



CHALMERS
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The Road to Project Management Excellence

Understanding the reasons and impacts of delays within project-organizations

Master's thesis in Supply Chain Management

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SUMMARY

This thesis addresses a significant problem concerning project management, specifically focusing on the impact of delays that occurs within an organization. The problem at hand revolves around the complex relationship between project management and various project functions, specifically examining how effective collaboration and communication between these functions ultimately impact the outcome of projects.

To achieve the objective, a qualitative data collection approach was employed, utilizing a case study design with semi-structured interviews, observations, and a thorough literature review. This methodological choice aligns with the work of Szajnfarber and Gralla (2017), who highlight the effectiveness of qualitative methods in capturing the intricacies of human interactions.

The study has revealed the paramount significance of communication and collaboration between individuals and project functions. Despite often being overlooked, these factors have a significant impact on the organization's profitability and the projects' ability to deliver high-performing products to customers. Failure to prioritize effective communication and collaboration within organizations poses a substantial risk of not meeting commitments, thereby elevating the likelihood of diminished profitability.

Based on the analysis of the data collected within the company, several significant conclusions can be drawn. Firstly, project management is an aspect that evolves over an extended period of the company's existence, and many established practices demonstrate a high standard of performance. However, potential areas for improvement have been identified, particularly in terms of internal collaboration and communication, which, if enhanced and further developed, can contribute to greater company and financial success.

The thesis has reached a conclusion that the company is lacking data and knowledge in estimating the impact of internal delays. Furthermore, the findings of this study highlight the importance of evaluating the outcomes of the restructuring initiatives that have been implemented. Assessing whether the intended outcomes of the restructuring align with the actual results is crucial to determine the effectiveness and impact of these organizational changes. Lastly, as the company undergoes ongoing evolution and growth, a compelling case can be made for implementing a robust onboarding process for new project managers. Such an initiative holds the potential to boost efficiency and performance by seamlessly integrating the fresh abilities of new team members with the wealth of knowledge already present within the organization.

Keywords: Project Management, Project Delays, Internal Collaboration, Cost Estimation, Communication, Information Flows, Military and Defence Industry, Organizational Structure

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1 Introduction

The following chapter explains the issue under investigation in-depth and provides a comprehensive background on the problem at hand, the purpose of the research, and the limitations identified at the start of the project. Furthermore, it clearly defines the specific issue that the research aims to address, giving a clear understanding of the scope and focus of the work. It should be noted that the company involved in this report wants to stay anonymous which means that it will be referred to as "the company" in the report.

1.1 Background

Projects are an important part of organizations as they are fundamental to developing new technologies, exploring new markets, and gaining new market shares (Clarke, 1999). Maylor & Harvey (2010) define projects as unique, temporary, and focused. The exact project has not been performed before and also has a beginning and an end. A project is focused which refers to the task of the project to deliver a particular product or service. However, the authors express that not all projects need to start with a ready-made idea or exactly what to do. In order for companies to be successful in this matter, they adopt project management tools. This involves control methods, reporting, scheduling, risk management, etc (Clarke, 1999). Prior to project initiations, companies usually conduct a project cost estimation to forecast the duration of the project and the following costs. This is done to estimate the required time needed for the project and its sub-tasks. The fundamental of project cost estimation is to make sure that the projects are profitable upon completion. Even though project management (PM) has the ability to help companies with their projects, it does not guarantee a successful outcome of the project. Projects do fail and the reasons are various. The reason why companies fail is not being able to meet deadlines or keep up with the budget. Depending on the type of contract, this could mean penalties or other types of consequences (Lawrence & Scanlan, 2007). The underlying reasons for this are many, for example, delays, poor initial planning, lack of clear objectives, lack of "buy-in" from stakeholders, etc. (Lawrence & Scanlan, 2007).

A project delay refers to a cost overrun in comparison with the project time schedule and could happen at any phase of the project. The most common example is that delays occur in the project execution phase (Ansah & Sorooshian, 2018). Jayaraman (2021) refers to the different stages of the project as pre-planning, planning and design, execution and monitoring, closure, and handover. These delays occur due to both internal and external issues. Delays that occur in projects result in cost overruns and usually organizations apply various risk management tools in order to mitigate or avoid these (Cervone, 2006). This is done by identifying risk factors and categories which then are assessed and prioritized depending on their impact. Higher impact requires more control and monitoring while lower impacts could be neglected. The existing literature has extensively explored various risk categories and factors, yet there remains a notable gap in understanding the concrete impact of these risks. Specifically, the research lacks comprehensive information on the ramifications of cost estimation delays caused by internal factors. Understanding the significance of these internal delays is imperative for organizations to effectively implement appropriate changes and risk management measures. Thus, bridging this knowledge gap is crucial for organizations to accurately assess and mitigate the risks associated with cost estimation delays caused by internal factors.

