study protocol and a case study database should be developed (Yin 2014), for this study these are presented in Appendix 1: Literature Review and Appendix 2: Case Study Protocol, where Appendix 1: Literature Review represents the case study database. However, as the authors approach has been partly adopted some of the analysis is based on the researcher interpretation. This lowers the reliability since interpretation could differ if another researcher would carry through with the same case study.

3 Theoretical Frame of Reference

In this chapter, a literature review of a total of 24 different studies within the field has been conducted for the purpose of developing a theoretical framework for this study. Due to a large magnitude of existing material within the field of PMS, focus has been on publications which are highly cited and relevant for the study. Initially the definition of performance measurement system is examined, and criteria are established. Further the value of creating a supporting infrastructure is investigated, before evaluating how performance measures should be developed and selected. Next, the order-to-delivery process was studied, as well as how a PMS should be constructed specifically for this process. Finally, based on the theoretical findings, a theoretical framework has been developed and applied as underlaying material for this study.

3.1 Performance Measurement System

Performance measurement system, also referred to as PMS, is a widely discussed concept with various definitions, purposes, and criteria. The diversity within PMS literature contribute to complications since there is no clear definition of what a PMS is. Neely *et al.* (1995) highlights this issue and acknowledge one potential explanation; the authors focus on different aspect of the PMS design. Neely *et al.* (1995) defines PMS as *"a set of metrics used to quantify both the efficiency and effectiveness of actions"* and describing measures as the process of quantifying actions which lead to performance. Lebas (1995) defines performance similarly, as an implementation of actions which will contribute to reaching objectives set by the business or business unit. He states a PMS should involve future possibilities rather than historical values and argues performance evaluation is the identification of these possibilities. However, no generic PMS definition, purpose, or characteristics can be identified (Franco-Santos *et al.* 2007; Neely *et al.* 1995). Hence, to develop a clear and qualitative research specification of what is included in the investigated PMS should be stated (Franco-Santos *et al.* 2007). Thus, the PMS in this case study will be defined based on a combination of *features, roles*, and *processes*, which are describes as the main characteristics by Franco-Santos *et al*. (2007). The characteristics developed by Franco-Santos *et al.* (2007) are based on a magnitude of literature review in the area of PMS definition. Furthermore, this literature review includes multiple recognized researchers; hence, this study is assumed valid to apply as baseline when defining PMS for this study.

3.1.1 PMS Characteristics

A PMS has historically been presented as a framework, process, or based on criteria (Neely *et al* 1995). All of which includes a set of characteristics based on functions and purpose of the system. As for the definition, there are numerous PMS characteristics presented in the literature and no generic combination can be identified. Franco-Santos *et al.* (2007) categorizes existing characteristics as a combination of:

- Features – components which build up the system
- Roles – purpose and functions of the system
- Processes – actions which shape the system

Features

Franco-Santos *et al.* (2007) present eight different features identified from their literature review including 17 different articles within the field. The features were: *performance measures, objectives/goals, supporting infrastructure, targets, casual models, hierarchy/cascade, performance contract,* and *rewards.* However, only two of the features, namely *performance measures* and *supporting infrastructure,* were stated as necessary. Franco-Santos *et al.* (2007) describes an increase of complexity will occur if more features, roles, and processes are included in the definition. For this study only the necessary features *performance measures* and *supporting infrastructure* will be included. To better describe the signification of these two features a brief description of each is presented following.

With *performance measures*, Franco-Santos *et al.* (2007) refers to the set of performance measures that are included in the PMS. There is no generic set which should be adopted (Franco-Santos *et al* 2007), but instead the choice of metrics depends on the organizational structure, culture, environment, and other factors (Caplice & Sheffi 1995; Lebas 1995). Caplice & Sheffi (1995) describes performance measures as the building block for a PMS essential for the system to exist and function. Therefore, to choose appropriate metrics is necessary for the system to work in a sufficient way (Caplice & Sheffi 1995). Additionally, performance measures facilitate the implementation of business objectives and guide improvements in performance for the company. Here, the metrics can be described as the link between strategic objectives and critical success factors (Bititci *et al.* 1997). Hence, a strategically well-designed system might fail due to insufficient metrics (Caplice & Sheffi 1995), further pointing out the importance of choosing an accurate set of measurements. How to choose and evaluate metrics will be discussed later in this chapter.

Supporting infrastructure includes various aspect such as methods for data acquisition, information systems, evaluation methods, and other procedure which can support the PMS. Not only processes developed explicitly for the PMS are included in the infrastructure, but also separate activities which facilitate the use of the system (Franco-Santos *et al.* 2007).

Roles

The roles of the PMS are described as the purpose and/or functions of the system. A purpose mentioned by several authors is the target to deliver on organizational objectives with the use of the PMS (Franco-Santos *et al.* 2007). Bititci *et al.* (1997) explain a PMS system should enable an understandable formulation of strategic and tactical objectives for the business, but also facilitate and control processes and decisions through appropriate information systems.

Franco-Santos *et al.* (2007) could from their study, identify 17 different PMS purposes and functions, e.g., roles. To clarify which roles that can be included in a PMS they developed five different categories. A description of the categories is presented in *table 3.1* below.

Table 3.1. Role categories (Franco-Santos *et al* 2007)

Role Category	Description
Measure Performance	Controls the progress and measure performance
Strategy Management	Plan, formulate, and implement business strategy
Communication	The role of internal and external communication of the performance
Influence Behavior	Reward and correct behavior
Learning & Improvement	Provide feedback, increase learning, and guide improved performance

Franco-Santos *et al.* (2007) describes that only one of the roles are essential for a PMS to function, namely *Measure Performance.* The importance of *Measure Performance* is also highlighted by Neely *et al.* (1995) who states several studies has proven performance measures to be especially valuable, no matter the choice of method for data accusation or implementation strategy. Apart from *Measure Performance* the PMS in this study includes the roles *Influence Behavior* and *Learning & Improvement*, since these two roles was considered relevant for this case study.

Processes

The last characteristic group is processes, which can be described as the actions and procedures the system consists of (Franco-Santos *et al* 2007). Lebas (1995) points out the importance of understanding the processes to enable the right choice of metrics and make sure the right actions are carried out. From 12 identified processes, five categories were established by Franco-Santos *et al.* (2007), these are defined and described in *table 3.2* below.

Table 3.2 Process categories (Franco-Santos *et al.* 2007)

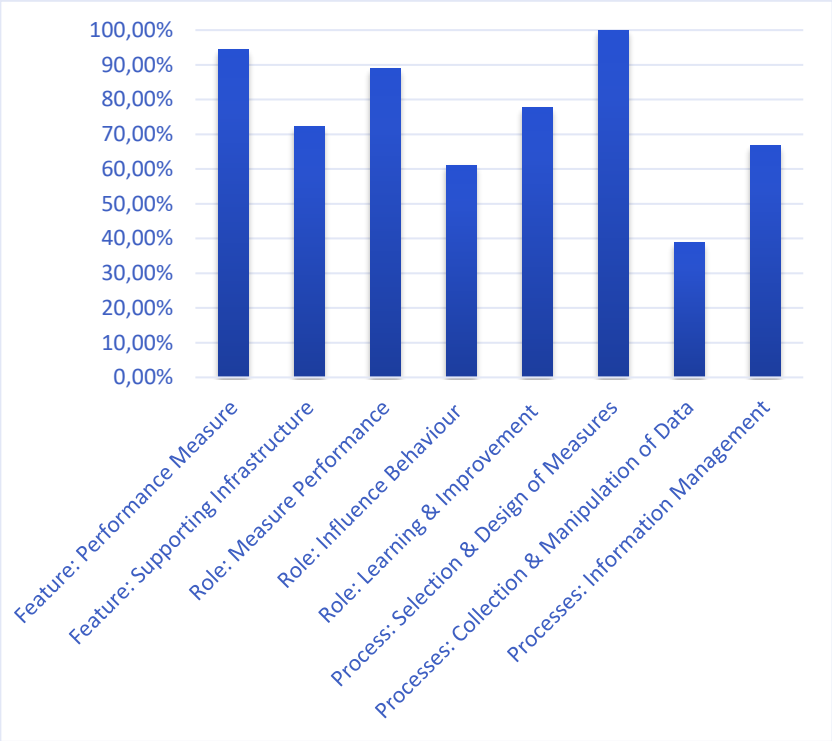
Process categories	Description
Selection & Design of Measures	The process to generate needs from stakeholders, specify objectives and targets, and design measures and selection procedure
Collection & Manipulation of Data	The process of collecting and analyzing the data
Information Management	The procedure to provide, analyze and interpret information
Performance Evaluation & Rewards	How to evaluate performance and link to rewards
System Review	Review procedures which ensure feedback loops within the system

From the 12 processes identified, Franco-Santos *et al.* (2007) states that three can be seen as necessary for the PMS to function. These processes are *measure and design selection, data capture,* and *information provision,* which are assumed to be included in the categories *Selection and Design of Measures, Collection and Manipulation of Data,* and *Information Management.* To keep the definition as narrow as possible, only these three categories will be included in the definition.

Relevance of selected characteristics

To evaluate the relevance of selected characteristics a review of the 16 articles touching the field PMS was conducted (see *Appendix 1: Literature Review).* Which of these articles concerned selected features, roles, and processes were interpreted and summarized in *diagram 3.1* presented below. From the diagram it is clear to see all categories are relevant when developing a PMS since it is mentioned by the majority of researchers. However, the process *Collecting & Manipulation of Data* is only mentioned in 39% of the studies but it is still considered a relevant part this study since it has been expressed as a problem area by the investigated department. Therefore, this process will still be included and considered during this case study.

Diagram 3.1 Share of studied literature addressing the different characteristics



3.1.2 Defining PMS for this study

To clarify which characteristics are included in the PMS in this study, a definition has been formulated. The definition is based on categories presented by Franco-Santos *et al* (2007) and validated through the review of the 16 articles within the field, see *Appendix 1: Literature Review*. The definition has been formulated for the purpose of creating a more transparent and comparable study, as well as to clarify boundaries. To keep the definition as narrow as possible, no more than three categories have been chosen for each dimension: features, roles, and processes. In *table 3.3* below, the characteristics selected for each dimension are presented and portray the PMS definition for this study.

Table 3.3 Definition of PMS included in this study described in the three definition dimensions.

Features	Roles	Processes
Performance Measures	Measure Performance	Selection & Design of Measures
Supporting Infrastructure	Influence Behavior	Collection & Manipulation of Data
	Learning & Improvement	Information Management

3.1.3 Criteria for a PMS

To establish which criteria are most important while developing a PMS, a screening of studied literature within the field of PMS has been conducted. This resulted in a review of 16 articles, see *Appendix 1: Literature Review*, and identified criteria has been summarized in *table 3.4* below. Further, the criteria were connected to features, roles, and processes defining the PMS for this study, see *table 3.3.*

Table 3.4 Summary PMS criteria captured from literature review

Literature	Criteria	Percent of literatures mentioning the criteria	Included in (feature, role & process)
Neely *et al.* (1995); Caplice & Sheffi (1995); Franco-Santos *et al.* (2007); Chae (2009)	**Include a set of performance measures**	25%	*Performance Measures* *Measure Performance* *Selection & Design of Measures*
Atkinson *et al.* (1997); Globerson & Riggs (1989); Chae (2009)	**Use limited number of measures**	19%	
Caplice & Sheffi (1995); Ecclers (1991); Beamon (1999)	**Metrics must be comparable**	19%	
Kaplan & Norton (1993); Supply Chain Council (2012); Chae (2009)	**Use multiple dimensions of performance measurements**	19%	
Wisner & Fawcett (1991); Caplice & Sheffi (1995); Atkinson *et al.* (1997); Bitici *et al* (1997); Supply Chain Council (2012); Chae (2009)	**Vertical Integration**	40%	*Performance Measures* *Influence Behavior* *Information Management*
Wisner & Fawcett (1991); Caplice & Sheffi (1995); Atkinson *et al.* (1997); Bitici *et al* (1997); Beamon (1999)	**Horizontal integration**	32%	
Caplice & Sheffi (1995); Lebas (1995); Neely *et al.* (1995); Melnyk *et al* (2013)	**Provide guidance for decision-making and necessary actions**	25%	
Eccles (1991); Atkinson *et al* (1997); Bitici *et al* (1997); Folan & Browne (2005)	**Include non-financial measures**	25%	*Performance Measures* *Learning & Improvement* *Selection & Design of Measures*
Bourne *et al.* (2001); Franco-Santos *et al.* (2007); Wisner & Fawcett (1991); Atkinson *et al.* (1997); Melnyk *et al* (2013); Beamon (1999); Folan & Browne (2005)	**Evaluate performance**	44%	*Supporting Infrastructure* *Measure Performance* *Collection & Manipulation of Data*
Wisner & Fawcett (1991); Eccler (1991); Bitici *et al.* (1997); Lebas (1995); Supply Chain Council (2012); Beamon (1999)	**PMS must reflect organizational strategy**	40%	*Supporting Infrastructure* *Learning & Improvement* *Selection & Design of Measures*
Caplice & Sheffi (1995); Atkinson *et al.* (1997); Ecclers (1991); Folan & Browne (2005)	**Include stakeholder perspective**	25%	
Caplice & Sheffi (1995); Ecclers (1991); Bourne *et al.* (2005); Lebas (1995); Melnyk *et al* (2013); Beamon (1999); Chae (2009)	**Compatible with organization structure, culture, and environment**	44%	

From the result shown in *table 3.4* a relatively diverse perception of what must be included in a PMS is shown. However, some mentioned criteria seem to be presumed, resulting in authors not mentioning it as a success factor even though it is critical for the PMS to fulfill its purpose. For example, the criteria '*include a set of performance measures'* is only presented as a critical success factor in 22% of the literature, even though its importance is obvious for the PMS to function (Franco-Santos *et al.* 2007). Accordingly, the criteria have been considered important within this case study.

The criteria highlighted most often was '*evaluate performance',* a criteria which can be assumed critical for a PMS to generate desired value. Two other criteria mention in 39% of the literatures were: *PMS must reflect organizational strategy* and *compatible with organization structure, culture, and environment.* These two concern the same area with a focus on how well a PMS fit the organization and its strategy. Hence, making sure to have a strategic fit by focusing on organizational strategy and fitting the PMS into the company culture can be concluded as an important requirement for a well-structured PMS.

Considering the even percentage and relatively few criteria, all criteria listed in *table 3.4* has been examined when developing the PMS in this project. Whether all criteria were fulfilled was dependent on perceived value of each specific criteria for the investigated department. A few of the criteria which have been considered especially important for the PMS to function, is those related to the feature *supporting infrastructure.* This is due to its relevance when adopting the PMS to concerned business unit. To better understand how to create a *supporting infrastructure,* a next step is to further investigate how this concept affect the PMS design.

3.2 Supporting Infrastructure

To establish a supporting infrastructure, methods and procedures supporting the PMS must be evaluated. Alongside this, the organizations environmental impact should be taken into consideration (Franco-Santos *et al.* 2007). Both the external- and internal environment has an impact on how effective a PMS will be. The external environment includes elements such as competitors, community, and economy, while internal environment refers to factors such as organizational structure, culture, and resources (Bourne *et al.* 2005). Three areas have been found particularly important when reaching for a supporting infrastructure and will be further investigated throughout this section. These areas are:

- *Strategic fit* – understand how the business environment and process characteristics impact requirements on the PMS
- *Stakeholder perspective* – clarify how stakeholders wants and needs can be taken into consideration in the PMS design
- *Data collection & reporting tools* – define how data collection, reporting, and visualization can best be practiced for a PMS to be successful

To evaluate these areas a few of the studied literatures were found especially interesting due to their approach regarding the subjects. For the areas *strategic fit* and *stakeholder perspective* 9 literatures discussing the area *organizational fit* has been reviewed, while for *data collection & reporting tools* the 7 literatures concerning *data collection* has been applied, see *Appendix 1: Literature Review*. Hence, these literatures act as basis for arguments lifted in this sub-chapter.

3.2.1 Strategic Fit

The design and purpose of a PMS vary depending on company culture, structure, and economic circumstances (Lebas 1995). Developing a PMS, it is crucial to take these organizational factors into considerations since they affect the strategic objectives of the company and/or business unit (Bititci *et al.* 1997). Important is, performance is not a generic term with a one-fit-all definition. Rather, it is a case specific attribute which aim to manage actions according to situation specific objectives (Lebas 1995). Therefore, to develop an effective PMS, it is necessary to make sure it fits the environment in which it will operate. If the PMS does not fit, the metrics cannot reflect what is important and will not contribute to increased performance (Franco-Santos 2007; Melnyk *et al.* 2013).

To establish a fit between the environment and PMS, it is essential to understand the process and/or unit for which the PMS will be built, and from that define what is performance (Lebas 1995). Furthermore, for a PMS to reach long-term success another critical matter is to determine environmental impact (Melnyk *et al* 2013). To increase the knowledge within these two areas two key literatures have been selected due to their focus on facilitating such a recognition. First off, Hayes & Wheelwright (1997) describes in their article *"Link manufacturing process and product life cycle"* how understanding the process will give a new dimension to strategy and with the use of their *Product-Process Matrix* establish a deeper understanding of how a PMS should be adjusted based on process characteristics. Secondly, the article *"Is performance measurement and management fit for future?"* written by Melnyk *et al* (2013) was included to gain deeper knowledge about how organizational structure and culture will affect what type of performance measures should be developed.

Understanding the process

To facilitate specification of business processes, the *Product-Process Matrix* shown in *figure 3.1,* was developed by Hayes & Wheelwright (1979). This matrix has a two-dimensional perspective which help managers define their most important competences and prioritize which processes and activities to focus on. Hayes & Wheelwright (1979) point out the importance to reflect upon the organizations' position in the matrix before developing metrics to ensure the measures are useful for the company.

Normally a company starts of in the upper left corner of the *Product-Process Matrix* which involves low volume production with a highly flexible process. This process is not cost efficient, and many companies strive to move towards a more standardized process when the product volume increases. When moving in that direction the process becomes less flexible and order specific, and instead becomes more reliable, predictable, and cost-efficient (Hayes & Wheelwright 1979). Depending on the companies' position in the matrix, different objectives should be applied due to diverse perspective on the term *performance.* The definition of performance can vary between customer satisfaction and cost-efficiency and by defining performance for a company or business unit the selection of measurements becomes easier (Lebas 1995).

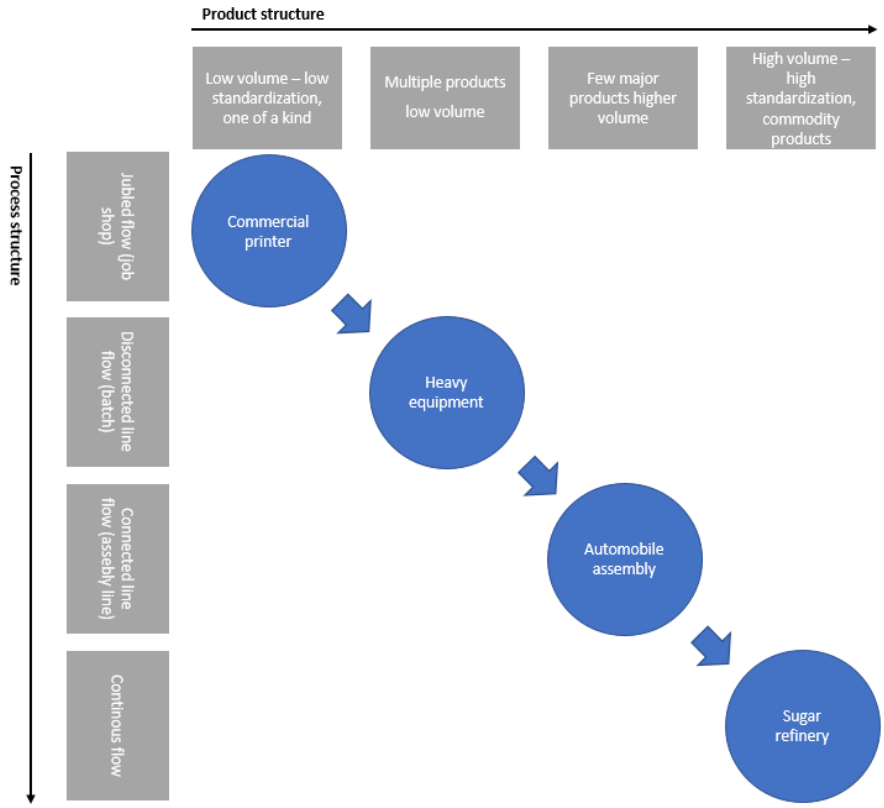


Figure 3.1 Product-Process Matrix (Hayes & Wheelwright 1979)

Understanding the business environment

The organizational structure and culture have an impact on a PMS's effectiveness. To make sure a PMS can reach its full potential and be an effective tool for the company, the measurements should be aligned with the structure and culture of the organization (Bourne *et al.* 2005). The company structure, culture, and strategy, also has an impact on how the PMS will react to changes in the business environment (Melnyk *et al* 2013). The case studied within this master thesis has a flexible process acting in a non-predictable environment, meaning the design of the PMS must be adopted according to these characteristics. Melnyk *et al* (2013) highlights the challenge of introducing a PMS in such an environment since historically, many companies implement measurements promoting specific outcomes generated through specific solutions. Measurements which is suitable for standardized processes operated in stable and predictable environments (Melnyk *et al* 2013). To approach this challenge Melnyk *et al.* (2013) developed the *Performance Alignment Matrix* shown in *figure 3.2,* a framework which create deeper understanding of how the PMS relates to company strategy.