The external factors have a huge impact on projects, such as supplier associations, material and component shortages, and logistics and transport (Agyekum-Mensah & Knight, 2017). Simultaneously, the researchers realized that information regarding the impact of internal delays within companies is relatively limited, which should be explicitly considered as it has a major impact on the success of companies working on a project basis and project organizations. While external factors such as changes in regulations, natural disasters, or economic downturns can pose challenges, the majority of delays in projects can be attributed to internal factors. These include poor planning, inadequate resource allocation, lack of clear communication between team members and

stakeholders, and inefficient decision-making processes (Ansah & Sorooshian, 2018). To mitigate these internal factors, it is essential to establish a well-defined project management framework that outlines the roles and responsibilities of each team member, sets clear timelines and milestones, identifies potential risks, and outlines mitigation strategies. Effective communication among team members and stakeholders is also key to ensuring that everyone is on the same page and aware of any changes or updates that may impact the project timeline.

1.2 Aim

The aim of this thesis is to investigate and evaluate how internal delays within projects affect performance. This is done by analyzing an organization's previous projects and identifying situations where an internal delay has occurred. Then, the aim is to build a greater understanding of what type of delay it is, where and why it occurred, and the following impact on the performance. In order to gain a better understanding of the internal processes, the aim is also to build a wider knowledge of positives and negatives regarding the information flow and collaboration. Lastly, the aim is to analyze the current way of analyzing internal delays and what measures that are required in order to avoid these in the future.

The primary objective of this research is to gain a deeper understanding of the impact of internal delays on project execution and cost estimation within the company. By examining the costs associated with delays, this study aims to provide valuable insights into the financial implications of these issues and to offer recommendations on how the company can effectively address and mitigate them. Ultimately, the findings of this research will help the company to optimize its PM practices, reduce costs, and improve overall efficiency and effectiveness.

1.3 Company description

The organization under investigation is a leading player in the global military and defense industry, with a strong presence in multiple countries all over the globe. With a focus on new product development, the company offers a range of innovative products, services, and solutions that meet the complex demands of the industry. The company operates in a dynamic market, where the product offerings are advanced and subject to rapidly changing customer demands. The company has established a reputation for being highly successful and innovative, with a culture that values trust, open-mindedness, and a drive for excellence. This is reflected in the high employee retention rate, where many employees have remained with the company for an extended period of time. By leveraging the expertise of its dedicated workforce and its innovative product offerings, the company has positioned itself as a market leader in the military and defense industry.

1.4 Delimitations

The company is divided into four business areas, each with a specific focus and for the purpose of this thesis, one of these business areas will be targeted, which is further subdivided into four business units. Furthermore, the thesis will only focus on four different functions within the company which are production, purchasing, planning, and engineering. It should also be noted that this thesis will not be covering technical aspects within their projects but rather focus on a higher process level. Furthermore, it should be noted that the thesis will only focus on internal reasons for delays and their respective impact. Meaning that delays caused by external factors such as material shortages from sub-contractors and transport delays will not be considered. Additionally, it is acknowledged that additional limitations may be identified as the project progresses, and these should be considered when interpreting the result.

1.5 Specification of the issue under investigation & research questions

The focus of this study is to investigate the impact of internal delays that occur between various departments of the company, specifically engineering, purchasing, planners, and production. The objective of this research is to understand where internal delays occur, and their implications in the project process. Also, to understand how costly these delays are in a performance aspect. To achieve this objective, the research is divided into four key research questions (RQs). These questions are designed to provide a comprehensive understanding of the problem, evaluate the issues, and recommend solutions to reduce internal lead times between company departments.

The first RQ is focused on conducting a current state analysis to understand the company's strengths and weaknesses regarding information flow and collaboration. The first research question further aims to enhance the knowledge regarding different functions, ultimately building an understanding of problems and challenges which will be the foundation for collaborative improvements. The second RQ will cover an in-depth analysis to identify where internal delays have occurred in previous projects and their implications. The third RQ will estimate the impact of internal delays on the initial cost estimation by translating delays into project costs. Lastly, the fourth RQ aims to provide the company with a recommendation on ways forward to avoid internal delays in the future. The answer to RQ4 will be highly dependent on the findings in the first three research questions.

In summary, the four RQs of this study are as follows, and answering the research questions will help provide valuable insights that can help the company optimize its PM practices, reduce costs, and improve overall efficiency and effectiveness:

RQ1: What does the current state look like in terms of structure and information flows within company projects?

RQ2: Why do internal delays happen and where in the organization do they occur?

RQ3: How much do internal delays affect the performance and cost estimation of the project?

RQ4: What actions should the company employ to prevent further internal delays?

2 Methodology

This chapter provides an overview of the methodology adopted in this study, which seeks to comprehensively examine PM practices within a multinational corporation. The researchers will present a detailed description of the research design, including the approach and methods employed to gather and analyze data. Additionally, ethical considerations related to the research will be thoroughly addressed and discussed.

2.1 Research design

According to Pickard (2017), research methods denote a structured and rigorous methodology employed by a researcher to examine a research problem. The term research method encompasses the various techniques, tools, procedures, and strategies employed by a researcher to gather and analyze data to answer research questions. Essentially, a research method is a bounded system that delineates the parameters, constraints, and techniques of an empirical inquiry. It furnishes a framework and structure for the research process, guiding the researcher from the initial planning stages to the final analysis and interpretation of data. The research method is a crucial aspect of the research process. It provides the researcher with a systematic and organized approach to the study of phenomena, which allows for accurate data collection and interpretation. Additionally, Pickard (2017) describes how a well-designed research method can improve the validity and reliability of research findings, ensuring that the research outcomes are credible and defensible. Therefore, a sound research method is essential for scientific inquiry and academic research.

The overall approach to the investigation refers to the general philosophy, assumptions, and strategies used to conduct research. Szajnfarber & Gralla (2017) mention that the research approach can be qualitative, quantitative, or mixed methods, depending on the nature of the research question and the type of data required. Qualitative research aims to understand the meaning and subjective experiences of participants, while quantitative research focuses on numerical data and statistical analysis. Mixed methods research combines both qualitative and quantitative approaches to provide a comprehensive understanding of the research problem.

To achieve the objective mentioned above, a qualitative data collection approach was employed, utilizing a case study design with semi-structured interviews, observations, and a literature review. According to Merriam (2002), the design of a qualitative study focuses on interpretation, which includes designing a problem for this type of study, selecting a sample, collecting and analyzing the data, and writing up the results. Moreover, qualitative methodology refers to a type of research that focuses on producing descriptive data and developing concepts, insights, and understanding from patterns in the data collected. Unlike quantitative research, which seeks to test preconceived models, hypotheses, or theories, qualitative research aims to explore and understand complex phenomena in depth. As Taylor (2015) notes, qualitative methodology is particularly useful when studying complex social issues that cannot be easily quantified or when the goal is to gain a rich understanding of human experiences, perceptions, and behaviors. By using open-ended questions, interviews, observations, and other techniques, qualitative research allows researchers to explore the nuances and complexities of a topic, generating rich and meaningful data that can inform theory and practice. Overall, the combination of interviews, observations, and literature review provides a rich and comprehensive dataset, enabling deep exploration of the research questions and a thorough understanding of the PM practices in the company.

Since the research aims to understand the meaning and subjective experience of participants, a qualitative research method was chosen. Szajnfarber & Gralla (2017) argue that qualitative methods can be an effective way to address the complexities of human interactions and provide valuable insights into the contextual and human factors that influence system design, development, and operation. Qualitative methods are not intended to replace traditional research approaches, but rather to complement them, forming a "value chain" of research that can lead to a more comprehensive understanding of complex systems.

Moreover, Szajnfarber & Gralla (2017) further state that the use of qualitative methods allows for a more nuanced understanding of the experiences and perspectives of individuals involved in the system, which can inform the development of more effective and user-friendly systems. By providing a direct and in-depth look at the human and contextual drivers of system design, development, and operation, qualitative methods can help researchers to identify gaps and challenges in current systems and develop innovative solutions.

2.2 Case study research

Woodside (2010), defines case study research (CSR) as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident. Furthermore, Pickard (2017) elaborates on the definition of a case study as a research method that involves an in-depth investigation and analysis of a specific phenomenon or instance, often within a real-world context.

Case studies are typically used to gain a deep understanding of complex issues or phenomena that cannot be adequately explained by quantitative data alone. They often involve collecting and analyzing multiple sources of data, including interviews, observations, documents, and artifacts. Pickard (2017) notes that case studies can be used in a variety of research contexts, including exploratory research, explanatory research, and descriptive research. They can also be used in conjunction with other research methods, such as surveys or experiments, to provide a more comprehensive understanding of a phenomenon.