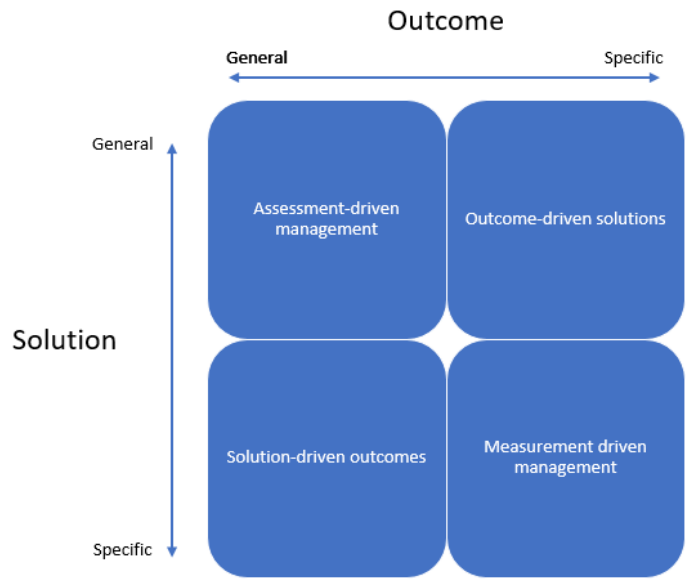


Figure 3.2 *Performance Alignment Matrix* (Melnyk *et al.* 2013)

The *Performance Alignment Matrix* consists of two dimensions: outcome and solution; where outcome refer to what the company aim to deliver, and solution describe how these outcomes are achieved. Moreover, the two dimensions are described as *general* or *specific*, depending on the characteristics of the processes. For a general outcome, there is a general understanding of what should be delivered, for instance: a supplier needs a well-working factory. For a specific outcome the requirements are more exact, as if: a supplier needs a machine repaired. Moreover, general solutions include multiple ways to achieve the wanted outcome and no specific method is described for reaching the result, while specifically described solutions involve only one acceptable way to reach the wanted outcome (Melnyk *et al* 2013).

An organization positioned in the top right corner is described to have an *assessment-driven management,* meaning management do not focus on specific outcomes or solution but instead the focus is whether goals are reached or not. This structure should involve assessment rather than measurements where solutions should be evaluated based on capabilities; and outcomes on whether projects and tasks are delivering according to set goals. In these type of business units, it is not a good idea to introduce measures connected to outcomes or solutions since this might result in outcomes not reaching requirements (Melnyk *et al* 2013).

Melnyk *et al* (2013) describes an organization or business unit positioned in the top right corner of the *Performance Alignment Matrix* to have an *outcome-driven solution*. This means the outcome is specified but the solution is general. Due to these characteristics, a specific strategy on how to achieve the outcome is not important. The attention is whether the outcome is achieved, with no regards on how it is accomplished. This is a more flexible approach where metrics should not be connected to explicit actions, instead they should be linked to the outcome creating more lagging measurements. In these cases, it becomes difficult to measure progress and focus is instead to simply measure success (Melnyk *et al* 2013).

When positioned in bottom right corner of the *Performance Alignment Matrix,* Melnyk *et al.* (2013) described it as *measurement-driven management,* which is the most specific approach where both outcome and solution are specified. With these characteristics the performance measures are more precise with a strong connection to strategy. For this approach the focus lays on comparing the performance with established targets to make sure the right progress is made, and objectives can be reached (Melnyk *et al* 2013).

For the approach described as *solution-driven outcomes* positioned in the bottom left corner of the *Performance Alignment Matrix*, metrics drive the outcomes without focusing on strategy or objective. Most times selected measurements are focused on activities but have no connection to associated outcomes. This is seen as a relatively dangerous position since the importance of needs and objectives are easily forgotten (Melnyk *et al* 2013).

As the strategic fit has been better understood, a next step is to consider how Converting Sales' stakeholders might impact the development of the PMS. To cope with this impact, it is also important to determine how to take stakeholder perspective into consideration while developing the PMS. Therefore, the following section will focus on the perspective of stakeholders.

3.2.2 Consider Stakeholder Perspective

Different companies have a various set of stakeholders. However, most commonly there are five main stakeholder groups: customers, employees, suppliers, owners, and the community. These can be categorized into two function groups: *environmental stakeholders* and *process stakeholders*. The *environmental stakeholders* consist of customers, owners, and the community, a stakeholder group that is in focus when formulating the business strategy. The *process stakeholders* are employees and suppliers that operates within the business processes to deliver upon the business strategy (Atkinson *et al.* 1997).

A successful PMS should reflect the company strategy, and more precisely demonstrate the strategic choices made in the organization. To do so, it is essential to determine what performance *is* and which facets of performance needs to be controlled (Atkinson 1998). Neely *et al.* (2001) argues the relationship between stakeholders and organization has long been lacking in priority and more focus should be put on the impact caused by stakeholders' wants and needs. Further, Neely *et al.* (2001) argues that the only reason a strategy exist is to deliver value to stakeholders. Therefore, measurements should not be derived directly from strategy but instead, the primary focus should be on stakeholders' interest which together with the strategy should influence the measurements (Neely *et al.* 2001). Atkinson (1998) also points out the need of stakeholders to reach a company's objectives, which further highlights the importance of including stakeholders' perspective. Atkinson *et al.* (1997) describe the PMS as a tool to monitor the relationship between company and its stakeholders, a relationship which is important for both parties (Atkinson *et al.* 1997).

By investigating strategic fit and stakeholder perspective, the organizational fit has been in focus. This is part of the supporting infrastructure and should be considered when developing the PMS for Converting Sales. To further establish a supporting infrastructure, a final step is to consider how the data collection should be carried through, as well as which reporting tool to implement. This will be further examined in the following section.

3.2.3 Data Collection and Reporting Tools

The PMS can be seen as the heart of a company's control system, which provide guidance and learning for the organization (Atkinson *et al* 1997). In such a system a structured information system is preferably based on high integrity data with a low burden on data capturing (Bourne *et al.* 2005). The data itself should be collected and used to predict potential outcomes and thereby guide decisions (Lebas 1995). In a PMS, the performance measures act as the supportive tool to transform data into valuable information that can guide decisions (Globerson & Riggs 1989). Important is, to gain value from collected data it must be transformed into information that can provide guidance in decision-making. Otherwise, collected data will only reflect past performance with no prediction of how to improve that performance (Lebas 1995).

Kaplan & Norton (1993) highlights the importance of a responsive system, an argument confirmed in the study *"Managing through measures: A study of impact on performance"* conducted by Bourne *et al.* (2005). Within this case study average- and high performing business units (within the same company) were investigated with the objective to determine measurements impact on performance. One observation was differences in how the PMS was managed had an impact on the performance level. Business units with an average performance score used the PMS as a simple control system: collecting data, evaluating gathered data, communicating result, and taking actions. The high performing units, however, used the PMS more interactively, where performance measures were used to gather weekly scores while informal data and tracking was used to take actions as soon as a problem occurred. These units also had more frequent communication, formal as well as informal, and was responding much quicker with actions on informal indicators gathered from this communication. Meaning, they did not wait until the end of the week to take actions. Conclusions from this study were, intensity of interaction with the PMS, as well as frequency of communication, has greater impact than mentioned in previous literature (Bourne *et al.* 2005). Bourne *et al.* (2005) describes their findings as similar to the concept of *interactive control* described by Simon (1991), and how this concept can be combined with reporting tools such as *strategy maps* (Kaplan & Norton 2001) or *success maps* (Neely *et al.* 2001), to create a well-working PMS solution.

To establish a potential reporting tool for this case study, four different frameworks were identified within the area. From these, criteria for a visualizing tool were collected and summarized in *table 3.5* below.

Table 3.5 Summary criteria for reporting tool

	Criteria	Riggs ' Objective Matrix Globerson & Riggs (1989)	Strategy Map Kaplan & Norton (2001)	Success Map Neely *et al* (2001)	Stakeholder Scorecard Atkinson *et al.* (1997)	Percentage of frameworks where the criteria is mentioned
(1)	**Specify performance measures linked to company objectives**	X	X	X	X	100%
(2)	**Include multiple dimensions and/or levels**	X	X	X	X	100%
(3)	**Include performance goals**	X	X		X	75%
(4)	**Visualize stakeholder perspective**		X	X	X	75%
(5)	**Visualize company strategy**		X	X		50%
(6)	**Related to work-unit performance**	X				25%
(7)	**Include weighted score**	X				25%
(8)	**Include ratio**	X				25%

From the results shown in *table 3.5*, criteria (1) '*specify performance measures linked to company strategy'* and (2) '*include multiple dimensions and/or levels'* can be seen as particularly important since it is mentioned within all studied frameworks. Criteria (3) '*include performance goals'* and (4) '*visualize stakeholder perspective'* was mentioned in 75% of the literature, which indicate the essential nature of these criteria. For remaining criteria (5)-(8) a maximum of 50% highlighted the criteria, hence these can be assumed more optional. Delimitations of this evaluation is the relatively low number of investigated frameworks. The summary contributes with an indication, but to design an appropriate reporting tool, further investigation is needed, however, the reporting tool is out of scope for this case study hence no further investigation has been carried through.

As the development of a *supporting infrastructure* has been established, a next step is to investigate how to create a set of performance measures which can contribute with increased performance. This will be examined in the following sub-chapter.

3.3 Performance Measures

For every PMS there is one crucial element to consider: the performance measures. These are described as the baseline of the PMS (Melnyk *et al* 2013), and poorly designed measures can damage the complete PMS (Caplice & Sheffi 1994). Hence, to create an effective PMS it is crucial to design well-working performance measures (Neely *et al.* 1995). To be able to reach improved performance, the measures should be connected to the secondary objectives, which in turn should be derived from the primary objectives. This will help align the company strategy with the performance measures (Atkinson *et al* 1997), which is a commonly mention criteria as shown in *table 3.4* in *chapter 3.1.3 Criteria for a PMS.*

Within this section, the selection of performance measures is further examined. The focus is to discuss selection and evaluation of metrics where 13 of the studied literatures were considered especially relevant due to their focus within the area, see *Appendix 1: Literature Review.* Therefore, these constitute the theory of which this sub-chapter is built.

3.3.1 Performance Measure Dimensions

Within a PMS the structure of the performance measures is of importance, both to facilitate for users as well as to achieve desired outcome from the PMS (Bourne *et al.* 2005). A limited number of metrics structured in multiple dimensions is the recommended design to properly reflect the company strategy (Melnyk *et al.* 2013). Multiple metric dimensions are valuable to communicate the focus of each metric and creates a better management tool for short-term decisions. This is turn give rise to increased performance and better long-term results (Globerson & Riggs 1989). Three widely used dimensions within PMS literature are quality, time, and cost (Myerson 2013). To better understand the meaning of these three dimensions, a brief description of each is presented below.

Quality

Quality has often been described as the extent of desired product specifications that can be meet. However, as market demand has shifted, so has the definition of quality. Today quality is more accurately described as the extent of customer satisfaction a product, service, or business unit can accomplish (Neely *et al* 1995). Customer satisfaction is a complex aspect and measuring it in a successful way is a challenging task. Atkinson *et al.* (1997) suggest metrics such as customer complaints or warranty claims could be used as indirect metrics, while Neely *et al.* (2001) suggest the use of customer surveys to determine level of customer satisfaction.

Time

The time dimension is described as a scope which contributes to both competitive advantage as well as process performance (Neely *et al.* 1995). It involves time related metrics such as cycle time, response time, as well as due-date performance (Myerson 2015; Beamon 1999).

Cost

Within the cost dimensions all metrics related to performance within financial aspect can be identified (Myerson 2015). It includes measure related to both inventory and operational costs (Beamon 1999), where the most traditional metrics are related to selling price, accuracy to budget, service cost, etc. (Myerson 2015).

A list of potential measures to use within each dimension is presented in *Appendix 4-6: Examples of metrics within the quality/time/cost-dimension.*

A next step when evaluating what metrics to include in the PMS, is the selection process. Therefore, how to select the appropriate set of measures will be further investigated in the following sub-chapter.

3.3.2 Performance Measure Selection

A critical and challenging step when developing a PMS is the selection of an accurate set of performance measurements (Beamon 1999; Chae 2009). Additionally, there is no generic guidelines for how the selection process should be carried through, which in turns make it even more difficult for companies to choose the optimal mix (Chae 2009; Franco-Santos *et al* 2007). However, the set of metrics should aim for increased performance, and on an individual level they should be both quantifiable and verifiable (Melnyk *et al.* 2013; Neely *et al* 1995).

To conduct the selection of performance measures within this study, criteria stated in *table 3.4* will be used as a baseline. The criteria have been reformulated and summarized as following:

- Select a limited number of performance measures
- Selected measures should reflect organizational strategy
- Selected metrics must be comparable
- Include non-financial measures
- Use multiple dimensions and levels of measures
- Make sure horizontal and vertical integration is possible

To demonstrate the importance of *selecting a limited number of metrics*, Atkinson *et al.* (1997) states that many PMSs include to many measurements that above that measures the wrong things. They highlight the need of narrowing the focus towards what really matters. Additionally, Beamon (1999) states a large and complex system including many metrics increase the challenge of successfully selecting qualitative and manageable measures. However, he also argues a system should not be too limited in scope since that can adventure the capturing of important trade-offs and fail to accomplish a complete analysis. Further, Chae (2009) also mentions the challenge of selecting the accurate number of measures, but neither of the literature include information about an optimal number of metrics. On the other hand, Atkinson (1998) and Globerson & Riggs 1989) states more than seven metrics tend to be unmanageable and is too broad to guide users towards what is important, but less than five metrics might cause users to overlook the impact on organizational performance. Hence, an appropriate number can be assumed between five and seven, preferably split among multiple dimensions and levels (Atkinson 1998).

Regarding '*reflecting the organizational strategy'*, authors describe measures should be in line, or derived from objectives formulated to achieve the organizational strategy. The importance when performing the selection should therefore be to ensure primary and secondary objectives are correlated. Additionally, *comparison between measurements* should be established by guaranteeing data collecting is conducted similarly, regardless of which user is responsible.

The discussion regarding *financial and non-financial measurements* has been widely discussed throughout recent years. The use of sole financial measures has been criticized since it does not provide the information needed to manage processes and make fast decisions (Atkinson *et al* 1997). Globerson & Riggs (1989) also highlights this problem since financial measures tend to focus on long-term objectives rather than on daily operational performance (Globerson & Riggs 1989).

The importance of introducing multiple levels is highlighted by several authors within the field, such as Wisner & Fawcett (1991); Caplice & Sheffi (1995); Atkinson *et al.* (1997); Bitici *et al* (1997); and Supply Chain Council (2012). However, not many authors mention how these levels should be adopted or structured. One explicit suggestion described by Chae (2009) is to use top-level metrics to reflect on the overall process performance, and lower-level metrics to gain detailed diagnose for top-level measures.

The final criteria, involving the recommendation of *horizontal and/or vertical integration* is highlighted in several of the included literatures, see *table 3.4* in *chapter 3.1.3 Criteria for a PMS.* However, no detailed description of how this should be carried out was identified.

Beyond these criteria, the framework *Performance Alignment Matrix* developed by Melnyk *et al* (2013), discussed previously in the chapter, suggests measures should be selected according to characteristics of how outcome and solution is determined. This should also be taken into consideration while selecting performance measures.

As the case study conducted within this study is focused on the order-to-delivery process, a next step was to examine how to specifically design a PMS for such a process. The research available regarding this was limited, but followingly is a brief section summarizing the findings collected through the literature review.

3.4 The Order-to-Delivery Process

The supply chain process can be divided into eight sub-processes which are: *customer relations management, customer service management, demand management, order fulfilment, manufacturing flow, supplier relationship management, product development* and *manufacturing flow* (Amer *et al.* 2008). In this case study, the order fulfilment process, further referred to as order-to-delivery (OTD) process, has been further examined since it was for such a process the PMS was designed. However, few studies could be found in the area of PMS in a OTD process, hence, this part of the literature review is limited in scope and based on sole 3 studies, see *Appendix 1: Literature Review*. The purpose of the section is to define what an OTD process is since this process has been in focus throughout the case study.

3.4.1 The Critical Impact of OTD Process

The OTD is one of the most critical processes within a company where customers' orders triggers activities in all other processes included in the supply chain (Amer *et al.* 2008; Forslund, Jonsson, & Matsson 2008). This is the process that make sure customers are provided with their ordered products and services, hence vital to achieve customer satisfaction (Brabazon & MacCarthy 2007). It is also the only process with a direct contact to the customers, making it crucial for understanding and collecting customers' requirements (Amer *et al.* 2008). The overall function of a successful OTD process can be summarized as following: deliver products and services with short lead times, reliable delivery dates, and with tolerance for customers changing their specifications at the last minute (Brabazon & MacCarthy 2007).

Due to the influence that the OTD process has on the complete supply chain it is by Amer *et al.* (2008) described as good starting point for achieving supply chain integration. By focusing on a key process like the OTD, the possibility of increased supply chain integration enhances which in turn can lead to improved performance, collaboration, and competitive advantages (Amer *et al.* 2008).

3.4.2 Description of the OTD Process

The OTD process starts when a customer places an order and ends when the delivery of the ordered product or service has been completed (Forslund, Jonsson, & Matsson 2008). It can be described as a set of sub-processes where the level of details is what decides how many sub-processes are included. A detailed version can be split into seven different activities including *order entry, order processing, start manufacturing, fill order, delivery, customer receipt,* and *post-delivery activities* (Amer *et al* 2008; Brabazon & MacCarthy 2007; Forslund, Jonsson, & Matsson 2008). When defining OTD using a process

map, the flow is best presented through these activities representing each sub-process, see *figure 3.3* below (Amer *et al.* 2008). The OTD can also be described as a service design where departments manage administrative operations to meet customer demand. These activities are conducted using several components such as ERP systems, logistics, information infrastructure, etc. (Amer *et al.* 2008)

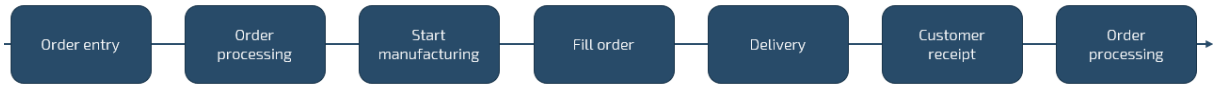


Figure 3.3. Example of an OTD process map**.**

3.4.3 Develop a PMS for the OTD Process

In the study *"Optimizing order fulfilment using design for six sigma and fuzzy logic"* Amer *et al.* (2008) presents a procedure for developing a PMS for the OTD process. This procedure is based on the methodology presented as Design for six sigma (DFSS) which is a methodology initially designed for developing new processes or products. The steps presented in DFSS are *identify, define & design, optimize,* and *validate* (Amer *et al.* 2008). These steps are further described below:

Identify
The first step towards designing a new product or process is by understanding and defining which requirements should be fulfilled and which specifications to include. The focus lays on transforming customer wants and need into product or service specifications. The customer wants and needs should be captured through data collection through interviews, surveys, or historical data.