In addition, Simons (2009) provides a comprehensive analysis of the strengths and limitations of using case study research to investigate a particular phenomenon. Highlighting these key factors, helps the researchers to better understand how case study research can be used to gain insights into complex issues and phenomena, while also acknowledging the potential challenges and drawbacks of this research approach.

- Qualitative case studies provide a detailed and contextualized analysis of programs and policies, allowing researchers to understand their complexity and impact in specific socio-political contexts.
- Qualitative case studies offer the opportunity to document diverse perspectives, examine conflicting viewpoints, highlight the role of influential actors, and illustrate how their interactions shape the implementation of a program or policy.
- Qualitative case studies are useful for exploring and understanding the process and dynamics of change.
- Qualitative case studies are flexible, neither time-dependent nor constrained by the method.
- Qualitative case studies have the potential to engage participants in the research process and provides an opportunity for researchers to take a self-reflexive approach to understand the case.

Simons (2009) highlights several potential limitations of case study research, including the risk of excessive personal involvement, which should be carefully monitored throughout the study to maintain objectivity. Additionally, it's important to note that in many cases, case study research is not aimed at formal generalization for policy-making purposes. Instead, it aims to provide particularization, which involves presenting a rich and detailed account of a specific setting or situation to inform practice. This approach can be especially useful in understanding complex phenomena and providing insights that may not be captured through other research methods. By acknowledging these limitations and benefits, researchers can effectively design and execute case study research that produces valuable and actionable results.

2.3 Data collection in the case study research

The upcoming section will describe the three methods employed in the case study for data collection. Firstly, a comprehensive literature review will be conducted, followed by semi-structured

interviews and observations. The process of data collection holds paramount significance in addressing the research questions effectively.

2.3.1 Literature study

To answer the research questions in this project, a comprehensive literature study was conducted to identify and gain an understanding of the critical aspects of internal delays in project-based organizations, and how these delays impacted project outcomes and results, as well as the accuracy of cost estimation at the beginning of the project. The literature study provided valuable insights into the factors that contributed to internal delays in project-based organizations, such as poor communication, lacking internal collaboration, and ineffective PM. In addition, the study highlighted the consequences of internal delays, including increased costs and missed deadlines. Overall, the literature study played a crucial role in guiding the project's direction and helping to develop strategies and measures to prevent further internal delays, mitigating the effects of internal delays on project outcomes and cost estimation.

Alderman (2014) emphasizes the importance of the literature review as an integral part of any research project. It serves as a means of surveying previous research conducted on a particular topic. While there are many reasons for conducting a literature review, establishing a baseline of existing knowledge on a topic before exploring it further is one of the primary reasons. Thomé et al. (2016) support this idea by defining the purpose of a literature review as a summary and critical assessment of existing literature related to a specific subject. The review usually entails searching for any previously published or presented materials that may be relevant to a new study.

In addition, Dodgson (2021) highlights the crucial role of literature reviews in advancing our understanding of various phenomena. According to Dodgson (2021), a well-executed literature review can make a significant contribution by providing new insights and adding to the existing body of knowledge. Moreover, a literature review can provide a critical analysis of the state of the science concerning a specific phenomenon of interest. By carefully synthesizing and analyzing existing research, a literature review can identify gaps in the current knowledge base and propose avenues for future research. In this way, literature reviews can help to drive scientific progress and inform evidence-based practice.

In summary, literature reviews are essential tools for advancing our understanding of various phenomena. As Dodgson (2021) notes, a well-executed literature review can provide new insights, add to the existing body of knowledge, and help to identify future research directions. Thus, researchers and practitioners alike should strive to conduct thorough and comprehensive literature reviews as a part of their research endeavors.

2.3.2 Interviews

Semi-structured interviews are, according to Galletta (2013), often used in the early stages of a research project to gather qualitative data from participants with diverse backgrounds and experiences. This approach allows for the collection of rich, detailed information that can provide valuable insights into the research topic. By using a semi-structured interview approach, questions and prompts can be tailored to each participant's unique experiences and perspectives, facilitating a more in-depth exploration of the research question. Galletta (2013) explains how the approach can be particularly useful in exploring complex or sensitive topics, as it allows participants to express themselves in their own words and at their own pace. Therefore, semi-structured interviews were used in this project to gain a deeper understanding of the root causes of internal delays in project-based organizations, building on the findings of the literature study and informing the development of effective strategies and measures to mitigate their impact.

To ensure the quality of the interviews and to prepare the employees for questions likely to be asked, all participants were sent a questionnaire before the interviews. The interviews were almost

2. Methodology

all conducted in person at the company's premises. To ensure confidentiality and data security, all interviews were recorded on a company laptop that is secured and with its information not leaving the company. The company that was the focus of this project will be anonymous and therefore all participants who took part in the semi-structured interviews will not be named to protect their confidentiality. By maintaining confidentiality, participants can feel more comfortable sharing their experiences and perspectives, which can ultimately lead to more valuable insights into the research topic. These transcripts were stored securely on a password-protected computer accessible only to the research team.

The interviews were conducted in different rounds. Each round of interviews had a specific purpose and therefore focused on different topics. For each round of interviews, a questionnaire was made to gain valuable knowledge in that specific topic area. In total, 25 interviews were conducted with different employees at the company within the four different functions procurement, engineering, planning, and production. The 25 interviews were split up into three rounds, the first focused on discussing and defining the scope, the second on gaining insights regarding RQ1/RQ2 and the third round was to understand the impacts related to RQ3. In Tables 1, 2, and 3 each round is presented along with the role of each interviewed person, the duration, the location, and the topic.

Table 1: Interview round 1

Interview	Role	Duration	On-site/remote	Topic
1	DPL	60	On-site	Scope
2	KPL	60	On-site	Scope
3	KPL	60	On-site	Scope
4	DPL	20	On-site	Scope
5	Procurement	60	On-site	Scope
6	DPL	30	On-site	Scope

Table 2: Interview round 2

Interview	Role	Duration	On-site/remote	Topic
7	DPL	60	On-site	RQ1/RQ2
8	DSA	60	On-site	RQ1/RQ2
9	DPL	60	On-site	RQ1/RQ2
10	DPL	60	On-site	RQ1/RQ2
11	Planning	60	On-site	RQ1/RQ2
12	DPL	60	On-site	RQ1/RQ2
13	DPL	60	On-site	RQ1/RQ2
14	DSA	60	On-site	RQ1/RQ2
15	DPL	30	On-site	RQ1/RQ2
16	DPL	60	On-site	RQ1/RQ2
17	Procurement	60	On-site	RQ1/RQ2
18	DPL	60	On-site	RQ1/RQ2
19	DPL	60	On-site	RQ1/RQ2
20	Procurement	60	On-site	RQ1/RQ2

Table 3: Interview round 3

Interview	Role	Duration	On-site/remote	Topic
21	DPL	60	Remote	RQ3
22	DPL	60	On-site	RQ3
23	DPL	50	On-site	RQ3
24	DPL	60	On-site	RQ3
25	DPL	60	On-site	RQ3

In addition to the interviews conducted and presented above, 13 more employees were contacted and asked to be part of the first interview round but they either declined or did not answer. This means that the success rate of getting people to be part of the interview process was slightly over

50 %. The negative factor of this is that most of the employees that declined worked in the planning and procurement function which explains their under-representation. As the response rate was low, it is possible that the results may not be representative of the entire organization. A low response rate may also result in biased perceptions of the topic being investigated, as those who did not participate may hold different opinions or perspectives. It is important to note that the responsibility for the low response rate may not lie solely with the respondents. The company may have failed to adequately prepare employees for the survey or communicate its importance. This lack of preparation could lead to a risk of bias in the responses that were collected.

Furthermore, the DPL role is a person with the responsibility of sub-task related to the product. For example, software or hardware, and is in charge of a group of people focusing on those aspects. A KPL is a person that is in charge of the whole project and has the main contact with the customer. DSA is the manager of a specific sub-system of the product that shall be delivered in the project.

2.3.3 Observations

Observations, as a method of data collection, can provide valuable insights into the daily activities and routines of the company being studied. As a complement to interviews and literature study, observations can help to provide a more comprehensive understanding of the research topic. This section will outline the role of observations in the data collection process for this project, and discuss how this method was used to generate new insights into the internal delays in project-based organizations. The observations were conducted as part of a wider data collection process that also included semi-structured interviews and a literature study. The use of multiple data collection methods allowed for triangulation of the data, increasing the validity and reliability of the findings.

Additionally, Chu & Ke (2017) elaborate on the fact that observation is a widely used research method that plays a critical role in various meta-methods, including experiments and field studies. In classic experiments, it is a necessary technique for collecting behavioral data before and after administering treatment. In non-classic experiments, some form of observation is also essential to obtain data for comparing the before-after and old-new differences. Furthermore, observation is often one of several data collection techniques employed in ethnography and field study.