Design
Once customer wants and needs has been collected these are further translated into critical customer requirements which aim to describe the requirements in engineering terms. From this the solution can be designed with the ambition to satisfy the needs identified during the identify phase.

Optimize
A step where the ambition is to optimize the design in order for the performance of the product or process to meet variations in manufacturing, environment, and user adoption.

Validate
A final step in purpose of validating that the process in complete and requirements has been meet or if further adjustments and improvements are needed.

Amer *et al.* (2008) also describes an overall measure which can be applied for the OTD. This metric is *"perfect order"* and can be designed in various ways depending on requirements. Amer *et al.* (2008) presents a solution where the metric is built up by three other measures namely, *on-time delivery, quantity of delivered order,* and *quality of delivered order.* Amer *et al.* (2008) describes these three measures as key elements for providing support for forecasting, supply, and transportation. However, to measure performance based on customer satisfaction these quantitative metrics is suggested to be supplemented with more qualitative measures as well (Amer *et al.* 2008).

A next and final step in the theoretical frame of reference, a theoretical research model has been developed. This is the result from the complete literature review presented throughout this chapter and has been used as a baseline for the continuing case study.

3.5 Theoretical Research Model

From theory described throughout this chapter, a PMS process has been established which will be applied for this case study. The model is based on findings within studied literature, as well as on characteristics of the case. The process is divided in three main parts: *Develop Performance Measures, Evaluate Metrics and PMS,* and *Reporting and Visualization.* The process is illustrated in *figure 3.3* below, and further description of each part will be discussed throughout this sub-chapter.

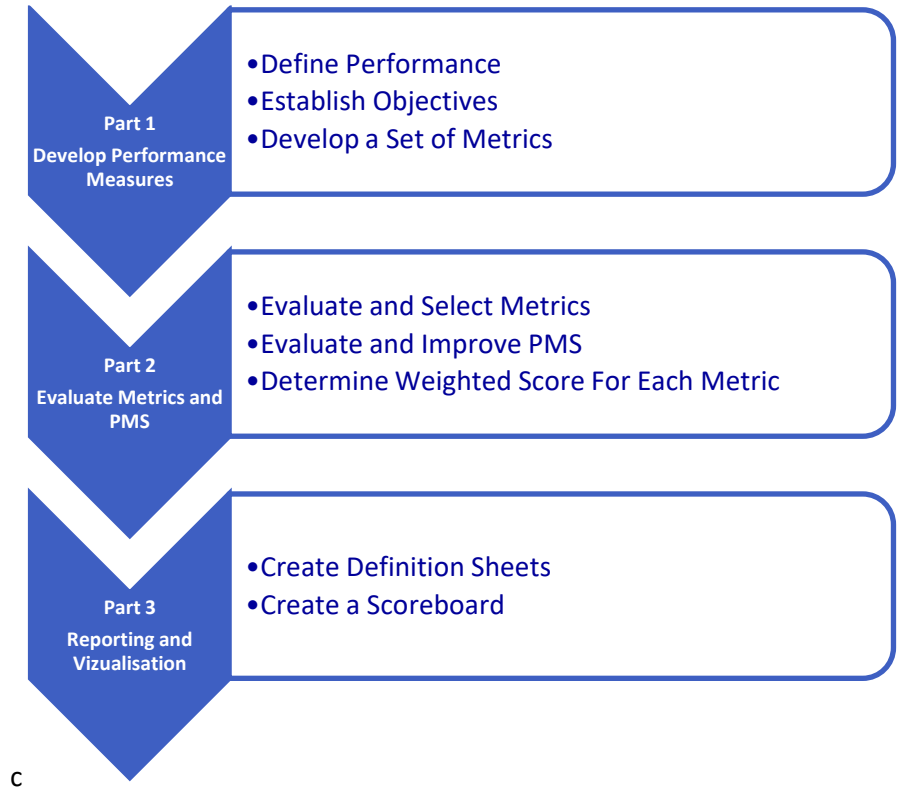


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Figure 3.3 PMS development process for this case.

3.5.1 Part 1: Develop Performance Measures

As an initial part of the process, the performance measurements should be established. These are the building block of the PMS, and their design are of great importance for the effectiveness of the system. This section is divided into three main areas which together will result in the development of performance measures:

- Define Performance
- Establish Objectives
- Develop a Set of Metrics

Define Performance

A first step towards developing performance measures is to establish the performance definition according to stakeholders' wants and needs. This step has been introduced due to the importance of including stakeholder perspective, as highlighted by Caplice & Sheffi (1995); Atkinson *et al.* (1997); Ecclers (1991); and Neely *et al* (1995). The outcome of this step should be a more specific description of what performance is to the business unit.

To carry through with a stakeholder discussion, a prior step is to identify who are the stakeholders. This can be established only after recognition of the business unit's functions and processes, as well as the correlations with other units and companies. Hence, the first step is to understand how the department work, and with whom they work.

- *Outcome: Performance definition*

Establish Objectives
Once performance is defined, the objectives can be established. The objectives should consist of primary and secondary objectives, where the primary objectives are closely related to the organizational strategy, and the secondary on activities which contribute to reaching the primary objectives, e.g., activities for increased performance.

The objective should be developed in accordance with stakeholders' perspective since objectives and related strategy should focus on contributing with stakeholder value. Additionally, the secondary objectives can be split into different dimensions, depending on the characteristics of the stakeholders' wants and needs and how much they differ from each other.

- *Outcome: Description of primary & secondary objectives*

Develop a Set of Metrics
The last step towards developing performance measure is the actual formation of metrics. These should be based on the secondary objectives and activities related to these. The set of metrics should be developed according to criteria mentioned in *chapter 3.3.2 Performance Measure Selection.*

- *Outcome: A list of suggested metrics*

3.5.2 Part 2: Evaluate Metrics and PMS

With the objective to develop a rigid structure of the PMS, an evaluation should be conducted for both individual metrics and the PMS. The evaluation process should be conducted as an iterative process by constantly modifying, improving, and evaluating. Additionally, once the PMS design is established, weighted scores for each metrics should be introduced to ensure relevance and importance of each activity. Part 2 of the process is divided into three major parts:

- Evaluate and Select Metrics
- Evaluate and Improve PMS
- Determine Weighted Score for Each Metric

Evaluate and Select Metrics
The focus within this part of the process is to ensure proper metrics are selected for the PMS. As discussed previously, it is of great importance that authentic metrics are chosen since they set the baseline for the system and is crucial for its effectiveness. During the selection process it is therefore valuable to constantly evaluate metrics that are considered.

For this case study, the criteria lifted in *chapter 3.3.2 Performance Measures Selection* will be applied for selection and evaluation of the metrics since these are based on theoretical findings from the literature review. Additionally, Globerson & Riggs (1989) and Beamon (1999) highlights the value of collecting historical data while evaluating a metric to ensure data-collection is operational possible. This type of evaluation method also facilitates determination of the measuring procedure (Globerson & Riggs 1989). Thus, this will be applied as an additional evaluation method alongside the criteria.

- *Outcome: Suggestion of a limited set of metrics*

Evaluate and Improve PMS

The second step within part 2 of the research model is to evaluate the PMS to identify if any improvements can be implemented. The evaluation can be conducted in similar way as for the measurements by considering criteria stated in *3.1.3 Criteria for a PMS.* As evaluation is carried out both measures and PMS should be put through further iterations until a desired design is achieved. Once the design is established and validated, a clear description of the system should be developed. The description should clarify structure, function, and value in relation to reaching wanted performance level.

- *Outcome: Description of PMS design and function*

Determine weighted score for each metric

A good final step when evaluating is to determine weighted scores for the selected performance measures to capture importance and reflect in what extent users can influence the performance score. A scoring system to use, which has proved its capability is the simultaneously-comparison, a system where each criteria is scored between 1-100 and the sum of all scores equal 100 (Globerson & Riggs 1989). The scoring system can help the business to concentrate on what matters. Priorities most often fluctuate over time and updates of the scores should be done regularly (Atkinson 1998; Globerson & Riggs 1989).

- *Outcome: Weighted score for each of the selected metrics*

3.5.3 Part 3: Reporting and Visualization

Once the performance measures are established and the overall design on the PMS has been set, a next step is to develop tools for reporting and visualization to facilitate the use of the system. The objective with the tools is to communicate progress and priorities, as well as to facilitate data collection. The process for this is split into the following steps:

- Create Definition Sheets
- Create a Scoreboard

Create Definition Sheets

For each of the metrics selected in part 2, a definition sheet should be developed to clearly communicate function, score, and value. The definition sheet should include specified information about the measure as well as how it can be used. Neely *et al.* (1997) describes a definition sheet can include various level of details, depending on what is needed in the specific situation. The key aspect to include is described in *table 3.6* below.

Table 3.6 Definition sheet (Neely *et al.* 1997)

Definition Sheet	
Aspect	**Description**
Title	A descriptive title to the measure
Purpose	The purpose of the measure; what is to be accomplished by measuring this
Relates to	Which objective is the measure related to
Objective owner	Individual or department responsible for the objective
Measurement owner	Individual or department responsible for collecting data and reporting according to the measure
Target	What is the target of the measure; standard level to which result is compared
Formula	Mathematical formula by which the metric is calculated
Frequency	How often should data be collected and reported
Source of data	Where and how can the data be collected
Who acts on the data	Who is responsible for taking action depending on the result
What do they do	What is the action plan or process if action is needed
Presentation	How the data should be presented
Notes and comments	Other relevant information related to the measurement

- *Outcome: Definition sheet for each metrics*

Scoreboard

As a last step of the process a scoreboard should be developed. This is where performance measurement scores are visualized, reported, and calculated. The scoreboard can include different functions such as ratio, index, and, weighted score (Globerson & Riggs 1989), but also a clear visualization of strategy and objectives (Kaplan & Norton 1993; Neely *et al.* 1995). An exact design should be based on findings from previous stages as well as the specific need of the investigated business unit.

- *Outcome: Scoreboard for reporting and visualization*

4 Empirics

From previous chapter a theoretical research model was developed based on findings from the literature review. A following step was to carry through with the empirical study. The results from that empirical study are presented in this chapter.

The data was gathered through interviews and meetings conducted with employees at Tetra Pak, as well as archival documents. As an initial part of this chapter, a description of Converting Sales' purpose, operations, and selected processes are presented, as well as their relation to effectiveness versus efficiency. Further, the strategic direction of Tetra Pak and relevant business units has been investigated. Next, success factors identified for Converting Sales' order-to-delivery (OTD) process were determined based on results collected from the interview phase. Concludingly, the findings are used to define performance and objectives for Converting Sales, according to the theoretical framework presented in chapter 3.5 Theoretical Research Model.

4.1 Converting Sales

The department investigated within this case study is Converting Sales, an operational department working with administrative sales tasks such as creating quotations, sales- and purchase orders, shipping arrangements, invoicing, etc. With their operating activities, they make sure to manage and coordinate in-house purchases within 400-500 projects every year reaching up to an annual net value of approximately 160 million euros (Tetra Pak 2020). To establish a suitable performance measurement system (PMS) for Converting Sales the department's purpose, process, and relation to other departments have been further examined. The data was collected through interviews, meetings, and archival documents and the findings are presented throughout this sub-chapter.

4.1.1 The Purpose of Converting Sales

As an administrative department, the main purpose for Converting Sale is to act as a supportive function for other departments at Tetra Pak. This by coordinating the sales process from purchase to completed delivery at agreed pick-up point. All purchase orders handled by Converting Sales are internal orders, e.g., equipment and installations are sold between Tetra Pak's different factories with no interest in making local profit. This impacts the expectations on the PMS since high margins are not prioritized, but rather to keep costs at agreed level.

Converting Sales operates within five areas dealing with different categories of purchase orders depending on their affiliation, e.g., whether orders are related to investment projects, individual spare parts, single equipment, etc. Within this case study, one of these areas is examined, namely, e*quipment sales*, which is the most comprehensive area including as many as 400 projects every year. Projects within *equipment sales* includes implementation of different solutions and will be further referred to as *implementation projects.* These projects are introduced as a result of previously conducted *development projects* where the solution has been developed as an investment for Tetra Pak's converting factories. Once a development project is completed an implementation project takes place to support the converting factories when implementing the new solution. This means implementation projects include implementations of strategic improvements developed for Tetra Pak's converting factories. Converting Sales' role within these projects is to handle the order management- and shipping process, ensuring equipment is available at site in time for scheduled installation.

Implementation projects are in several cases dependent on each other due to multiple factories installing the new developments. For these implementations it is often the same laborers who are needed for a successful installation, causing time schedules for these projects to be dependent on each other meaning, a delay in one project can cause delays in next-coming projects. These unplanned stopping times can be both costly and impact the end customers negatively if the converting factory cannot deliver as promised. Thereby, it is of great importance the supporting operations accomplished by Converting Sales are effective to ensure equipment can be delivered on time and installations prolong according to schedule. With their early involvement in projects, Converting Sales have the ability to not only accomplish this but also to improve the effectiveness of the order- and shipment process (Tetra Pak 2020).

To further understand how these processes and operations are conducted by Converting Sales, a more throughout investigation of their OTD process has been performed. This was also done to investigate where in the process a PMS can contribute to the highest value and select appropriate limitations thereafter. The findings are presented in the following sub-chapter.

4.1.2 The OTD Process

The OTD process issued in this report consists of five main activities, illustrated in *figure 4.1* below. The scope of the study excludes all operations conducted before a purchase order is initiated, e.g., project start-up and creating a quotation, hence, these activities has not been illustrated in the process below. Another limitation is to exclude invoicing and other activities conducted after the delivery is completed. The process can be split into two groups of activities that can be measured and evaluated separately, *order administration* and *delivery flow.*

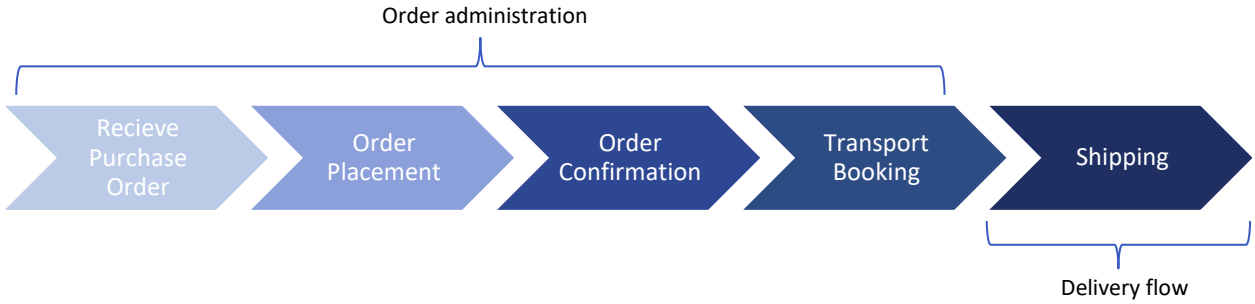

Figure 4.1 The OTD process

Order administration

Order administration includes all activities related to the administrative operations which are crucial for managing each order. Most of the administrative tasks are handled with the use of Tetra Pak's business system SAP where different documents are created and transformed into PDF documents, which are further forwarded by email to intended recipient. However, for transport booking, Converting Sales recently started using a system called OTM which was implemented by the shipping department who handles transport booking at distributers. Beyond this, Microsoft Office and Adobe Acrobat are important tools for the department when carrying through with their administrative tasks. Further, a brief description of each activity included in the *order administration* is presented.

Receive purchase order refers to when an email involving the purchase order is received in the format of a PDF-file. The information gained on the purchase order is supplemented with data shared via a file referred to as PCC, which stands for *Project Cost Calculation.* This file is created by the project manager responsible for the implementation project for which the purchase order is meant for. This file includes details about purchases related to the specific project with details such as supplier, price, delivery date, equipment, etc. This is the main tool for sharing purchase order information between project managers and Converting Sales.

Order placement is conducted once the order has been received from the factory and the project manager has initiated an order should be placed at the supplier. This involves creating a sales order and connected purchase order in SAP and transform the purchase order into a PDF-file which is emailed to desired supplier. Orders placed by Converting Sales are based on information shared on the purchase order received from the factory as well as details gathered from the PCC file. Hence, keeping the PCC file updated with accurate information is important for the process to be sufficient.

Order confirmation involves both receiving the order confirmation from the supplier and sending one to the factory. Once an order confirmation is received from the supplier the delivery date is confirmed in SAP and the sales order is updated and sent as an order confirmation to the factory.

Transport booking should be conducted once the supplier sends a notification to the department with further information regarding when an order is ready for pick-up, referred to as *notification from supplier.* When booking a transport, a packaging list must be conducted with the use of Microsoft Excel. The packaging list is based on information received from the supplier thus, the information shared about weight, quantity, size, etc., must be accurate for the transport booking to be correct. Once the packaging list is created; alongside supplementing documents needed for the shipping; the transport booking is sent to the shipping department via the OTM system. The shipping department is then responsible for placing a booking at the distributer.

Beyond activities stated in *figure 4.1* several *supporting activities* are carried through by Converting Sales and should also be seen as part of the activity group *order administration*. These activities refer to customer support; monitoring active orders; register historical data; etc. Which supporting activities that are more or less important have not been evaluated during this case study.

The administrative operations are carried through with the purpose of ensuring delivery flow is conducted adequately. The orders should be sent in time, packed, shipped, and finally arrive at site for the installation to prolong within the implementation projects. To better understand how these correlate a description of the *delivery flow* is presented below.

Delivery Flow

Delivery flow is in this study related to the complete delivery, including all activities related to collecting, shipping, and monitoring desired equipment from the supplier to the receiving factory. This process is dependent on several stakeholders and for the process to achieve the desired result, all stakeholders must live up to set agreements.

To enable a qualitative result, further delimitations are made. The starting point for the investigated delivery flow will be when the order confirmation is received from supplier. This is due to activities before this stage are mainly administrative and/or negotiations regarding delivery time. To capture the performance of the delivery flow, these activities do not need to be included and the suggested starting point is considered superior. Additionally, since delivery agreements most often do not reach beyond the airport or harbor this is where the official responsibility of Converting Sales ends, and therefore the PMS will not be designed to capture performance beyond this point.

To determine if and how the delivery flow can be measured a deeper description of affecting breaking points between included stakeholders, e.g., suppliers and distributors, has been conducted for the process. This with an ambition to capture both transmissions of responsibility and action points for Converting Sales. In *figure 4.2* identified breaking points are visualized.

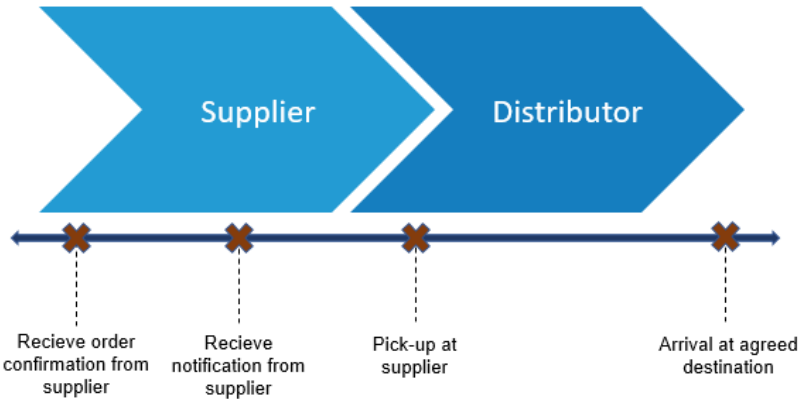

Figure 4.2 Key breaking points in the delivery flow

Receive order confirmation from supplier, relates to the starting point of the delivery flow and involves the order confirmation sent from the supplier to Converting Sales. It is at this point the supplier accepts the order and commits to a specific pick-up date. Henceforth, the supplier is responsible to produce the equipment according to agreed specifications and time plan.

Receive notification from supplier, refers to the procedure of *transport booking* described previously. At this point, the supplier further guarantees equipment will be ready for pick-up at a specific date, indicating transport can be booked. Since the supplier is responsible for packing, they also deliver the exact information regarding dimensions, weight, and packaging list, which the transport booking is based upon. For the booking to be correct it is therefore important the shared information is valid.

Pick-up at supplier, concerns the breaking point when the goods is picked up by the distributor and thereby the responsibility is transferred from supplier to distributor. The remaining part of the process consists of transportation to agreed destination, either with transshipment at a collection point, or to the end-destination, e.g., airport, harbor, or factory.