In this research project, observations will be used as a complementary method to gather information about social interactions and group dynamics in the company being studied. While interviews and literature studies can provide valuable insights, observations can provide a more detailed and nuanced understanding of how people behave and interact with each other in the workplace. The researcher will conduct observations in the company's natural setting, such as the work floor or meeting rooms, to capture different types of social interactions and group dynamics that may be relevant to the research question. For example, the researcher may observe how employees collaborate on projects, how they communicate with each other, how they react to conflicts or challenges, and how they interact with their superiors.

The observations will be used to complement and triangulate the data collected through interviews and literature reviews. For example, the researcher may use observations to confirm or challenge the information obtained through interviews, or to provide additional details or insights not captured by other methods. Overall, the use of observations in this research project will provide a more comprehensive and in-depth understanding of social interactions and group dynamics in the company and will increase the credibility and accuracy of the research findings.

2.4 Data analysis

There are two main approaches to conducting a qualitative analysis, it can be either inductive or deductive, or even both. The article by Bingham & Witkowsky (2022) describes how the analysis of the qualitative data depends largely on the methodology, personal organizational and analytic

preference, and the type of data that has been collected. Furthermore, the authors outline deductive analysis as a top-down approach to data analysis, whereby predetermined codes are applied to the data. This method involves the use of pre-existing theoretical frameworks or categories, which can be applied to the data to organize it into meaningful and manageable segments. For example, categories such as data type, participant characteristics, or period can be used to sort the data into organizational categories. The deductive approach is particularly useful when the research aims to test a pre-existing theory or hypothesis, as it allows for a systematic and structured analysis of the data. However, it can also be limiting as it may not allow for the emergence of new and unexpected themes that may be relevant to the research question (Bingham & Witkowsky, 2022). Therefore, researchers may also apply an inductive approach to analyze the data.

Inductive analysis is described by the authors as a method in which the researcher reads through the data and allows codes to emerge, naming concepts as they surface. This approach is often referred to as a "bottom-up" analytic strategy, as it allows themes and patterns to emerge from the data itself, rather than being imposed by pre-existing categories or frameworks (Bingham & Witkowsky, 2022). Inductive analysis is particularly useful in exploratory research or when the research question is not well-defined, as it allows for the emergence of new and unexpected themes that may be relevant to the study. However, this method is described as time-consuming and therefore requires a high level of flexibility and adaptability. Nonetheless, when used appropriately, inductive analysis can provide rich and valuable insights that can inform theory and practice.

In the article by Vaismoradi et al. (2013) the qualitative descriptive approach to research is discussed. This approach is a type of qualitative research that is used to describe and understand the characteristics of a phenomenon or experience. The authors explain that qualitative descriptive research is particularly useful when the goal of the research is to provide a straightforward and comprehensive description of a phenomenon or when there is limited previous research on the topic. Furthermore, the article outlines the steps involved in conducting a qualitative descriptive study, including selecting a topic, defining the research question, sampling, data collection, data analysis, and reporting. The authors emphasize the importance of using a flexible and iterative approach to data analysis, which involves reading and re-reading the data to identify themes and patterns.

The article also provides an overview of two popular methods of analyzing qualitative data: thematic analysis and content analysis. The thematic analysis involves identifying and analyzing patterns and themes in the data, while content analysis involves identifying and quantifying specific characteristics or themes in the text. The authors note that both methods have their advantages and limitations, and the choice of method will depend on the research question and objectives. The authors highlight the importance of using a flexible and iterative approach to data analysis in qualitative research. They emphasize the need to remain open to emerging themes and patterns, while also ensuring that the analysis is rigorous and systematic.

Braun & Clarke (2006) describe thematic analysis as a method for identifying, analyzing, and reporting patterns and themes within data. At its most basic level, thematic analysis involves organizing and describing the data set in detail. However, the method can also be used to interpret various aspects of the research topic. According to Braun & Clarke (2006), thematic analysis typically involves several stages, including familiarizing oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing a report of the analysis. Through the use of a thematic analysis, it is possible to approach the data with an inductive, deductive, or mixed-methods approach, depending on the research question and available data.

In addition, a thematic analysis is described by the authors as a flexible and adaptable method that can be applied across various fields and research designs. By identifying patterns and themes within the data, researchers can gain a deeper understanding of the research topic and develop insights that can inform theory and practice. However, it is important to note that thematic analysis

is not a linear process and requires a high degree of reflexivity and attention to detail. Researchers must therefore be mindful of their assumptions and biases throughout the analysis process and work to ensure the trustworthiness and rigor of their findings.