Arrival at agreed destination, is the breaking point where the distributers responsibility ends also where Converting Sales delivery flow is completed. From this point the order is considered received by the factory and they arrange for further transportation if needed and manage potential custom controls. However, Converting Sales still assists to make sure the order can be transported to the factory by providing and correcting necessary documents to get through custom controls and other regulations.

For this study, the focus will be limited to the performance of the delivery flow, hence activities related to *order administration* will not be in focus when designing the PMS. The reason is, measuring the delivery flow is believed to increase visuality and monitoring support for Converting Sales, which has been requested by several respondents during interviews. By measuring the delivery flow, expectations are that issues occurring throughout delivery can be detected, prevented, and minimized. As a starting point, the focus was to determine what is considered high performance for the delivery flow. To do this, a first step was to evaluate the priority between effectiveness and efficiency since it was assumed to have a high impact when defining high performance for the process.

4.1.3 Effectiveness versus Efficiency

To better understand success factors related to Converting Sales' delivery flow within implementation projects, the product-process matrix developed by Hayes & Wheelwright (1979) has been applied as an analytical tool. A presentation of the model can be found in *Chapter 3.2.1 Strategic Fit.* By applying the concept from the product-process matrix the importance of effectiveness versus efficiency is better understood which facilitates for performance and objectives to be defined accordingly.

Product-Process Matrix

To analyze according to the product-process matrix, a first step is to clarify what the product is and how the process is defined, as well as understanding who the customers are. In this case, the process can be seen as the delivery flow with all included operations, and the product as the service of these operations. This service is utilized by Tetra Pak's converting factories and project managers; thereby these two stakeholder groups can be viewed as customers.

Every implementation project is unique which suggests the position of the projects on the process structure-dimension would be on the far left, at the position I: "*Low volume – low standardization, one of a kind"*. Such a position would, according to the model, involve a need for flexibility and quality, and the competitive advantages would be primarily based on custom design, general purpose, and high margins. However, the service conducted by Converting Sales is not as unique as the projects. Activities related to the delivery flow are quite systematic and includes operations similar to each other, regardless to project characteristics. However, since projects are unique, diverse demands on the delivery flow do occur, especially due to unique equipment, project plans, and agreements with stakeholders. Thereby, even though the process is more systematic than the projects, quality and flexibility are still required for Converting Sales to be successful.

Based on these conclusions, the position on the process structure-dimension should be relatively far left but moving from the position I towards position II: *"Multiple products low volume".* This position requires flexibility and quality but moves towards a greater need for dependability and cost-efficiency compared to position I. The competitive advantage is, according to the model, quite similar focusing on custom design and high margins but also includes quality control and service. Important to remember when evaluating this specific case is, Converting Sales operates within internal orders, e.g., transactions between Tetra Pak's different converting factories. Hence, the target is not to make profit on these sales, rather it is an investment for the company.

Converting Sales operates within 400 implementation projects each year, where each project includes numerous purchase orders. With a total of four team members handling these operations, there is a need for an efficient process. Due to this, the department strives for further standardizations of the process. However, reaching for a more standardized process it is important to consider the potential outcome of such a shift. Since projects will continue to be unique and involve diverse demands, it is important to keep flexibility and quality of the service. Considering this, the position at the process structure-dimension should be kept somewhere around position I: *"Jubled flow (job shop)"* and II: *"Disconnected line flow (batch)"*. The position in the product-process matrix for Converting Sales' delivery flow is visualized in *figure 4.3* below.

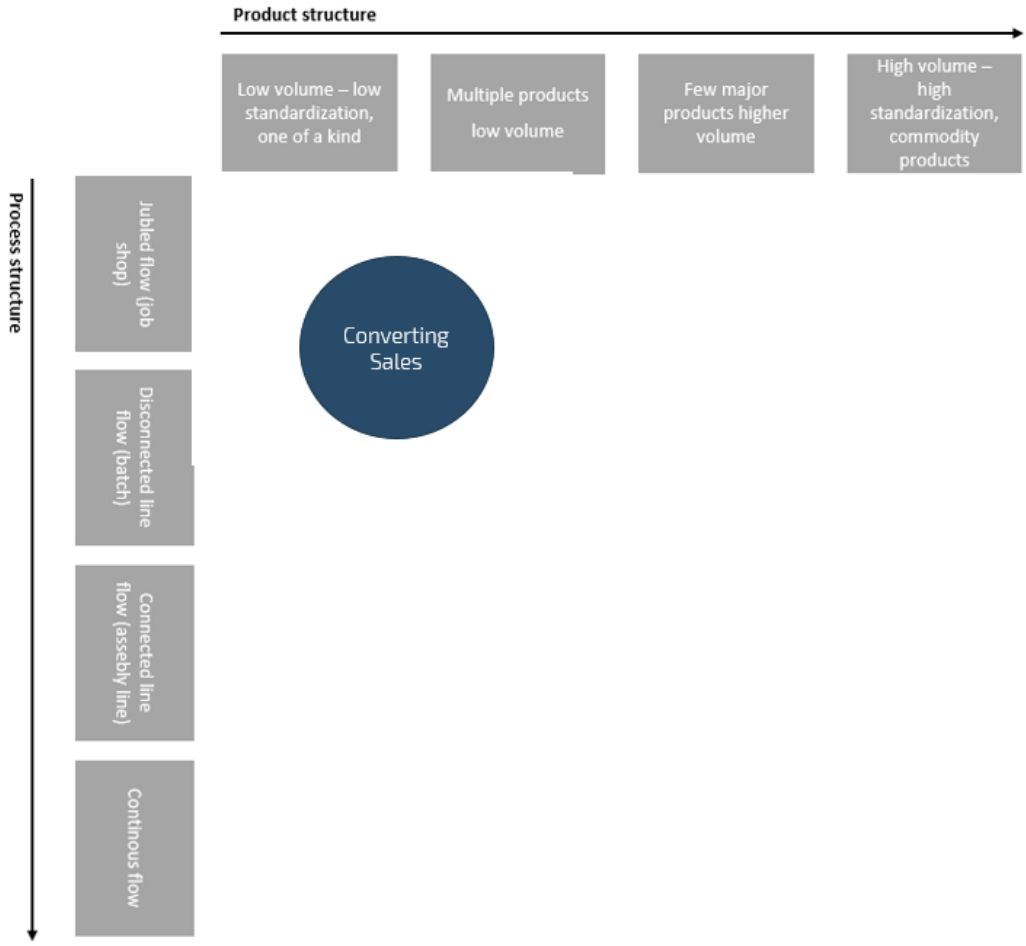

Figure 4.3 Illustration of position in product-process matrix

Considering the position in the matrix, effectiveness can be seen as prioritized over efficiency. This means when designing a PMS for Converting Sales the focus should be on how well the outcome lives up to customer expectations. Additionally, to what extent this focus is aligned with the strategic direction of Tetra Pak was further examined. The first step to do this was to investigate Tetra Pak's strategy and primary objectives and investigate how these relates to operations conducted by Converting Sales, which is presented in the following section.

4.2 Organizational Strategy & Objectives

An important criteria when designing a PMS is to align it with the organizational strategy. Because of this, an examination of Tetra Pak's strategy and objectives were conducted within this case study and the findings are presented throughout this section. Initially, a description of how Converting Sales is connected to the company strategy is presented to make it easier to put the strategy into context. Further, strategic direction formulated for Tetra Pak as well as the business units Supply Chain Operations (SCO) and Industrial Base Performance (IBP) have been examined. How Converting Sales are correlated to mentioned business units will be further described initially in this sub-chapter.

4.2.1 Converting Sales' Connection to the Company Strategy

As described previously, the focus in this master thesis is the *delivery flow* managed by Converting Sales as supporting activities within the implementation projects. With this, Converting Sales role is to make sure equipment can be delivered through order management and shipping coordination. To further describe how these operations connect on a strategical level, departments positioned higher up in the company hierarchy has been investigated. Due to the relatively complex company structure, the complete structure of Tetra Pak will not be presented but solely those functions which have a direct impact on Converting Sales.

Converting Sales is part of a business function called *Industrial Base Performance (IBP)* which in turn is part of *Supply Chain Operations (SCO).* SCO is responsible for sourcing, producing, and delivering packaging material, to ensure customers can produce Tetra Pak Packages at site (Tetra Pak 2021b). To enable this, SCO has five core functions which together make sure this responsibility area can be fulfilled. Beyond IBP these functions are *Additional Materials*, *Base Materials*, *Integrated Supply Chain* (ISC), and *Packaging Material Production* (Tetra Pak 2021c). A brief description of what each core function does is presented in *figure 4.3* below.

Figure 4.3 Core functions within Supply Chain Operations (SCO) (Tetra Pak 2021c).

For this case study, the focus will be on core function number three: *Industrial Base Performance (IBP)*, since this is the function where Converting Sales act as a supporting department. The purpose of IBP is to deliver equipment and processes which will ensure that converting factories can deliver according to customer demands. They make sure factories are updated with accurate equipment and techniques for the packaging production to prolong (Tetra Pak 2021c). Hence, this is the department where development and implementation projects are developed, performed, and prioritized.

To design a PMS in line with the strategic direction of the company, it is important to, beyond Tetra Pak's strategy and objectives, consider strategy and objectives formulated for both SCO and IBP. This since they are responsible for all strategic decisions which Converting Sales aim to support. By examining the connection between Converting Sales, SCO, IBP, and the organizational strategy, the possibility of designing a PMS which contributes to a strategic level increase. It also ensures a connection between organizational strategy and the PMS can exist; a criteria highlighted by several authors within the field.

4.2.2 Tetra Pak 2030 Strategy

A recommended step when designing a PMS, supported by several authors within the field, is to define the primary objectives set by the company owners, see chapter *3.1.3 Criteria for a PMS.* Several authors argue performance measures should be derived directly from the overall organizational strategy, which also defines the primary objectives. In 2019 Tetra Pak implemented *Strategy 2030,* a new strategy with the four following objectives (Tetra Laval 2020):

(1) Deliver food safety and the best quality

Tetra Pak aims to deliver premium products that require a high performing and qualitative production. The ambition is to consistently deliver per customer satisfaction and gain their trust and loyalty (Tetra Pak 2021e).

(2) Lead the sustainability transformation

The ambition is that sustainability will be one of Tetra Pak's future purposes and the target is to integrate sustainability into the core of the company, in the same way as safety is integrated today (Tetra Pak 2021e).

(3) Integrate and optimize customer operations

The target is to offer end-to-end solutions to help improve customers' performance. One priority is to keep working in collaboration with customers, suppliers, as well as society (Tetra Laval 2020).

(4) Innovate for customer growth

By combining market knowledge and technical capability Tetra Pak intend to deliver innovative solutions and create the best experience possible for their customers (Tetra Pak 2021e).

With the new strategy, Tetra Pak also introduced three key characteristics for how they should act in conformity with their new objectives namely: *dynamic, productive,* and *capable.* Where *dynamic* refers to the ability to act and deliver quickly, *productive* on resources utilization, and *capable* on collaboration with business partners and each other (Tetra Pak 2021e). Additionally, below vision followed by mission has been formulated for the company (Tetra Pak w.y.):

"We commit to making food safe and available, everywhere"

"We work for and with our customers to provide preferred processing and packaging solutions for food. We apply our commitment to innovation, our understanding of consumer needs and our relationships with suppliers to deliver these solutions, wherever and whenever food is consumed. We believe in responsible industry leadership, creating profitable growth in harmony with environmental sustainability and good corporate citizenship"

Designing the PMS, the strategic direction formulated for the company should be taken into consideration. However, as Converting Sales is positioned relatively far down in the company structure, their strategic impact might not be obvious. The contribution to the primary objectives comes from strategic decisions made within SCO and IBP, and thereby their objectives should be evaluated.

Note that, the PMS designed within this study is not meant to support the determination of project validity, prioritization of projects, or allocation of resources. These types of decisions are handled with the use of already existing PMS's which are owned and managed by SCO and/or IBP. The PMS designed for Converting Sales should instead focus on supporting activities that are carried through for all assigned implementation projects, with no regard to the overall project value. However, by examining

the strategic direction of SCO and IBP, the PMS can be designed to make sure Converting Sales' operations are in line with this direction. A first step towards this ambition was to evaluate if SCO and IBP are in line with the primary objectives presented above. The results is presented in the following section.

4.2.3 Supply Chain Operations' Contribution to the 2030 Strategy

To contribute to the new strategy, SCO clearly align their priorities with two of the primary objectives. For the primary objective with a quality focus, e.g., objective number **(1)**, SCO has introduced a so-called *enabling programm*e referred to as '*The quality 100 programme'* (Sinead 2020). Within this *programme* the ambition is to coordinate activities towards increased quality by focusing on defect prevention, containment, and eradication. The objective is to reach a zero-defect system which in turn enables the best quality (Tetra Pak 2021f).

The next objective, for which SCO presents their contribution, is the sustainability objective, e.g., primary objective **(2)**. To enable the transformation, SCO strives towards industrializing the production of a new packaging material, a material which meet the requirements for both renewability and recyclability set by the company. This includes non-detachable straws and closure, as well as straws and wrapping made from paper. Additionally, they strive towards decreasing their CO_2 footprint from operations and logistics (Sinead 2020).

The remaining two of Tetra Pak's primary objectives, which focus on optimizing and integrating customer operations, as well as promoting innovation, e.g., objectives **(3)** and **(4)** were not highlighted by the business unit. Meaning, a clear description of how SCO aims to deliver according to these objectives could not be identified. Possibility is the business unit do focus on these but lacks in communicating how this is done.

The key characteristics: *dynamic, capable*, and *productive*; formulated to describe how Tetra Pak should act to meet the new 2030 Strategy, is partly highlighted by SCO. The function describes an ambition to become a role model and change the way they work, following these key characteristics. To succeed with this, SCO will keep their focus on safety first at the same time as adopting and driving their leadership behaviors. They also aim to transform the way they work by adopting fast decisions, agile methods, and by aligning the organization where this is needed (Tetra Pak w.y.). Additionally, to be more *productive,* SCO will adopt to one of their other *enabling programmes*, namely *Lean 5.5 programme.* Within this *programme* the focus is on four key areas: end-to-end supply chain, automation, operational excellence, and installed base (Tetra Pak 2021d). The exact definition of these focus areas could not be identified, neither considered crucial for further evaluation of the strategic connection.

Another priority within SCO is described as *PM Growth,* which refers to their objective to establish growth in the packaging material function within the company (Tetra Pak w.y.). This ambition can be connected to the mission formulated by Tetra Pak since they strive to "*…creating profitable growth in harmony with environmental sustainability and good corporate citizenship".* The mission focus on establishing growth in combination with increased sustainability, ambitions also highlighted by SCO. A visualization of SCO's strategic structure is presented in *figure 4.4* below.

Figure 4.4 Strategic structure for Supply Chain Operations (Tetra Pak 2021d).

Concludingly, a gap between Tetra Pak's primary objectives and the strategic direction of SCO can be identified. This is due to the lack of correlation towards two of the four primary objectives. A possibility is, this connection does exist but is not clearly communicated within sources used for this case study. A deeper gap analysis is conducted in *chapter 5.1.1 Gaps Identified for Supply Chain Operations.*

To further evaluate how Converting Sales' operations are connected to the company strategy the next step is to evaluate how IBP commits to the strategic direction set by SCO and Tetra Pak.

4.2.3 Industrial Base Performance's Contribution to the 2030 Strategy

In line with SCO, priority areas for IBP are quality, sustainability, and productivity (Tetra Pak Internal 2021). To contribute to quality, e.g., primary objective **(1)**, IBP develops and implements solutions contributing with desired value in several areas such as inline equipment and process specifications. They also make sure to prioritize quality defects, -losses, as well as feedback from customer experience. All with an ambition to ensure high quality and commitment to *Strategy 2030*. Beyond this, IBP has, in accordance with SCO, committed to *the quality 100 programme* which includes a focus on defect prevention, containment, and eradication, through multiple equipment and process improvements (Tetra Pak Internal 2021).

To facilitate the sustainability transformation, e.g., contribute to primary objective **(2)**, a primary focus for IBP is guaranteeing that solutions they develop, implement, and maintain, live up to the new sustainability requirements set by Tetra Pak. This means equipment and processes implemented must be able to manage and produce packages compatible with the new renewable and recyclable packaging solutions. To ensure this, an *enabling programme* called *industrialize future package programme* has been introduced. This *programme* is mainly meant to synchronize IBP's converting operations with other related departments (Tetra Pak Internal 2021).

Further, to increase productivity, IBP aims to enhance their productivity for converting operations. This is targeted by limiting productivity losses in existing processes and developing new productive solutions. Additionally, an *enabling programme* has been introduced referred to as *industrial process productivity programme*, which further describes how IBP aims to contribute to the key characteristic *productivity.* This *programme* describes in what areas IBP has its primary focus when developing and implementing solutions for increased productivity. These areas are described as supporting processes such as quality, maintenance, and safety; internal logistics; and equipment lines and sub-sections (Tetra Pak Internal 2021). The definition of these areas and why they are prioritized

was not identified from the sources used within this case study. However, it is not seen as essential for the study and further investigation has been discounted.

Beyond the strategy to achieve *quality, productivity,* and *sustainability*, further connections with IBP's strategic direction and the primary objectives **(3)** and **(4)** could be identified. Objective **(3)** describes the importance to integrate and optimize customer operations, and how this can be done through continuous collaboration with customers and suppliers. For this, IBP presents two ways of working that are correlated namely, *customer experience,* and *working with partners. Customer experience* is described as the core of the business unit where customers' needs are in focus when developing solutions. Beyond this, improvements and activities are prioritized and carried through based on customer feedback (Tetra Pak Internal 2021). This proves the focus on customer collaboration since their wants, needs, and experience are highlighted. *Working with partners* concentrate on collaboration with internal and external partners such as other Tetra Pak departments, converting factories, and suppliers (Tetra Pak Internal 2021), another important area mentioned within objective **(3).** Additionally, both these working priorities can be identified within Tetra Pak's mission in the following section: "… *We apply our commitment to innovation, our understanding of consumer needs and our relationships with suppliers to deliver these solutions, wherever and whenever food is consumed…".* Thus, this is clearly in line with the overall strategic direction of the company.

Primary objective **(4)** highlights the importance of innovation for customer growth, since promoting innovative solutions contributing to the best customer experience possible. To achieve this, IBP has described two ways of working, namely, *world class manufacturing* (WMC) and *next generation packaging material & converting equipment.* WMC is an integrated part of Tetra Pak's manufacturing system with a focus on continuous improvement where IBP's role is to contribute with advancement within converting factories through development and implementation projects. *Next generation packaging material & converting equipment* refers to IBP's ambition to introduce new technology and establish the next generation of converting equipment (Tetra Pak Internal 2021). Both these ways of working confirm the connection towards primary objective **(4)** considering the target for improvement and innovation.

Concludingly, IBP's strategic direction can be connected to the organizational strategy with correlation to all four of the primary objectives formulated by Tetra Pak. This further indicates, projects assigned to Converting Sales for order management and shipping coordination, are developed and prioritized in accordance with the company strategy. Hence, supporting the implementation projects and making sure they are delivered according to agreements, have an impact on the overall strategic result of the company. How Converting Sales can contribute in the best way possible, and which strategic direction the department should take, has been further investigated and will be presented throughout the chapter. In the following section a summary of the interview results is presented, and performance and objectives formulated.

4.3 Interview Results

Within this section, findings from the interviews are presented. A full description of the interview procedure is presented in *Appendix 2: Case Study Protocol* and *Appendix 3: Interview Guide.* From the interview results, success factors for Converting Sales' OTD process to succeed has been established. With this knowledge Converting Sales' possible contribution to the overall strategy could be better understood and the PMS designed accordingly.

4.3.1 Success Factors for the OTD Process

To determine high performance for the OTD process conducted by Converting Sales, perceived success factors were collected from the interviews carried out with 14 different respondents. The result is presented in *table 4.1* below where the left column represents success factors which are further described in the middle column. The right column '*share of respondents'* represents how many of the interviewees mentioned this success factor as essential for the OTD process to succeed. Success factors mentioned by less than two respondents are not presented in the table.

Table 4.1 Success factors for the OTD process.

Success factor	Description	Share of respondents
According to plan and/or agreement	The delivery should be carried through according to plan and/or agreement in terms of time plan, price, quantity, etc.	**100%**
Information flow	Share and receive accurate and complete delivery information with and from stakeholders. E.g., the accurate information at the correct time.	**93%**
On-time delivery	Make sure orders can be delivered according to time agreements.	**87%**
Complete delivery	The accurate quantity and equipment are delivered according to agreement.	**21%**
Realistic time scope for delivery	The received purchase order includes a realistic time scope for suppliers, admin, and distributor to deliver upon.	**21%**
Realistic forecast	The project forecast is properly conducted; hence, the plan is realistic and achievable.	**14%**
Shipping preparation	Collect accurate shipping information and prepare documents to establish correct distribution and packaging details from start.	**14%**
Responsiveness	Flexibility when changes in orders occur due to new agreements, external circumstances, etc.	**14%**
Systematic work process	Adopt a systematic work process to create a more efficient order management.	**14%**
Properly conducted development phase	The development of solutions is completed and qualitative. This involved development, testing, and setting standards.	**14%**
Increase automatization	Speed of the order handling process through automatization.	**14%**
Resources available	Needed resources are available.	**14%**

From the result shown in *table 4.1,* three success factors distinguish particularly from the others, namely *according to plan and/or agreement, information flow,* and *on-time delivery.* Particularly frequently highlighted was success factor *according to plan and/or agreement* which was mentioned within all interviews. This indicates the importance of an effective process since the outcome must live up to the expectations, a result that is in line with previous estimations regarding effectiveness importance on the delivery flow. Additionally, the other two success factors are also related to effectiveness since both refer to receiving accurate equipment or information at an agreed time. This demonstrates the emphasis on *'time'* since it is highlighted within all three of the top-rated success

factors. Further, *'time'* was, by the respondents, referred to as *according to plan and/or agreements*, which indicates *'time'* is not related to pace nor short lead time but rather precision and on-time delivery. This further proves the main priority is effectiveness rather than efficiency, where customer satisfaction is in focus.

Two of the top-rated success factors, *information flow,* and *on-time delivery,* also had part in the grading system conducted throughout the interview phase, see *Appendix 3: Interview Guide.* To better understand how they relate to each other, as well as to the top-rated success factor *according to plan and/or agreements,* the results from the gradings has been summarized and evaluated. The findings are presented in the following section.

4.3.2 Grading Result for Two of the Top-Rated Success Factors

To better understand which focus areas within the OTD process contributes to high performance a grading system was applied, shown in *Appendix 3: Interview Guide* within Module 1 - question 5. The grading was perceived as relatively difficult for most respondents and several times a grade could not be collected. In those cases, a discussion about the area was perceived enough to gain knowledge about its importance. Additionally, when grades were collected, they did not consequently reflect the observed opinions. Instead, respondents seemed to suggest a higher or lower grade compared to their attitude. Thereby, the grades cannot fully represent a rigid result and the findings presented are based on collected scores combined with expressed attitudes.

On-time delivery

On-time delivery was graded 6,33/7,00 by a total of 12 respondents and described as critical for implementation projects to be successful. The most crucial part was specified as the need to make sure ordered equipment can be delivered before the installation is planned. Otherwise, the cost for already hired personnel will be wasted, delays will occur, and the project stands still causing additional costs further down the stream. All purchase orders managed within the implementation projects are linked to the project time plan, and for the plan to succeed it is crucial orders can be delivered as agreed. Following statements were expressed by respondents:

"Otherwise, the project stands still"

"It is important equipment arrives before planned installation start"

The ability to succeed with on-time delivery is dependent on a good forecast conducted by the project managers, who base their estimations on the lead time promised by suppliers and distributors. Thereby, deliver according to promised lead time is essential for all stakeholders involved, e.g., connection to success factor *according to plan and/or agreement* is considered strong. Additionally, discussing the lead time for the OTD process, a fast lead time was not considered necessary. If the lead time is accurate, the project manager can plan for it and the project can prolong. Following statements were said concerning OTD lead time:

"It is more important the equipment is delivered according to the agreement. Short lead time is only critical if there is a deviation to the plan."

"A short lead time is not important as long as the suggested lead time is correct. Since then, we can plan for it."

This also highlights a short lead time is only critical if there would be a deviation to the plan, e.g., equipment gets lost, there is a breakdown, or other unforeseen situations. Concludingly, to deliver according to promises is essential, which indicates on-time is closely connected to success factor *according to plan and/or agreement.*

Information Flow

Information flow relates to having a well-working communication where accurate information is shared among stakeholders at the right time. The success factor was graded 6,79/7 by a total of 8 respondents. Regarding information to factories, the overall information about projects and equipment was claimed a responsibility area of project managers, while delivery information should be shared by Converting Sales. Critical was to update factories if the delivery date changed, as well as to deliver quick replies to ensure factories their requests have been received. However, the time scope for which a reply should be sent was described as dependent on the situation. More important was to make sure information was accurate, which is expressed in the following statement collected during interviews:

"It is important that information is correct from the beginning"

A statement that also indicates correct information should be available from the initial stage of the project, indicating the development phase must be carried through in a correct way. Some respondents mentioned Converting Sales and project managers of implementation projects should put pressure on those responsible for the development projects, to make sure to receive accurate information from start.

Regarding information from suppliers, the order confirmation is of great importance. This is relevant not only for new purchase orders but also when updating a previous purchase order. Converting Sales has several experiences where their active orders have been updated by the project manager and supplier, without informing Converting Sales about this update. This results in Converting Sales reaching out to suppliers when delays occurred in the system just to find out the order has been postponed in agreement with project manager and receiving factory. This lack of information gives rise to time loss when order monitoring is conducted without actual value.

Another reason why accurate information was described as essential is due to the complex procedure related to customs control. Since orders are delivered to multiple countries, multiple rules for exportations apply. For the delivery flow to run smoothly the accurate documents must be delivered together with the goods. Since most orders are sent straight from the supplier to the factory, the supplier must send accurate shipping information once the equipment is ready for pick-up. If shipping documents are not correct the purchase order risk getting stuck in custom control for several weeks, which might cause delays if estimated time buffer is not long enough. However, this part of the delivery flow is not included in this case study and the PMS will not be designed to capture these complications.

When discussing *information flow,* it was described in such a way it can be considered a requirement for the delivery flow to run smoothly rather than a target for increased performance. A better information flow would give rise to a more efficient process which in turn increases the possibility of reaching higher performance, since more projects can be delivered as promised. This indicates this success factor has a strong connection to *according to plan and/or agreement* where information flow is not seen as a performance indicator but a requirement to reach desired results.

Considering all three top-rated success factors, e.g., *according to plan and/or agreement, information flow,* and *on-time delivery,* they are assumed equally crucial for the delivery flow. Additionally, a strong connection was identified amongst where *according to plan and/or agreement* was perceived as the

target which can increase performance and *information flow* and *on-time delivery* requirements to reach this target. Hence, by delivering successful *information flow* and *on-time delivery* the ambition to deliver *according to plan and/or agreement* can be achieved. A connection to effectiveness was also identified since the overall target is to deliver as promised, living up to customer expectations, where customers can be seen as the converting factories and project managers.

Concludingly, the target for Converting Sales is to deliver according to customer satisfaction, a focus which is connected to Tetra Pak's primary objective **(1)** where the focus is to deliver per customer satisfaction to gain their trust and loyalty (Tetra Pak 2021e). However, the primary objective formulated by Tetra Pak is focused on end-customers while Converting Sales' customers refers to converting factories and project managers within the IBP implementation projects. However, as the correlation between IBP's strategic direction and the primary objectives was strong, the contribution from Converting Sales when living up to IBP's expectations, is assumed to bring a positive impact on the overall company strategy.

As correlation to the company strategy has been established, and success factors identified, a final step from the empirical study was to define high performance and formulate objectives for Converting Sales. The result of this procedure is presented in the following section.

4.4 Defining Performance and Objectives for Converting Sales

Before designing a PMS for Converting Sales, an initial step according to the theoretical framework developed in *chapter 3.5 Theoretical Research Model,* is to determine both performance definition, as well as primary- and secondary objectives. The primary objectives were identified initially in the chapter, namely objectives **(1)**, **(2)**, **(3),** and **(4)** formulated by Tetra Pak. Further, the correlation to Converting Sales' delivery flow was evaluated through an investigation of the strategic direction described by SCO and IBP, where IBP was perceived to have the strongest connection. IBP is also the business function that has the largest impact on Converting Sales since IBP is the business function they aim to support. The conclusion were, implementation projects assigned to Converting Sales are in line with Tetra Pak's strategy; hence the focus should be to support these. Additionally, success factors were established which described how Converting Sales should operate to contribute to increasing performance within the implementation projects. As a final step before analyzing how a PMS should be designed, the findings from this chapter will be applied to define performance and objectives for Converting Sales to use as a basis for the PMS.

4.4.1 Defining Performance

To design a valuable PMS for Converting Sales, an initial step is to clearly define what is considered high performance and how this can be achieved. As described in part 1 of the theoretical framework (see c*hapter 3.5.1 Part 1: Develop Performance Measurements*) stakeholder perspective should be considered while defining performance. A clear and descriptive option is to define one performance definition for each stakeholder group. This would facilitate a full stakeholder perspective based on stakeholder requirements, a perspective which should be considered when introducing a PMS (see *chapter 3.1.3 Criteria for a PMS*). To establish this, an initial step was to determine who are the stakeholders, where six stakeholder groups were identified as particularly important. These groups were included in the interview phase to make sure a comprehensive perspective could be captured. Each stakeholder group has been represented by at least one interviewee and below is a brief description of each stakeholder group, as well as the distribution of representatives.

- **Employees** – four team members within the Converting Sales department
- **Project managers** – six Tetra Pak employees working as project managers for implementation projects
- **Factories** – one Tetra Pak employee working closely with the converting factories with knowledge about their requirements
- **Department manager** – one manager of the Converting Sales team
- **Suppliers** – one Tetra Pak employee working closely with suppliers having knowledge about their requirements
- **Distributers** – one Tetra Pak employee from the shipping department working closely with distributors with knowledge about their requirements

To determine stakeholder perspective, success factors presented in *table 4.1* have been segmented according to results collected from the different stakeholder groups. The result is presented in *table 4.2* below. In the left column, the concerned stakeholder group is stated. In the right column, those success factors that were described important by at least 50% of the representatives of concerned stakeholder group are listed.

Table 4.2 Stakeholder perspective on success factors

Stakeholder Group	Success Factor
Employees	"According to plan and/or agreement" "Information flow" "On-time delivery" "Realistic time scope for delivery" "Realistic forecast"
Project managers	"According to plan and/or agreement" "Information Flow" "On-time delivery"
Factories	"According to plan and/or agreement" "Information flow" "On-time delivery" "Properly conducted development phase" "Resource availability"
Department Manager	"According to plan and/or agreement" "On-time delivery" "Information Flow"
Suppliers	"According to plan and/or agreement" "Information flow" "On-time delivery" "Realistic Forecast"

	"Properly conducted development phase"
Distributors	"According to plan and/or agreement" "Information flow" "Realistic time scope for delivery"

From the result presented in *table 4.2*, it is shown similar opinions are shared among the different stakeholder groups. For all six stakeholder groups the top-rated success factors *according to plan and/or agreement,* and *information flow* was mentioned, hence, these success factors are further confirmed as particularly critical to achieving high performance. The third top-rated success factor *on-time delivery* was highlighted by five of the six stakeholder group, further proving the importance of this criteria. Due to the minor differences in stakeholder perspective, one joint performance definition is perceived as comprehensive enough to capture all perspectives. The definition is based on the three top-rated success factors as they have proven especially important throughout this case study. The definition has been formulated as follows:

"A high performing OTD process is achieved when orders are delivered on time according to plan and/or agreement, and with accurate delivery information shared at the right time."

With this performance definition the formulation of objectives is facilitated, and stakeholder perspective assured.

4.4.2 Objectives Converting Sales

Formulating objectives for Converting Sales, several aspects were taken into consideration. Firstly, the strategic direction and primary objectives formulated by Tetra Pak. To capture these the strategic direction of SCO and IBP was further examined. Secondly, the performance definitions formulated in the previous sub-chapter had part due to their relevance in supporting implementation projects and considering stakeholder perspectives. Lastly, opinions collected from team members had a vital part in the final decision. A few objectives were proposed and discussed with the team during a workshop before final modifications were applied. At an initial stage, the primary objective was formulated as one, but after a redesign, the target was split into the two following objectives:

(1.1) Make sure on-time delivery according to plan and/or agreements always can be met

Aims to collect time parameters and point out the importance to deliver according to plan and/or agreement. The agreement is referred to as; what is decided between the factory, project manager, and supplier. It does not matter when the agreement is set or if this is modified, the on-time delivery should always be according to the current agreement, making sure to deliver as promised.

(1.2) Always collect and share necessary delivery information about the purchase order

Refers to information both in the terms of documentations such as shipping document, order confirmation, purchase orders, etc., but also more informal information shared among stakeholders through meetings, e-mail, and other platforms. This communication is important to make sure equipment can be delivered according to agreement.

The objectives formulated have a strong correlation to the success factors identified during the interview phase. Objective number **(1.1)** is connected to both *according to plan and/or agreement* and *on-time delivery* due to the focus on both on-time delivery and fulfilling agreements. For objective number **(1.2)** the connection to *information flow* is strong since this is the content of the objective. With these formulations of both performance and objectives, the first part of the theoretical framework has been fulfilled and the next step is to design the PMS, a procedure carried through in the following chapter.

5 Analysis

The main purpose of this chapter is to select a set of performance measures and create the PMS design for Converting Sales. This procedure starts with a gap analysis conducted for SCO's and IBP's strategies compared to strategy 2030. Further, the performance measures selection is carried through where the selected metric on-time delivery ratio is evaluated, discussed, and split in multiple dimensions throughout the chapter. As a concluding part, the PMS design and included measures are compared to Tetra Pak's 2030 strategy by using the performance definition and objectives formulated for Converting Sales which were presented in chapter 4.2.1 Defining performance and 4.2.2 Objectives Converting Sales.

5.1 Identified Gaps to Strategy 2030

From the previous chapter the correlation between company strategy and Converting Sales was determined. To create a rigid presentation of the gaps identified, SCO and IBP have been examined separately. The findings have been further analyzed to determine if and how the PMS can help limiting these gaps.

5.1.1 Gaps Identified for Supply Chain Operations

The result showed a partly connection between SCO and the company strategy, where two out of the four primary objectives were highlighted. A connection to Tetra Pak's mission could also be identified. However, the description about how the business unit aim to contribute to primary objectives **(3)** and **(4)** (presented in *chapter 4.2.2 Tetra Pak 2030 Strategy*) were limited. Similar limitations were identified for the description of the key characteristics *capable* and *dynamic*.

As SCO is responsible for sourcing, delivering, and producing packaging material, the business function is of great importance to ensure customers can produce Tetra Pak's packages at site (Tetra Pak 2021b). Considering this, contribution to objective **(3)**, which aims to optimize and integrate customers operations, is considered necessary. A connection which was not identified today. One hypothesis is that the business unit does plan for how this contribution will occur, but it is not clearly communicated. Hence, employees might have limited knowledge regarding the importance to deliver according to this objective.

Regarding objective **(4)**, where innovation is prioritized, SCO's contribution could not be identified. However, assumption is innovation is prioritized, especially considering the transition towards more sustainable packaging materials. To enable such a transformation there is a need for innovation, and it can be assumed SCO has priority within sustainability. However, it could be better communicated to enlighten employees of how innovation and sustainability is prioritized. The same applies to the key characteristics *capable* and *dynamic.* Where *capable* refers to collaboration within the company, as well as with partners, while *dynamic* refers to the ability to act and deliver quickly (Tetra Pak 2021e). How the business unit strives to deliver in accordance with these could be better communicated or evaluated if such a focus is not yet established.

Concludingly, the gaps identified between SCO's strategic direction and the 2030 strategy are: optimizing end-customer operations; innovation; ensure collaboration within the company and with partners; and how to act and deliver quickly. The extent to which these connections exist but lack in communication is difficult to say.

5.1.2 Gaps Identified for Industrial Base Performance

The connection between IBP and Strategy 2030 is perceived strong. The complete set of primary objectives and mission formulated by Tetra Pak is by IBP taken into consideration. How the business function contributes to the key characteristic *productivity* is also described. IBP also highlights their ambition to deliver according to SCO's focus on quality, sustainability, and productivity, pointing out their contribution to the company strategy. The only priority areas where IBP's contribution was not clearly stated were for the key characteristics *capable* and *dynamic.* However, collaboration was often mentioned as a priority, which suggests *capable* is considered. Regarding *dynamic,* no focus was identified during the evaluation. Neither was it identified as a success factor during interviews. Hence, this can be seen as a gap for further consideration.

As the potential gaps between SCO's and IBP's objectives compared to Tetra Pak's overall strategy, a next step was to analyze how these gaps might affect the design of the PMS. In the following section the impacts on the PMS designed caused by the gaps are further evaluated.

5.1.3 Gaps Impact on the PMS Design

The overall connection between IBP and Strategy 2030 is strong, indicating the business function is well in line with the organizational strategy. This suggests, implementation projects developed, prioritized, and implemented by IBP can be assumed to have a positive impact towards reaching the primary objectives. This means, the implementation projects assigned to Converting Sales are aligned with the company strategy, and by supporting these, Converting Sales contribute to achieving the primary objectives. This means the design of the PMS should be focused on how Converting Sales' operations best can contribute to a well working delivery flow to support the implementation projects in the best way possible. The PMS should measure purchase orders on an individual level, evaluating the overall performance of the delivery flow. This means the performance of the implementation projects will not be evaluated since these are assumed aligned with the company strategy. Additionally, PMS for projects evaluation already exist and are managed by IBP.

A gap identified for both SCO and IBP is the key characteristic *dynamic.* This is a gap which Converting Sales could help minimize if targets for their order-to-delivery (OTD) process are put towards acting and deliver quickly. However, as the performance was evaluated for the department, effectiveness is prioritized over efficiency. This plead, quick responses and short lead times should not be considered as the most important. Instead, the focus should be on fulfilling customer satisfaction meaning an effective process should be promoted. Thereby, this gap will not be prioritized when designing the PMS.

As connection to the organizational strategy has been established, the next step is to determine how to choose performance measures. The selected measures should support the ambition to achieve high performance and deliver according to Converting Sales' objectives formulated in *Chapter 4.4 Defining Performance and Objectives for Converting Sales.* To facilitate the selection process, priority areas based on success factors should be determined, a step which is presented in the following section.

5.2 Priority Areas for the PMS to Contribute to Success

The success of the delivery flow is dependent on needs within the implementation projects. These needs are defined by the project manager and converting factory. To design a valuable PMS for Converting Sales it is thereby important to evaluate what is important to them on a general level, e.g., what is important for an implementation project to be successful and how can Converting Sales contribute to this success. These needs were identified throughout the interview phase and gave rise to three top-rated success factors used to define high performance and objectives presented in *chapter 4.4 Defining Performance and Objectives for Converting Sales.* Throughout this section, a more throughout analysis of how Converting Sales can deliver accordingly is presented.

5.2.1 Customer Satisfaction

A recurrent priority throughout the empirics and analyzes is the ambition to deliver an effective process which contribute to customer satisfaction. Summarizing the most important success factors for the OTD process, the three top-rated success factors were: *according to plan and/or agreement, information flow,* and *on-time delivery.* These had a distinct difference in results, compared to any of the other success factors, which plead for the importance of these three areas. All three of the top-rated success factors can be related to effectiveness and customer satisfaction since they aim to deliver according to expectations, either by delivering equipment, results, or information as promised.

Selecting performance measures for the PMS, customer satisfaction must be in focus. This can be achieved by selecting measures that capture effectiveness rather than efficiency and evaluating the outcome of the process. Examples of such performance measures that fulfill the requirement of being quantitative non-financial metrics are: on-time delivery, complete delivery, perfect order fulfillment rate, etc. Measurement which captures efficiency should be avoided, such as lead time, operational lead time, number of orders handled, etc.

5.2.2 Time Dimension

Another area enlightens by several respondents throughout the interviews was the importance of time. This was described as a critical aspect when reviewing if an order had been delivered successfully. Time dependency is thereby assumed essential to achieve high performance within implementation projects. Hence, time is a priority over cost and quality, a conclusion confirmed by several interviewees who mentioned time is the most critical aspect. However, the time dimension should be put into perspective of *according to plan and/or agreement.* This indicates time is not related to pace nor short lead time but rather precision and on-time delivery, where the main priority is for stakeholders to deliver according to their promises. Further, the following statement was expressed concerning time dependency by a respondent:

"Time is dependent on agreement with the factory"

A statement that confirms how time is related to plan and agreement rather than speed and efficiency. A perspective that should be taken into consideration when formulating measures for the PMS. In the same way, as concluded for customer satisfaction, the measures must be focused on the outcome capturing the effectiveness of the process.

5.2.3 Transparency

A priority connected to the success factor *information flow* is transparency. This is an area which was frequently mentioned during interviews since respondents have experienced complications caused by poor communication between stakeholders. By increasing transparency, the process can become more efficient and effective since information can be properly shared among all actors included in the process. However, transparency is difficult to measure without focusing on individual performance. The performance could be captured by measuring for example: to what degree the PCC's are updated; how many times new agreements are communicated to Converting Sales; etc. Beyond focusing on individual performance, this type of measure also needs a high degree of manual administration leading to decreased efficiency, which counteract the target with introducing the PMS. Instead, to support transparency, an increase in visuality could be a better solution. This could be done by introducing monitoring support and facilitate control with the use of supporting tools, preferably available for several departments within IBP. Beyond transparency and visuality, this could improve productivity by reducing manual activities executed by Converting Sales and expanding automotive control and monitoring systems. Increasing visuality for the department would also give rise to easier and more accurate forecasts which would be beneficial to achieve a higher rate of on-time deliveries. Thereby, this would not only improve productivity but potentially enhance effectiveness. The ambition to implement a PMS is considered the first step towards this goal since capturing the performance of the delivery flow will help increase visuality.

As priority areas had been evaluated a selection of performance measures could be conducted. The suggestion is to implement *on-time delivery ratio,* a selection which will be further motivated throughout the following section.

5.3 Selection of Performance Measure On-Time Delivery Ratio

Reviewing the priority areas highlighted previously a performance measure well-suited is on-time delivery ratio. This metric has a clear focus on outcome by evaluating if the existing delivery flow adopted by the department contribute with on-time deliveries. To further prove the compatibility and value of the metric, definition and compatibility analysis is presented throughout this chapter.

5.3.1 Definition of On-Time Delivery Ratio

On-time delivery ratio evaluates to what degree orders can be delivered according to time agreements. The definition of on-time delivery ratio can be formulated as following:

"Measure the ratio of shipments sent to customers on-time, according to agreed delivery date"

Note that, in this case time agreements should focus on current agreements, suggesting updates are accepted without affecting the performance score generated from the measurement. This is due to several respondents describing order changes as okay if it is communicated between stakeholders. Additionally, this type of approach can encourage *transparency* since communicating delays will give rise to a higher score.

The measure should be calculated using the following calculation formulae:

[Number of orders delivered on agreed date] / [Number of orders delivered]

For example, company X is responsible for delivering 5 orders on the 10th of December. Two of the orders arrives 6th of December, one arrives 10th of December, and two arrive 11th of December. This

means, three orders could be delivered on agreed date while two of the orders arrived past the agreed date. The performance score can be calculated as following:

$$[3] / [5] = 0,6 = 60\%$$

The on-time delivery ratio for company X reach up to 60% for the 5 orders delivered.

The measurement is suggested to be divided into two different levels. The first level should capture the overall performance of the delivery flow, and the second level the performance of suppliers and distributors. This is to ensure potential bottlenecks can be identified and minimized. Additionally, this can increase in visuality since parts of the process are evaluated, making the process easier to monitor and control. A throughout description of the PMS design and the three included measuring levels are presented in chapter *5.4 PMS Design.*

5.3.2 Reasons Behind the Selection

The selection was based on needs identified throughout the case study where the priority areas described in *chapter 5.2 Priority Areas for the PMS to Contribute to Success*, can act as a summary of these findings. Beyond this, criteria described in *chapter 3.3.1 Performance Measure Selection* have been considered while choosing suitable metrics.

Evaluating the priority area of *customer satisfaction*, the customer is seen as the project managers and converting factories. This due to these two stakeholder groups utilize the delivery flow offered by Converting Sales. For these two actors, the time plan related to the implementation projects is of great importance due to potential costs if delays occur. Especially important is the time plan for the project managers since they often manage several projects at a time that are dependent on each other. A delay in one project could thereby end up causing delays in other projects resulting in increasing costs and failed budgets. Measuring the ability to deliver on time is considered a valuable step to ensure customer satisfaction is fulfilled. Additionally, if problems appear the measure can provide more details that enable correction for future deliveries, resulting in increased performance. This means, the measure has the potential to both capture performance and promote increasing performance.

Regarding priority of *time dimension* the suggested metric includes this parameter since it measures on-time deliveries. Beyond measuring Converting Sale's delivery performance, this metric has the potential to contribute with knowledge regarding stakeholders' delivery performance, which can facilitate forecasting. Today the forecast is based on estimations, but an actual evaluation of the accuracy is not conducted. By implementing *on-time delivery ratio* there is a potential to improve the forecast and minimizing the need for buffer time. A next step towards improved estimations would be to measure lead time for different destinations which could improve forecasts even further. However, due to limited time frame, this measure is not further evaluated during this case study.

Transparency can, as discussed previously, be improved by increased visuality, something that the suggested metric supports. Additionally, by evaluating on-time delivery performance based on current agreements, a better score will be achieved if delivery dates are updated between actors. This can promote a change in behavior since transparent communication is rewarded.

To describe how criteria stated in *3.3.2 Performance Measure Selection* has been taken into consideration, an evaluation has been carried through which is presented in the following section.

5.3.3 Performance Measure Evaluation

Selecting measures, a brief evaluation is assumed valuable to ensure accurate performance measures are selected. However, as measures are being implemented, a deeper evaluation should be conducted capturing the actual value and functionality of the metric.

Select a limited number of performance measures

A criteria considered during the selection process. The number of metrics suggested for the PMS at an initial stage is a total of 3 metrics, including *on-time delivery ratio* for the overall delivery flow and two additional measures focusing on supplier and distributer *on-time delivery ratio*. Adopting only 3 metrics is a bit few since the recommendation is to apply 5-7 measures (Atkinson 1998; Globerson & Riggs 1989). However, due to time constraints, the limited number is considered preferable to make sure the measures can be designed qualitatively. When these three measures have been successfully implemented, designing additional metrics are favored where one recommendation is to focus on the more qualitative measure *customer satisfaction rate* to capture opinions from factories and project managers. This recommendation is further discussed in *chapter 6.6.3 Customer Satisfaction Rate.*

Selected measures should reflect the organizational strategy

To determine the connection to the organizational strategy, the objectives formulated in *chapter 4.4.2 Objectives Converting Sales* are used as reference. These objectives are connected to both the performance definition based on interview results and Tetra Pak's primary objectives through connection with SCO and IBP. Through the gap analysis conducted in *chapter 5.1 Identified Gaps to Strategy 2030* IBP's objectives were established as aligned with the strategic direction of the company. This means, since objectives for Converting Sales have been formulated accordingly, these objectives are also in line with the company strategy. This means if the metric is compatible with Converting Sales' objectives it can be assumed aligned with the company strategy.

Reviewing the objectives formulated for the department and their relation to *on-time delivery ratio*, a correlation is seen for especially objective **(1.1)** which is focused on on-time delivery according to agreements. This shows a strong connection, and the measure can be assumed a good support to achieve this objective. For objective **(1.2)** where the focus is more towards a sufficient information flow, the connection is more subtle. To achieve a high-performance score on *on-time delivery ratio* a well-working information flow must be in place. This indicates, if the objective **(1.2)** is not achieved a low-performance grade will be generated from the suggested measures. The metric can also promote an increase in information flow and transparency, for reasons mentioned previously.

Selected metrics must be comparable

To ensure comparability regardless which team member collects the data, the data collected for the measure should be as automatic as possible. This can be accomplished by collecting data with the use of SAP and OTM, and by defining specific routines for when different operations should be carried through. Recommendations to cope with this will be further presented in the following *chapter 5.4.1 Suggested Data Collection and Routines.*

Include non-financial measures

A criteria that is fulfilled since only non-financial parameters is included. Considering the absence of financial measures this is not considered an issue, since costs are not prioritized over customer satisfaction. However, cost parameters do have an impact on the department if rising above budgeted costs but as several project managers described during interviews, the cost generated from Converting Sales constitutes such a small part of the overall project cost they are not even a part of the project budget. Nevertheless, costs do have an impact and the price for equipment, transports, etc., cannot be unreasonably high. However, as Converting Sales are not responsible for negotiating prices,

applying cost measurements within the PMS would bring limited value. As a result, non-financial measures have been exclusively selected.

Use multiple dimensions and levels of measures
A criteria that is connected to the overall structure of the PMS. Considering the suggested metrics, the PMS consists of multiple levels where *on-time delivery ratio* for the overall delivery flow can be seen as the level 1 metric, and the level 2 metrics are related to *on-time delivery ratio* for suppliers and distributors. Regarding multiple dimensions, only one dimension is used, namely *time.* This was also identified a priority area and introducing parameters related to this dimension is considered enough. However, if the PMS grows, measures within the quality and cost dimension could be preferable to generate a balanced system.

Make sure horizontal and vertical integration is possible
Regarding integration, *on-time delivery ratio* can have an impact on both project managers and factories since it will help identify the supplier and distributor performance, e.g., horizontal integration. This also has the potential to improve forecasting carried through by project managers. If reaching the potential to increase forecasting performance this can affect how the implementation projects are carried through, which can be seen as tactical decisions, e.g., vertical integration is achieved.

As the selection process is completed and the brief evaluation ensures validity of selected measures, the next section describes the complete design of the suggested PMS.

5.4 PMS Design

The PMS has been constructed based on chosen part of Converting Sales OTD process, e.g., the delivery flow. This is further narrowed by restraining the focus from: reception of order confirmation sent by the supplier; to arrival at the agreed pick-up point for the factory. Key breaking points while developing the PMS for the delivery flow were presented and visualized in *chapter 4.1.2 The OTD Process,* see depict of *figure 4.2* below.

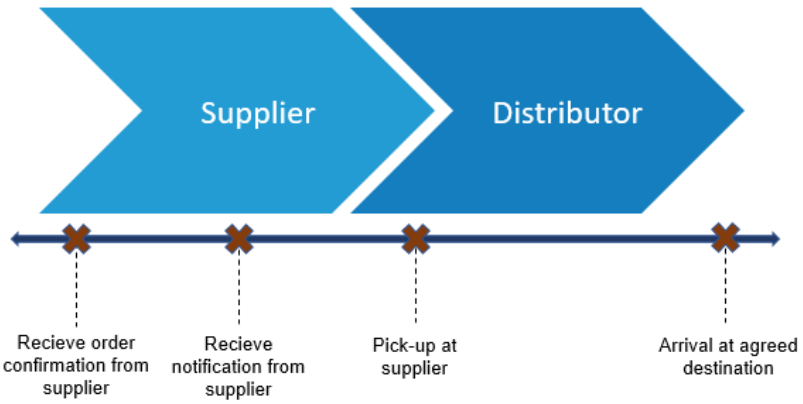

Figure 4.2 Key breaking points in the delivery flow

Further, measures suggested to capture and promote desired performance were presented and evaluated in *chapter 5.3 Selecting Performance Measures.* The PMS structure is visualized in *figure 5.1* below.

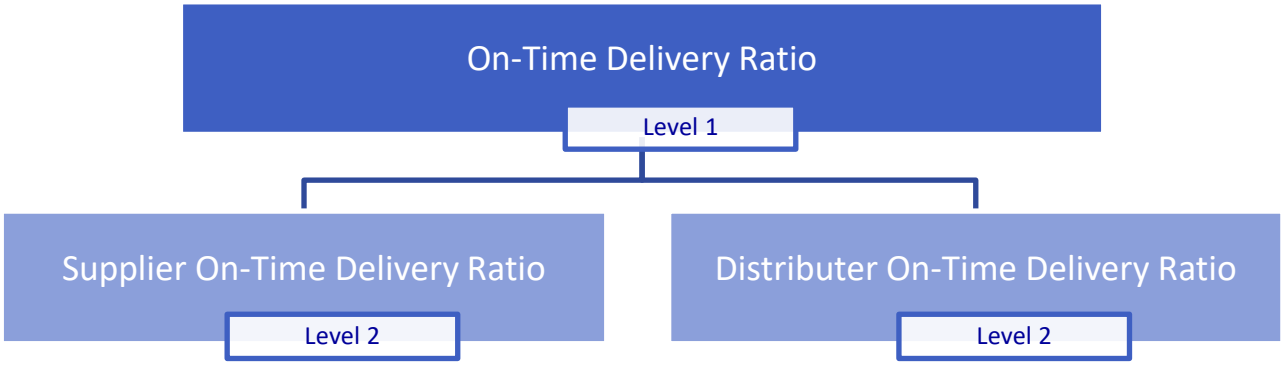

Figure 5.1 Suggested structure of PMS

With *on-time delivery ratio* the target is to measure the overall performance of the delivery flow. This refers to: extent of deliveries that arrive at the final destination according to promised arrival date shared by Converting Sales. Hence, this is a measure focused on Converting Sales delivery performance, regardless to what or who cause potential delays.

Two different level 2 metrics are suggested with ambition to break down the overall performance into minor pieces. This is to ease the possibility to identify what caused a delay. Beyond this, there is an ambition to gain more knowledge about stakeholder performance which can be valuable to increase the overall performance. One of the level 2 metrics focuses on *supplier on-time delivery ratio* while the other focuses on *distributer on-time delivery ratio.* To better describe the function of included measure a more throughout description of data collection, time intervals, and suggested routines will be further described throughout this section.

5.4.1 Suggested Data Collection and Routines

To measure the different levels of *on-time delivery ratio* has proven rather complicated in terms of data collection. The complex delivery flow combined with the extensive number of manually managed operations results in a large scale of data is not available in any system. To work around this, relatively extensive changes in routines must be adopted, and to what extent these changes are viable needs further investigation. However, they are recommended since it is valuable measurements for evaluating the overall on-time delivery performance. Needed changes for a successful measurement system will be presented parallel to the data collection procedure.

To capture the performance of the delivery flow, an initial step is to determine *reference dates* and *actual dates* for which the metrics will be measured. The reference date should represent the agreed arrival date, while the actual date reflects the actual arrival date. How these can be established for the three measurements is presented below.

Reference date

A suggested reference date to apply for *on-time delivery ratio* is *estimated time of arrival*, further referred to as ETA. This date refers to the day Converting Sales estimates the equipment will arrive at the agreed pick-up point such as airport, harbor, or factory. A date that should be communicated on the order confirmation shared with the receiving factory. However, the date shared on order confirmations today is *estimated time of dispatch*, further referred to ETD, which represents what day

Converting Sales estimate the order to be shipped from the supplier. This means, as of today, transportation lead time is not included in promised delivery dates. To capture the performance of the complete delivery flow, recommendation is to change this routine and start using ETA instead of ETD. Expectation is the lead time uncertainty which existing for transportation today may be limited by applying ETA instead of ETD. This since visuality increases as the complete delivery flow is captured. Initially when evaluating the performance score of *on-time delivery ratio* lead time uncertainty should be taken into consideration due to uncertainty affecting the performance score. A more accurate estimation of transportation lead time is believed possible first after estimations have been conducted regularly.

The referenced date suggested for *supplier on-time delivery date* is ETD from the supplier site. This date refers to what day the supplier estimates the order will be ready for pick-up by the distributor. Information on ETA is generated from the order confirmation received from the supplier, which is inserted in SAP by Converting Sales where the measuring data should be collected. The reason for choosing this as a reference date is since it is based on promises made by the supplier, e.g., agreements made. Additionally, with this date there is a possibility to adopt if ETD is updated, which prevents changes in agreements to affect the performance score negatively. However, cases where the pick-up date is updated between suppliers and project managers without advising Converting Sales ETD will not be updated and delays occur. Hopefully, this can initiate a change in behavior as supplier performance decrease if updated order confirmation is absent. Additionally, updated order confirmation received from the supplier should only be inserted into SAP if there is an agreement to postpone the purchase order. In that way, suppliers cannot update order confirmations to avoid a lower performance score.

Lastly, the *distributer on-time delivery date* is recommended to be evaluated on two different reference dates, namely ETD and ETA. Both dates are shared by the distributor and can be collected from OTM. The reason for measuring both ETD and ETA is due to the simplicity in data collection combined with the value it may bring. A summary of suggested reference dates is presented in *table 5.1* below.

Table 5.1 Suggested reference dates.

Performance Measure	Reference Date
On-time delivery ratio	**ETA** promised to factory
Supplier on-time delivery ratio	**ETD** promised by supplier
Distributer on-time delivery ratio	**ETD & ETA** promised by distributer

Actual Date

For the *on-time delivery ratio,* the recommendation is to apply *actual time of arrival,* further referred to as ATA, as the actual date. To be able to capture ATA a few changes must be adopted regarding what is inserted in OTM. Today sales order numbers are not included in the transport booking which means information received from OTM cannot be related to specific sales orders. The recommendation is to introduce such a connection by making sure transport bookings include information about which sales order is being transported. A change that must be coordinated together with the shipping department who are responsible for the OTM system. Another change, which can make monitoring of orders easier is to make sure the *ship to code* applied by Converting Sales is

identical to the *ship to ID* used by the shipping department. This is the reference number for the end destination and should be the same for both departments to ease comparison.

Evaluating how to measure actual date for *supplier on-time delivery ratio* there are two types of delivery flows which should be taken into consideration. This is dependent on whether the purchase order should be sent directly from the supplier to the factory, or if it is initially sent to Tetra Pak in Lund. The two flows have different routines; hence, the data collection procedure will differ. For both delivery flows the actual date should capture *actual time of dispatch*, further referred to as ATD. This represents the actual day the equipment is ready for pick-up at the supplier. This date can be captured using *Goods Received Date,* further referred to as GR date. However, the difference between the two delivery flows results in different GR dates are collected. For a purchase order that is sent directly from the supplier to the factory, Converting Sales creates a GR that is well in line with ATD, and a high measuring precision can be achieved. The other scenario involving purchase orders that are initially sent to Tetra Pak in Lund before being sent to receiving factory. For these orders, a GR is proceeded by a department referred to as *Incoming Goods*, who conduct this when the order arrives in Lund. This results in a lower precision in the measure and the time interval must be adjusted to include a time buffer for both transportation and internal handling. The procedure also calls for a higher degree of manual work since the degree of inaccuracy in performance score is assumed higher. However, for both situations, the actual date will be referred to as the GR date and sole the suggested time intervals will be different.

To capture the actual date for *distributer on-time delivery date,* ATD and ATA should be captured from OTM. These are shared by the distributor and involve a simple data collection procedure. A summary of the suggested reference and actual dates are presented in *table 5.2* below.

Table 5.2 Suggested reference dates.

Performance Measure	Actual Date
On-time delivery ratio	**ATA** received from distributer
Supplier on-time delivery ratio	**GR date** conducted by Converting Sales or Incoming Goods
Distributer on-time delivery ratio	**ATD & ATA** received from distributer

A summary of which reference- and actual dates are suggested for the different measures is presented in *table 5.3* below. Within the yellow column, the preferred reference date is presented whereas in the green column the actual date is presented.

Table 5.3 Summary suggestion of reference- and actual dates.

Performance Measure	Reference Date	Actual Date
On-time delivery ratio	**ETA** promised to factory	**ATA** received from distributer
Supplier on-time delivery ratio	**ETD** promised by supplier	**GR date** conducted by Converting Sales or Incoming Goods
Distributer on-time delivery ratio	**ETD & ETA** promised by distributer	**ATD & ATA** received from distributer

5.4.2 Time Intervals

A next step is to determine what is defined as *on-time.* A recommended solution is to implement four different time intervals as following: *on-time deliveries, early deliveries, delayed deliveries*, and *critical delayed deliveries*. The suggested time intervals are based on estimations and should be evaluated as metrics are implemented and tested.

Early deliveries

For the measure *on-time delivery ratio,* early deliveries are suggested to be orders which are at site more than 14 calendar days before the reference date. This means an order which arrives more than 2 weeks before ETA will show as *early delivery*. The impact caused by an early delivery is limited in comparison with a delayed delivery. However, if large equipment arrives too early, it might cause difficulties for the receiving factories due to limited possibilities for warehousing or to arrange for pick-up. These scenarios might cause additional costs for the factory, but it has not been lifted as a major problem suggesting the main purpose of this time interval is to promote an increase in delivery precision. The reason for accepting an order 14 days before the reference date without labeling it as an *early delivery,* is since project manager often include a 2-week time buffer in the forecasts. By adopting a relatively generous time interval, the adopted 2-week buffer is accepted without adventuring the performance score of the measure.

For *supplier on-time delivery ratio* no intervals for *early deliveries* are suggested. This since it has zero impact on the delivery flow and only affects the supplier themselves. This due to Tetra Pak is responsible for arranging transportation and no matter how early the order is ready at the supplier, the booked truck will pick up the order at the agreed pick-up date.

For *distributer on-time delivery ratio* a more restrained interval is suggested for the *early deliveries.* For ATA an actual date more than 3 working days before the reference date should be considered an *early delivery.* This is simply to promote a high precision for orders since no buffer time is applied by Converting Sales when booking transports. Additionally, an early pick-up conducted by the distributor can cause complications if the supplier does not get enough time to get the order ready for pick-up. Hence, ETD compared to ATD should be measured even more strictly not accepting any pick-up prior the reference date. A summary of all time intervals is presented in *table 5.4* below.

On-time deliveries

For the measure *on-time delivery ratio,* the suggestion is orders which are delivered no later than 0 calendar days after- and 14 calendar days before the reference date should be considered *on-time deliveries.* The reason for choosing a harsh measure point when evaluating delays is based on the

principle: either a delivery is on time, or it is not. This is applicable since identified measuring point is assumed to be precise.

For *supplier on-time delivery ratio,* two different time intervals need to be adopted due to the differences in the delivery flow. For deliveries that are sent straight from the supplier to the factory, the on-time interval is recommended to be no later than 0 calendar days after the reference date. For orders which are initially transported to Tetra Pak in Lund, a suggestion of 7 additional calendar days is recommended as a time buffer. The buffer is an estimation based on procedures conducted by other departments at Tetra Pak and aims to capture both transportation from supplier to Tetra Pak in Lund, as well as internal handling time for Incoming Goods. However, this is an uncertain estimation, and an evaluation should be conducted as the metric is implemented.

For *distributer on-time deliver rate* the time interval *on-time deliveries* are recommended a bit differently for ETD versus ATD and ETA versus ATA. For ETD versus ATD, no fluctuation is accepted since both early and late dispatch dates harm the delivery flow. However, the ETA versus ATA is suggested to accept 3 working days prior- but 0 working days after the reference date.

Delayed deliveries

Orders which are considered *delayed deliveries* arrive at site after the reference date but not more than 14 calendar days after. This means all orders which arrive at site one day after ETA will be considered a delay, even though it might not have an impact on the project plan. This is to increase overview and promote an improvement of delivery precision since this has the potential to support more accurate forecasting. If an order is more than 14 calendar days late, this is considered a critical delay. This is based on the same principle as for the early deliveries, e.g., forecasting usually includes a 2-week buffer before a delay has an actual impact on the overall project performance. This time interval is applied for all measures except when evaluating *supplier on-time delivery ratio* for orders transported via Tetra Pak in Lund, for these an additional 7 calendar days is added, e.g., 21 days after the reference date.

Critically delayed deliveries

The final time interval includes orders which arrive more than 14/21 calendar days after the reference date. Orders which arrive with such a delay can hurt the overall project if causing the project plan to fail due to equipment not being in place before installation starts. This can result in increased costs for one or several projects which can cause project budgets to fail. Thereby this time scope is the most critical one and no purchase orders should exist in this time interval without analyzing what went wrong.

Table 5.4 Summary time intervals

Performance Measure	Early deliveries	On-time deliveries	Delayed deliveries	Critically delayed deliveries
On-time delivery ratio	More than 14 calendar days prior ETA promised to factories [∞, -15]	No more than 14 calendar days prior- and 0 calendar days after ETA promised to factories [-14, 0]	At least 1 calendar day after- but no more than 14 calendar days after ETA promised to factories [+1, +14]	More than 14 days after ETA promised to factories [+15, ∞]

Supplier on-time delivery ratio (deliveries straight from supplier to factory)	-	No more than 0 calendar days after ETD promised by supplier [∞, 0]	At least 1 calendar day after- but no more than 14 calendar days after ETD promised by supplier [+1, +14]	More than 14 days after ETD promised by supplier [+15, ∞]
Supplier on-time delivery ratio (deliveries via Tetra Pak in Lund)	-	No more than 7 calendar days after ETD promised by supplier [∞, +7]	At least 8 calendar days after- but no more than 21 calendar days after ETD promised by supplier [+8, +21]	More than 21 days after ETD promised by supplier [+22, ∞]
Distributer on-time delivery ratio (ETD versus ATD)	More than 0 calendar days before ETD promised by distributer [∞, -1]	No more than 0 calendar days before- and no more than 0 calendar days after ETD promised by distributer [0, 0]	At least 1 calendar day after- but no more than 14 calendar days after ETD promised by distributer [+1, +14]	More than 14 days after ETD promised by distributer [+15, ∞]
Distributer on-time delivery ratio (ETA versus ATA)	More than 3 calendar days before ETD promised by distributer [∞, -4]	No more than 3 calendar days before- and no more than 0 calendar days after ETD promised by distributer [-3, 0]	At least 1 calendar day after- but no more than 14 calendar days after ETD promised by distributer [+1, +14]	More than 14 days after ETD promised by distributer [+15, ∞]

As the PMS structure has been presented an evaluation of how the PMS can contribute to the organizational strategy is further described. This to guarantee the value of the PMS and prove its contribution to strategy 2030.

5.5 PMS's Contribution to Strategy 2030

To evaluate the validity of the suggested PMS, the performance definition and objectives formulated for Converting Sales in *chapter 4.4 Defining Performance and Objectives for Converting Sales* has been used as a baseline. This since their connection to Strategy 2030 is previously established and by making

sure the PMS support progress towards these, the organizational strategy is also supported. The performance definition was expressed as follows:

"A high performing OTD process is achieved when orders are delivered on time according to plan and/or agreement, and with accurate delivery information shared at the right time."

The PMS's contribution to this is considered strong based on suggested performance measures focusing on on-time delivery of the delivery flow. The measurements have been recommended to allow for potential updates in delivery dates, making sure the measurement is flexible and can adapt to any agreements which are made during the process. To contribute to the second part of the definition, where information flow is highlighted, flexibility is an asset. The expectation is by introducing a flexible reference date communication is promoted for achieving a higher performance score. Further, the below-stated objectives were introduced to Converting Sales:

(1.3) Make sure on-time delivery according to plan and/or agreements always can be met

(1.4) Always collect and share necessary delivery information about the purchase order

The objectives are closely related to the performance definition, meaning the same connection as presented previously can be identified. For objective **(1.1)** the correlation is found since the measurements focus on on-time deliveries in combination with an allowance of rearrangements when needed. For the objective **(1.2)** the correlation is related to the PMS's indirect encouragement for a higher degree of information flow and transparency between stakeholders, which has been described previously.

Based on this analysis the suggested PMS is well in line with both the performance definition and objectives. This further proves the contribution to Strategy 2030 since objectives and performances have been previously established as aligned with the strategic direction of SCO and IBP.

6 Conclusion and Discussion

As a concluding part of the case study the conclusion and discussion are presented. In this section a brief summary of the findings is presented, and fulfillment of research questions discussed. Further, the theoretical and practical contribution from this study is discussed and future research suggested. Additionally, limitations with the study is highlighted. As a final part future recommendation for the company are stated.

6.1 Summary of Findings

From literature review a theoretical research model was developed describing the process for designing a performance measurement system fit for the company culture, strategic direction, and stakeholder perspective. The theoretical research model acted as basis for the case study research where the initial stage was to develop performance measures by defining performance, establish objectives, and develop a set of metrics. As an initial part the priority between effectiveness and efficiency were investigated, where effectiveness was established prior to efficiency. Further, objectives were investigated and evaluated, showing limited gaps between IBP and the organizational objectives. This resulted in a conclusion that by providing value to IBP and their implementation projects, Converting Sales contribute positively to the company strategy. Hence, the focus when designing the PMS was to ensure the needs within the implementation projects could be fulfilled in an effective way. To do so, the analyse continued to determine what is considered high performance for Converting Sales when operating within implementation projects. From interview result the success factors *according to plan and/or agreement; information flow;* and *on-time delivery;* were identified. These were further translated to three main priority areas, namely *customer satisfaction; time dimension;* and *transparency.* From these priority areas the performance measure *on-time delivery ratio* was suggested in a two levelled structure. A measure which is seen as preferable for needs, requirements, and success factors identified at the department.

To further describe, evaluate, and discuss the result from the case study the following section will highlight the purpose of the study and the included research questions. This to ensure the purpose has been fulfilled and research questions properly answered.

6.2 Purpose and Research Questions

To verify that the case study has fulfilled its purpose two areas are further discussed, the overall purpose described in chapter *1.4 Purpose,* and the research questions presented in chapter *1.6 Research Questions.*

6.2.1 Fulfilment of Purpose

The purpose of this case study was formulated as following:

"Designing a performance measurement system which can support increased performance for an operative department managing an order-to-delivery process."

As stated in the purpose the main objective with the study was to **develop** a PMS for an operative department managing a order-to-delivery process, which in this case study is the department Converting Sales. The process to develop a PMS has been started and a first solution is presented in chapter *5.4 PMS Design.* However, additional development is needed to complete the design and ensure a successful implementation can be carried through. A first step towards completing the design

is by following through with the theoretical research model presented in *chapter 3.5 Theoretical Research Model,* which could not be completed in this case study due to the limited time frame.

The ambition to develop a PMS contributing to increased monitoring support has been evaluated throughout the study. The suggested performance measure *on-time delivery ratio,* structured in a two-dimensional design, is believed to increase visuality for the department. This in turn can contribute to improved monitoring support for the OTD process, facilitating the workflow for the department. From this, the overall purpose of the study can be perceived as fulfilled. However, to ensure the complete set of supposed investigation areas has been evaluated, the fulfillment of the research questions will be further examined.

6.2.2 RQ1: How can a PMS be designed to measure and evaluate the OTD process managed by Converting Sales?

Initially in the study a literature review was conducted with the main objective to investigate how to construct a PMS according to theory. A broad set of criteria could be collected where *evaluate performance, reflect organizational strategy* and *strategic fit* was three of the most frequently mentioned criteria, see *table 3.4* at p.28. However, as the frequency was considered relatively even among collected criteria in *table 3.4,* all was considered important thus taken into consideration throughout the case study. However, the criteria collected were not focused on developing a PMS for the OTD process, but rather to design a PMS to use at a strategic level of the company. Thus, one challenge with the study was to translate these criteria making them relevant for a department active at an operational level, with focus on the OTD process conducted by Converting Sales. To do so, the collected criteria were used to design a model describing how a PMS can be developed and was presented as a theoretical framework seen in *chapter 3.5 Theoretical Research Model* (a depict of *figure 3.3* is presented below). This model aims to describe an easily followed process for developing and implementing a PMS for a business unit operating in a OTD process. With the use of this model the PMS presented in *chapter 5.4 PMS Design* could be developed for Converting Sales to measure and evaluate their OTD process.

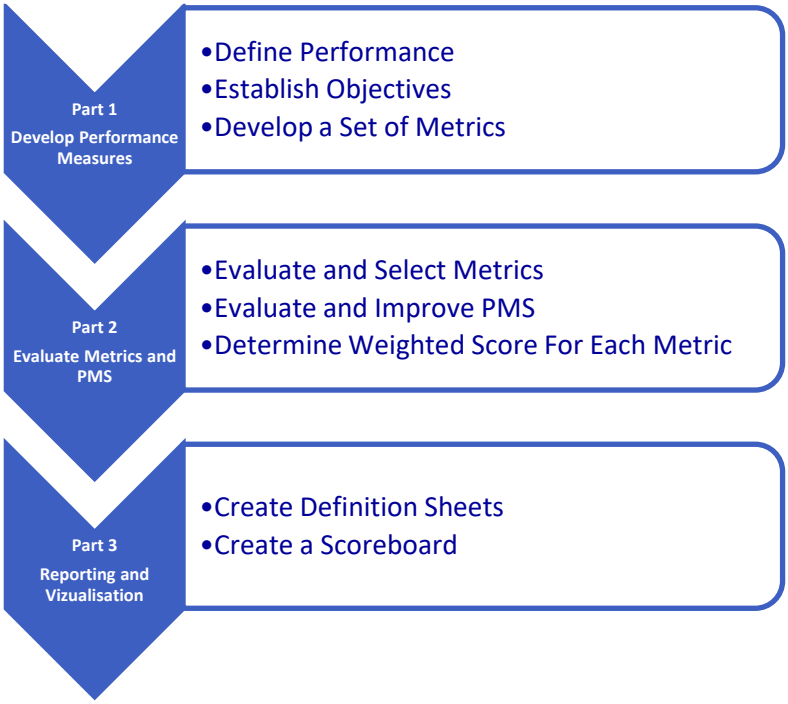

Figure 3.3 PMS development process for this case study.

6.2.3 RQ2: What objectives should the PMS contribute to, and what are the gaps between these and the organizational strategy?

One criteria frequently mentioned within theory was that a PMS should contribute to the organizational objectives. To achieve this, a first step was to investigate Tetra Pak's formulated strategy and objectives, see chapter *4.2.2 Tetra Pak 2030 Strategy.* Further, departments with connection to Converting Sales were investigated to determine how they work towards achieving these objectives, an investigated presented throughout chapter *4.2 Organizational Strategy and Objectives.* This analyse was carried through in accordance with *Part 1: Develop Performance Measures* in the theoretical research model presented above (see *figure 3.3),* where *Establish Objectives* is one of the promoted actions towards developing a PMS.

During the analysis correlation could be identified between Tetra Pak's primary objectives and the ambitions formulated by SCO and IBP, for which Converting Sales act as a supporting department. The connection for IBP was perceived strong, a connection particularly relevant for Converting Sales considering their collaboration with this department. By establishing this connection, the conclusion was: if generating a PMS that supports increased performance for implementation projects conducted by IBP, the PMS will contribute to the organizational strategy. Further, by evaluating and establishing performance definition, success factors, and priority areas for Converting Sales, based on operations conducted within implementation projects, this contribution could be ensured when designing the PMS.

6.2.4 RQ3: What are the success factors for the OTD process managed by Converting Sales?

Developing the PMS one step was to identify success factors for the OTD process. This was established through interviews carried through with the 14 respondents included in the study. From these interviews three success factors distinguished as especially important for the OTD process to be effective. The success factors were *according to plan and/or agreement; information flow;* and *on-time delivery.* These were mentioned by nearly all respondents, proving their importance when reaching for an effective OTD process. For a full description of each of the captured success factors, see *chapter 4.3.1 Success Factors for the OTD process.*

6.2.5 RQ4: What are the priority areas for Converting Sales to achieve high performance in the OTD process?

From the success factors collected through interviews, three priority areas were formulated. The priority areas are *customer satisfaction; time dimension;* and *transparency.* The priority areas were meant to describe what should be in focus when reaching for improved performance within the OTD process. Fulfilling these three priority areas, the OTD process deliver effectively reaching the desired outcome of the process.

Concludingly, the purpose of the case study research is considered fulfilled since the overall purpose, as well as all research question has been successfully answered and promoted throughout the study. Further, a discussion regarding contributed is presented.

6.3 Contribution

The contribution from this study is split into two mayor fields, theoretical and practical. How the study has contributed to these two fields is presented and discussed throughout this sub-chapter.

6.3.1 Theoretical Contribution

The theoretical contribution from this study is within the area of PMS, and more precisely, PMS for OTD processes. Initially in the study, a gap was identified in existing research where the majority of reviewed literature focus on developing a PMS applicable at a company's strategic level. The gap refers to the limited research found regarding PMS for operative department that does not have direct focus on strategic or tactical decisions. The output of this gap is that limited guidance can be found regarding designing a PMS for departments dealing with more operative processes and decisions. This case study research contributes to decreasing this gap by introducing more research within the area.

While carrying through with this study, knowledge gained from the research area of PMS was collected and adapted to a more operative department. One challenge while adjusting the basis of the PMS was the importance to connect the system to the organizational strategy of the company. Since the case study focused on a department with no direct connection to the overall strategy of the company, the contribution to the primary objectives were more challenging. To ensure the PMS could support the organizational strategy and objectives, the impact of the formulated strategy was traced from the top level and down to where it affected the investigated department. By doing this the case study can contribute with deeper knowledge of how to connect a PMS designed for an operative department to the organizational strategy of the company. Additionally, how to translate other criteria developed for a strategic PMS to a more operative PMS, has been discussed throughout this study. This can contribute to deeper knowledge of how to translate a strategic procedure to a more operative approach, regarding PMS development.

Within this study the procedure of developing a PMS to an operative department was carried through. This means, not only does this study contribute with theoretical knowledge of how an operative PMS could be developed, but also how it can be carried through practically. This increases the value of the study since it proves the practical applicable of the theoretical model developed from the literature review. However, since the model could not be completely realized a more throughout study with a longer time frame could be of value to increase the contribution of how to practically design such an PMS.

The last of the theoretical contributions regards the enlighten of existing research gap. By highlighting the need for more research within the area, a hope is more studies will be carried though within mentioned field. With increased research within this field, business leaders dealing with the challenge to develop PMS for their operative departments, have more guidance and thereby higher chances of succeeding with this task. This can also deepen the knowledge of the strategical impact that operative departments have, which might be taken for granted if they are not measured and monitored in a sufficient way.

6.3.2 Practical Contribution

The practical contribution is especially large for the Converting Sales and Tetra Pak that were included in the case study. From this master thesis a PMS was designed and developed specifically for this department. This PMS can be assumed contribute with several benefits for the department and Tetra Pak.

A first benefit generated from the PMS and the case study, is the increased knowledge of the OTD process managed by Converting Sales. During the case study this process were in focus, contributing with deeper knowledge of what is important for this process to succeed. This can help the employees understand possible bottlenecks in the process, which can provide guidance if issues would occur. With the use of the suggested PMS this knowledge is expected to increase even further, helping the department to monitor and manage the OTD process effectively.

Another contribution to Converting Sales is the promotion towards an increased information flow. This was a problem area expressed by several of the team members within the department. The problem was that the information flow was not seen a sufficient and important information diapered in the process. This resulted in team member of Converting Sales had to spend time searching for necessary information rather than focusing on value adding activities. Hence, by promoting an increased information flow with the use of the PMS, Converting Sales can spend less time on searching for more information and more time on what matters. This extends the contribution to Tetra Pak as a company, since more time can be spent on value adding activities.

The PMS also contribute with deeper knowledge regarding which are the success factors and priority areas where Converting Sales should focus when reaching for increased performance. By gaining knowledge of what works and what to prioritize, an expectation is that Converting Sales will continue with their well appreciated work reaching for even more success with the OTD process. With the help from the PMS more information, knowledge, and monitoring support are available for Converting Sales, making their everyday work easier and possible the outcome from their OTD process even better.

Finally, this study can contribute with value to similar departments that are standing before comparable challenges. This regards departments both inside of Tetra Pak but also departments at other companies. By taking part of the results generated from this case study, the procedure of developing a successful PMS can be better understood and the process easier. Especially valuable is assumed to be the criteria collected and adopted to fit the theoretical model describing how to develop a PMS for a department such as Converting Sales.

6.4 Future Research

To minimize the theoretical gap identified in this study, future research should focus on PMS suitable for operative departments, such as for a sales departments managing OTD processes. Today research seems to have a primary focus on strategic departments focusing on how to achieve strategic or tactical improvements with the use of a PMS. This creates a gap in literature and creates challenges for business units searching for monitoring and evaluation support with the use of a PMS. Additionally, the importance of operative processes is undeniable and the need for well-working flows within these processes should not be forgotten. Thereby, further research within the area should be conducted and added to the theoretical base.

6.5 Limitations

The main limitations of this case study can be summarized into five different areas. The first limitation exists due to time constraints and concerns the interviews conducted during the research, where no interviews were conducted with respondents outside of Tetra Pak. Thereby, stakeholder perspective is based on Tetra Pak's own observations and beliefs regarding their stakeholder's wants and needs. This is a crucial limitation since it means it cannot guarantee stakeholder needs has been generated within the study, hence, the value of the PMS can be questioned. However, as Converting Sale's most

critical stakeholders are the project managers of the implementation projects, the PMS is still considered valuable since several project managers took part in the study.

Another limitation related to the restricted time frame is the narrow material conducted prior the second phase of the interviews, e.g., the workshop. An assumption is a better result could have come from the workshop if a more rigid solution had already been in place. Another issue with the workshop was that it was held digitally due to the Corona pandemic. If a physical workshop could have been carried through, a belief is discussions would have been more comprehensive, generating even more value to the study.

The limited time frame also resulted in the theoretical framework presented in *3.5 Theoretical Research Model* could not be fully carried through. Evaluation, weighted scores, and monitoring tools, could not be conducted, hence, the PMS cannot be seen as completed. Additionally, since the model has not been followed through an evaluation of the model cannot be conducted since each part is dependent on each other. However, the parts used is perceived valuable and seen as a good support in the design of a PMS.

The study was also based on mainly qualitative data, which make the result dependent on the researcher. A different researcher might therefore analyze the result differently, resulting in another set of performance measures. However, the results from the interviews are considered rigid and an assumption is, regardless of who would have conducted this study the result would be a focus on customer satisfaction, time, and transparency.

Another limitation is that the study was carried through by one single researcher. If another researcher would have been involved, more discussions would have carried through which in many cases generates a better result. It would also make the time frame more manageable since two writers would generate more working hours.

6.6 Further Recommendations

As a final conclusion for this master thesis, a set of further recommendations has been formulated and are presented within this section. These recommendations relate to further development of the PMS which intend to support the department when implementing the PMS. Further, a few recommendations are connected to other improvement areas identified during the case study analysis, which were not highlighted due to time constraints.

6.6.1 Further Evaluation

During the project a brief evaluation was conducted for the suggested measurements. This evaluation was carried through in purpose of making sure suggested metrics contribute to Converting Sale's and Tetra Pak's objectives. From the brief evaluation the metrics showed a positive impact towards reaching these goals. However, as the PMS is introduced a recommendation is to carry through with a more throughout evaluation. This evaluation should focus on making sure the measures are manageable; establishing rigid time intervals; and evaluate impact of the measurements. A first step in this evaluation is to collect historical data, a step which was started during this project since a brief set of historical data was collected. However, to establish a rigid evaluation based on historical data a more throughout set of orders should be collected and measured using the suggested PMS.

The measures should also be evaluated over a period of time where the focus should be to establish improved *time periods* compared to those suggested in *Chapter 5.4.2 Time Intervals.* This since the suggested time periods are based on estimations and information collected from other departments

at Tetra Pak. By evaluating the time interval based on real values they are assumed to improve considerably. The impact of the metrics and the PMS should also be monitored to make sure the correct outcome is achieved, e.g., improved performance and increased visuality.

The continuous evaluation suggested can be viewed in part 2 of the theoretical research model presented in chapter *3.5 Theoretical Research Model* and depicted in *figure 3.3* at p.68*,* where an evaluation of metrics and the PMS is suggested. As a result of the evaluation, it is suggested to determine weighted scores for each metric guiding users of the PMS regarding which measures to prioritize. This is a recommended step as the evaluation prolongs.

6.6.2 Implement Definition Sheets and Dashboard

Once the evaluation is completed and weighted score determined, part 3 of the model should be initiated. This includes development of reporting and visualization tools such as definition sheets and a scoreboard. To ensure these tools are effective they should be constantly updated and improved as new information is generated. The definition sheets should be created for each of the included performance measures where a clear description of value, score, and responsible worker is presented. For further description see chapter *3.5 Theoretical Research Model.*

6.6.3 Customer Satisfaction Rate

During this master thesis the focus was to implement quantitative measures since this was requested by the investigated department. However, an additional measure which, based on findings from the analysis, would bring value to the department is *customer satisfaction rate.* This because customer satisfaction has been consistently highlighted as a priority for the department, where the identified success factors were all related to effectiveness and thereby customer satisfaction. Additionally, the suggested metric *on-time delivery ratio* aims to measure the rate for which the department and its stakeholders can deliver effectively according to project managers and factories wants and needs. However, this metric does not measure the actual satisfaction rate that the department contribute to, but instead focus on activities which are perceived to generate such satisfaction. To ensure that customer satisfaction is meet it would therefore be valuable to ad the additional metric *customer satisfaction rate* to capture the actual value experienced by Converting sales customers. By measuring the satisfaction rate the department can also evaluate how well the introduced metrics live up to desired outcome.

Beyond evaluating the performance of suggested metrics, *customer satisfaction rate* could also help the department capture additional success factors for increasing customer satisfaction even further. Since the investigation within this case study did not include any interviews with factories the risk is all success factors have not been captured. Thereby, adding a survey designed to capture the *customer satisfaction rate* the analysis of success factors could be further improved. How to design such a survey should be further investigated.

6.6.4 Process Mapping

Another area where possible improvements were identified were the documentation of how Converting Sales operates. To capture the complete process and identify critical breaking points, a clear process mapping specifically designed for the department could be of value. The process map should focus on all activities conducted by the department throughout the order handling process. By developing this, a better overview of the process can be established, and administrative tasks can be better aligned and improved if necessary. Today the process maps available for the department was perceived rather general or brief and difficult to apply within this study. Therefore, a recommendation is to construct a rigid and specific process map for each process conducted by the department.

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Appendix 1: Literature Review

Below table presents studies included in the literature review conducted in this master thesis. A mark "x" is put into those boxes where the subject described in the top row is mentioned in the article mentioned in the left column.

Source \ Subject	Performance measurement system	Performance measures	Organizational Fit	Data collection	OTD Process
Amer *et al.* (2008)					X
Atkinson (1998)			X		
Atkinson *et al.* (1997)	X	X	X	X	
Beamon (1999)	X	X			
Bititci *et al.* (1997)	X	X	X		
Bourne *et al.* (2005)	X	X	X	X	
Brabazon & McCarthy (2017)					X
Caplice & Sheffi (2014)	X	X			
Chae (2009)	X	X			
Ecclers (1991)	X				
Folan & Browne (2005)	X				
Forslund, Jonsson, & Matsson (2008)					X
Franco-Santos *et al.* (2007)	X	X	X		
Globerson & Riggs (1998)	X	X		X	
Hayes & Wheelwright (1997)			X		
Kaplan & Norton (1993)	X			X	
Kaplan & Norton (2001)				X	
Lebas (1995)	X		X	X	
Melnyk *et al.* (2013)	X	X	X		
Myerson (2013)		X			
Neely *et al.* (1995)	X	X			
Neely *et al.* (2001)			X	X	
Supply Chain Council (2012)	X	X			
Wisner & Fawcett (1991)	X	X			

Appendix 2: Case Study Protocol

Overview

Purpose of the study

The purpose of the empirical study is to define *high performance* as well as identify *success factors* for Converting Sales. From this, a set of metrics can be generated and constitute the basis of the PMS.

Research questions

Below stated research question has been formulated for the case study:

- **RQ1**: How can a PMS be designed to measure and evaluate the OTD process managed by Converting Sales?
- **RQ2:** What objectives should the PMS contribute to, and what are the gaps between these and the organizational strategy?
- **RQ3:** What are the success factors for the OTD process managed by Converting Sales?
- **RQ4:** What are the priority areas for Converting Sales to achieve high performance in the OTD process?

Theoretical Framework

The theoretical framework used in this case study has been developed through literature review conducted in chapter *3 Theoretical Frame of Reference*. From theory a development process has been formulated and is presented in *chapter 3.5 Theoretical Research Model*. The model is illustrated in *figure 3.3* which is depicted below, for a full description see *chapter 3.5 Theoretical Research Model.* Due to time constraints *Part 1: Develop Performance Measures* of the model has been of highest priority. However, *Part 2: Evaluate Metrics and PMS* has also been initiated, but a full evaluation of metrics and PMS has not been conducted. *Part 3: Reporting & Visualization* has not been started during this project but should be considered as the development of the PMS prolongs.

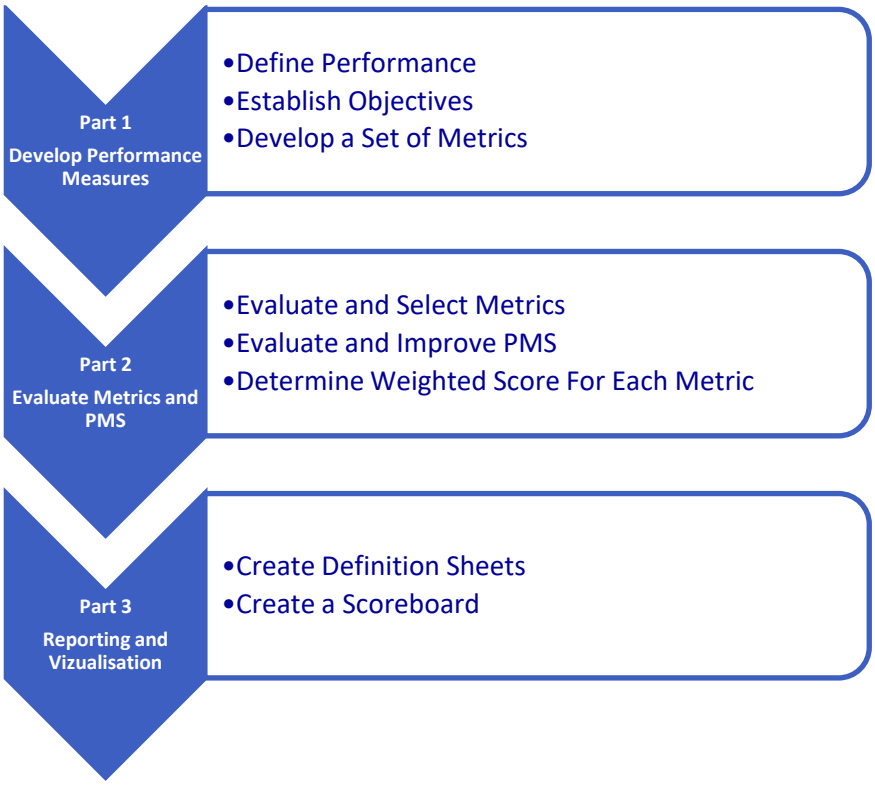

Figure 3.3 PMS development process for this case study.

Role of Case Study Protocol

The role of this protocol is to guide the data collection procedure carried through within this case study with a particular focus on the interviews. The protocol holds information about the two different phases of the data collection included in the study and aims to describe how the collected data should be analyzed.

Data Collection Procedure

Data Collection Plan

The data collection has been generated from several sources with purpose to create triangulation for increased validity of the research (Yin 2014). The main source for data collection has been video interviews. These are supplemented with data collected through documents received at Tetra Pak's intranet; historical data available in the Tetra Pak's business system SAP; and information gained through various meeting with team members and manager. The data collection is divided into two phases which are further described below.

Phase 1: Define performance and success factors

Within the first phase the focus was to establish what is performance based on values within the department, stakeholders' interest, as well as the primary objective formulated for Tetra Pak. The data collection procedure was primarily be based on interviews with team members, project leaders, and employees who has insight in stakeholders' interests. The data collected from the interviews has also been supplemented with documents from Tetra Pak's intranet and information collected from meetings. A phase 1 interview schedule is presented in *table 7.1* below. The outcome from phase 1 was a list of suggested metrics as well as objectives formulated for the department.

Table 7.1. Interview schedule.

Date of interview	Name	Position	Representing stakeholder group
May 31, 2021	Malena Samuelsson	Converting Sales Expert	Employees
May 31, 2021	Malin Nilsson	Converting Sales Expert	Employees
June 1, 2021	Petra Hoff	Converting Sales Expert	Employees
June 1, 2021	Johannes Håkansson	Implementation Project Manager	Project Managers
June 2, 2021	Markus Meijer	Portfolio and Planning Manager	Department Manager
June 2, 2021	Morgan Bengtsson	Implementation Project Manager	Project Managers
June 3, 2021	Carina Lembke	Converting Sales Expert	Employees
June 3, 2021	Junaid Farrukh	Senior Supplier Manager	Suppliers
June 3, 2021	Malin Gejde	Shipping Manager	Transporters
June 7, 2021	Lars Olsson	Implementation Project Manager	Project Managers
June 10, 2021	Johan Ohlstrom	Process Manager Lamination	Customers
June 11, 2021	Selma Kuric	Implementation Project Manager	Project Managers

Phase 2: Validate chosen metrics

As the metrics had been selected the next step was to evaluate and validate. This was done through a workshop where all team members participated. During the workshop the suggested objectives, metrics, and possible new routines were discussed. Beyond validate and ensure the metrics was accepted by the team members, the practical challenges of how to capture data for the metrics were discussed. The outcome from the workshop was improved objectives, set metrics, and a deeper understanding of how the data can be captured.

Data collection questions

The interview questions for phase 1 of the data collection procedure are presented in *Appendix 3: Interview Guide.* The interview questions are standardized for all interviewees; however, some adaption was applied depending on who the respondent was and which stakeholder group they represented. No specific interview guide was used for the second phase, instead a Power Point presentation was used as basis for the workshop.

Appendix 3: Interview Guide

Introduction (10 min)

- Describe purpose of the master thesis
- A brief introduction of the theoretical findings
- Explain purpose of the interview and how the data will be used

Basic information

- Name
- Department
- Title and years at position

Module 1: What is performance? (30min)

1. Imagine an implementation project accomplished in the best way possible, what would you say is the 3 main reason you consider this project a success?
2. Imaging an implementation project not reaching up to the client's expectations, what would you say is the 3 main reason causing a client not to be satisfied?
3. According to you, within OTD what are the 3 main outcomes which must be prioritized to make the client of the project satisfied?
4. According to you, within OTD what are the 3 main outcomes which must be prioritized by Converting Sales to make their client satisfied?
5. Rate 1-7 (1=not at all; 7=completely) how important do you believe the following prioritization areas are for the success of an implementation project (OTD):
    a. Effectiveness/Customer satisfaction
        i. Time
            1. On-time delivery (not to late vs. not to early?)
            2. OTD lead time
            3. Other
        ii. Quality (quality of the service)
            1. Flexibility/Responsiveness
            2. Reliability
            3. Confirmed order lead time
            4. Information
            5. Other
        iii. Cost
            1. Within budget
            2. Warehousing
            3. Transportation
            4. Cost due to late/wrong delivery
            5. Other
    b. Efficiency
        i. Time
            1. Supplier confirmed order lead time
            2. Supplier on-time delivery
            3. Supplier lead time
            4. Distributer on-time delivery
            5. Distributer lead time
            6. Other
        ii. Quality (quality of the process)
            1. Supplier reliability

2. Perfect order rate (ability to delivery incident free)
3. Document accuracy (correct shipping doc. vs all shipping doc.)
4. Information transparency
5. Other

iii. Cost

1. Revenue of goods sold
2. Low cost
3. Other

Module 2: What do we want to measure? (8min)

1. What do you believe would be valuable to measure related to performance of the order-to delivery process within implementation projects?

Module 3: What are the challenges? (7min)

1. According to you, which are the 3 main challenges related to working with implementation projects?
2. According to you, which are the 3 main challenges for Converting Sales when working with implementation projects?
3. What do you think would be the biggest challenges whit introducing a PMS for Converting Sales?

Module 4: Other questions if time allows

1. Which stakeholders are important in the implementation projects?
2. Stakeholder X:
    a. What specific demand do you experience from this stakeholder within projects/orders?
    b. Are there any specific challenges related to working with this stakeholder?
    c. How does this stakeholder contribute to achieve performance within projects?

Conclusion (5min)

- Summary of the interview and possibility for the interviewee to add in.
- Thank the interviewee for their time and ask permission for further contact.

Appendix 4: Examples of Metrics Within the Quality-Dimension

Examples of metrics within the quality dimensions. Collected through literature review and interviews.

Measurement	Description
Team satisfaction level (team satisfaction index)	Measure the satisfaction of the working team
Workload (number of overtime hours)	Measure number of overtime hours to determine the workload for the team
Incorrect products delivered (number of incorrect deliveries shipped)	Measure how many shipments are sent with incorrect equipment.
Warranty claims (number of warranty claims)	Measure number of warranty-claims on delivered equipment.
Perfect order fulfilment (total perfect orders / total number orders)	Percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage, e.g., all equipment delivered on-time with correct documentation.
On time in full (OTIF) (total numbers of orders delivered in full / total number of orders delivered)	Measure the percentage of orders that are received by customers in the quantities committed, e.g., all equipment is delivered in agreed quantities.
Documentation accuracy (total number of orders delivered with accurate documentation / total number of orders delivered)	Percentage of orders with on-time and accurate documentation supporting the order, including packing slips, bills of lading, invoicing, etc.
Shipping documentation accuracy (total number of orders delivered with accurate shipping documentation / total number of orders delivered)	Percentage of orders with on-time and accurate shipping documentation supporting the order, including packaging slips, bill of landing, and government or customer documentation.
Perfect condition (number of orders delivered in perfect condition / number of orders delivered)	Percentage of orders delivered in undamaged state that meet specifications, have correct configurations, are faultlessly installed, and accepted by customer, as well as not returned for repair or replacement within warranty period.
Supplier fill rate [total sum of items delivered on time] / [total delivered items]	Measure suppliers' reliability to deliver materials. Must be measured item-by-item.
Delivery location accuracy (total number of orders delivered to the correct location / total number of orders)	Percentage of orders which is delivered to the correct location and customer entity
Delivery flexibility (total number of changed delivery dates upon request / total number of requests for changed delivery dates)	The ability to change planned delivery dates

Transaction w/o errors (Number of transaction w/o errors / number of transactions)	Measure rate of transactions which can be carried through without errors.
Supplier rerouting flexibility (possible to reroute / rerouting request)	Measure in what extent it is possible to reroute an order at the supplier.
Complexity of procedures (size of batches of information)	Measure the complexity of procedures by for example measuring number of rows in the PCC, number of documents to report, number email, etc.

Appendix 5: Examples of Metrics Within the Time-Dimension

Examples of metrics within the time dimensions. Collected through literature review and interviews.

Measurement	Description
On-time delivery ratio (number of orders delivered on agreed date / number of orders delivered)	Measure the ratio of shipments sent on-time to customer according to agreed delivery date
Average lateness of orders (total lateness from all orders delivered / total number of orders delivered)	Measure the average time an order is late based on agreed delivery date
Average earliness of order (total earliness of all delivered orders / total number of delivered orders)	Measure the average earliness of orders based on requested delivery date
Lead time (lead time from initiated order until complete delivery)	Measure the complete lead time for the OTD process.
Delivery lead time (lead time from pick-up until complete delivery)	Measure the lead time from pick-up until complete shipment.
Lead time variability (normal distribution lead time)	Measure the variability through normal distribution of the lead time. Could be measured for multiple different lead times.
Order fulfilment cycle time (sum of actual cycle time for all orders delivered / total number of orders delivered)	The average actual cycle time to fulfil customer orders. This cycle time starts from the order receipt and ends with customer acceptance of the order.
Source cycle time (sum of actual source cycle time for all orders delivered / total number of orders delivered)	The average time associated with source processes, e.g., select supplier, schedule product deliveries cycle time, receive product cycle time, verify product cycle time, etc.
Receive product from source cycle time (sum of actual receive product from source cycle time for all orders delivered / total number of orders delivered)	The average time associated with receiving a transfer of product to deliver from source.
Deliver cycle time (sum of actual delivery cycle time for all orders delivered / total number of orders delivered)	The average time associated with delivery processes.
Ship product cycle time (sum of actual shipment cycle time for all orders delivered / total number of orders delivered)	Average shipment cycle time

Response time (time from request until reply)	Measure how long it takes to get a response on a request sent by stakeholders.

Appendix 6: Examples of Metrics Within the Cost-Dimension

Examples of metrics within the cost dimensions. Collected through literature review and interviews.

Measurement	Description
Internal failure cost (cost from discrepancies found prior to delivery)	Measure cost caused by discrepancies found before delivery of products to the customers. Could include all cost which arise due to not able to deliver according to plan, e.g., additional freight cost, warehousing costs, and prolonged shut-down costs.
External failure cost (cost from discrepancies found after delivery)	Measure cost caused by discrepancies found after delivery of products to customers. Could include all cost due to wrong deliveries, equipment not reaching up to requirements, and equipment not working.
Budget versus actual (budget cost vs. actual cost)	Measure the actual cost of the process related to the targeted cost.