In the case study with a thematic approach, the researchers utilized a qualitative analysis method to analyze the data collected. Firstly, the researchers adopted an inductive thematic approach to data analysis. This approach involved a careful reading of the data, allowing themes and patterns to emerge naturally. The researchers did not impose pre-existing categories or frameworks on the data but rather let the themes and codes emerge from the data itself. Through this "bottom-up" analytic strategy, the researchers identified and labeled concepts and themes as they surfaced. Secondly, the researchers employed the content approach to data analysis. This approach involved identifying and quantifying specific characteristics or themes in the text. The researchers systematically examined the content of the data to identify recurring elements or patterns.

2.5 Ethical consideration

Ethical considerations are crucial in qualitative research to ensure that participants are treated with respect and that their rights and welfare are protected. The article by Arifin (2018) highlights several key areas that require careful consideration when conducting qualitative research. These include obtaining informed consent from participants. Informed consent is a fundamental ethical principle in research that emphasizes respect for individuals' autonomy and the protection of their rights and welfare. It ensures that participants understand the study's purpose, procedures, potential risks, and benefits, and can make a voluntary and informed decision to participate. The National Institutes of Health (NIH) Guidelines for Research Involving Human Subjects (2016) have outlined a comprehensive framework for obtaining informed consent. The following key elements are being specifically considered by the researchers to provide all participants with the free choice of participating:

- **Information disclosure:** Researchers provide clear and concise information about the study's purpose, procedures, potential risks and benefits, and alternative treatments or options.
- **Comprehension:** Participants should have adequate time and opportunity to ask questions, clarify any doubts or misunderstandings, and understand the information presented.
- **Voluntariness:** Participants should make a voluntary decision to participate, free from coercion or pressure from others.

According to Saunders et al. (2015), anonymizing interview data is an important ethical consideration in qualitative research. It involves taking steps to protect the privacy and confidentiality of participants by removing or obscuring identifying information from transcripts, recordings, or other data sources. While anonymization is important for protecting participant privacy, the authors further mention the issues of compromising the integrity and usefulness of the data. Therefore, a researcher must carefully balance the need to protect participant privacy with the need to preserve the richness and complexity of the data when anonymizing interview data. Saunders et al. (2015) suggest that the research should be transparent about the anonymization strategies and engage in ongoing ethical reflection. Ultimately, the article emphasizes the importance of using anonymized interview data responsibly, with a clear understanding of the limitations and trade-offs involved in different approaches to anonymization. Overall, ethical considerations are crucial in qualitative research to ensure that participants are treated with respect and that their rights and welfare are protected.

Given the sensitive nature of the material and information handled by the company in question, ensuring the security of its facilities is of utmost importance. The researchers conducting the investigation must respect the high level of security measures in place and take extra care to ensure that specific details about projects and employees are not disclosed outside the company walls.

2. Methodology

The researchers must understand the gravity of the situation and ethically conduct themselves throughout the investigation. They must adhere to the company's policies and protocols concerning access to information, physical security, and confidentiality agreements. Any breach of these protocols could lead to severe consequences for the company, its employees, and its stakeholders.

3 Literature review

The upcoming chapter will provide a robust literature review that serves as the foundation for this thesis. The literature review will encompass diverse areas, including internal collaboration, communication, PM, procurement involvement, and cost estimation, and will be utilized to address the research questions at hand. This comprehensive review of existing literature will provide a theoretical framework that contextualizes the research and helps build a solid understanding of the relevant concepts and theories related to the study. It will serve as a critical basis for synthesizing, analyzing, and interpreting the findings of the research, and will aid in developing meaningful insights and conclusions.

3.1 Project management

The following section will address relevant literature concerning PM. It will explain the fundamentals of PM, what benefits PM could bring, and the factors that influence a project's success. Furthermore, the section will elaborate on lean PM and how agile teams in a project could ultimately affect the project outcome.

3.1.1 What is project management

The fundamental principle of PM is to implement and execute projects according to a plan or schedule. This involves planning and controlling the project's cost, quality, and time (Munns & Bjeirmi, 1996). Projects could be executed in many different ways and there are many well-known techniques that managers can adopt to gain a competitive advantage in the market. Furthermore, PM has shown in the last decades that it is an efficient tool for handling complex assignments and activities (Munns & Bjeirmi, 1996). It is also important to mention that it is a difference between a project and (PM). The term PM is defined as the following:

"The application of processes, methods, knowledge, skills, and experience to achieve the project objectives". (Burke, 2013)

A project could be defined as the following:

"The achievement of a specific objective, which involves a series of activities and tasks which consumes resources. It has to be completed within a set specification, having definite start and end dates". (Munns & Bjeirmi, 1996)

3.1.2 Project management benefits

Offering customers the ability to create unique products or customization through engineer-to-order (ETO) processes gives the organization a chance to target a specific part of the market (Kaufmann & Kock, 2022). This type of ETO project has the downside that they are complex and time-consuming. To deal with this complexity and customization, customer orders are regarded as projects and approached with PM to make sure that companies don't lose out on their profitability (Kaufmann & Kock, 2022). To guarantee customer satisfaction and project profitability, PM supports with techniques, and practices to enhance the effectiveness (Kaufmann & Kock, 2022). The authors also suggest that the level of PM highly affects the outcome of complex projects in terms of profitability (Kaufmann & Kock, 2022). The PM offers the company the possibility of establishing standardized practices that are structured according to organizational preferences. This includes approaches, systematic ways of working, decision tools, and the capability of transferring experiences into knowledge that could be stored within the organization (Monteiro de Carvalho et al., 2015).

Julian (2010), further argues that projects are the vehicle for transforming the modern global corporation. Furthermore, the author states how projects are how businesses achieve leaner cost structures, more effective operations, and better IT. Projects can also increase the production and

implementation of new products and enhance the way a company executes new business strategies. Successful projects can therefore result in revenue growth, improved productivity, lower costs, more efficient operations, and ultimately a higher market valuation.

3.1.3 Factors influencing project success

Large projects are complex and to consider a project to be successful there are factors to consider. These are scope, quality, schedule, budget, resources, risks, customer satisfaction, and stakeholder support (Gido & Clements, 2014). The scope defines all the deliverable that needs to be accomplished to meet the customer requirement or the project objective. Quality refers to the standard of the deliverable and how well these are aligned with the criteria set by the customer. The schedule provides dates for when the deliverable should be finished and maybe the most important date which is the handover. Budgets are estimated costs that the project will require to be finished. Resources refer to people, equipment, and facilities. Risks are incidents or other possible events that could jeopardize the project. A large project will engage many stakeholders and it is crucial to build relationships and engage them to create a good outcome. Lastly, the whole idea of a project is to satisfy the customer and make sure that their specifications are fulfilled (Gido & Clements, 2014).

According to Radujković & Sjekavica (2017), PM, success factors could be categorized into three different categories. These are elements of PM competence, organization, and methodologies (methods, tools, and techniques). The first element refers to managers' competencies, knowledge, and skills in teams and their coordination. The second element refers to the organizational structure and the culture. Lastly, are tools and methods used in their project execution.

3.1.4 Project delays and failures

When an organization is not able to keep up with the schedule and deliverables, a delay has occurred (Ansah & Sorooshian, 2018). Delays are a problem within PM as they affect the profitability of a project since the cost is an outcome of time overruns. The project leaders and other participants must understand where the main sources of delays occur to avoid them. This means understanding when and where they occur and the responsible parties to mitigate them in the future (Ansah & Sorooshian, 2018). Even though it is recognized in the literature that organizations work more proactive and are more aware it is still an issue within PM. In terms of internal delays and their source, poor information coordination, lack of experienced personnel, lack of information sharing, and poor feedback capabilities are the most common reasons mentioned by Ansah & Sorooshian (2018).

Project delays in ETO companies are a recurring problem since there are no available stocks of finished products and very few components. Since projects in ETO environments aim at satisfying customer needs which include product differentiation, the customer is exposed to very long lead times. Increased lead times do not only affect customer satisfaction but also the profitability of the projects (Mello et al., 2015). Large and complex project in the ETO environment comes with many interdependent activities which require coordination efforts. The need for coordination increases when parts of production are outsourced and when all components are not produced in-house (Mello et al., 2015). Therefore, Mello et al. (2015) argue that competitive advantage comes from the organizations' ability to coordinate internal and external activities to avoid delays. Mello et al. (2015) mention the company dilemma of balancing the difficulty of producing components in-house and the coordination costs that comes with outsourcing. Coordinating in this type of environment is not simple and common problems are poor communication, inadequate cooperation, and the organizational structure which inhibits coordination within different functions and teams (Mello et al., 2015). Mello et al. (2015) mention three specific phases that require coordination which is the tendering, product development, and product realization. To handle these phases and establish a good level of coordination, three types of coordination mechanisms could be used. These are standards, plans, and mutual adjustment. Standards refer to rules and routines that need to be established by the company. This will support the organizations that the processes and the actions

taken are aligned by all involved functions and teams. The second coordination mechanism refers to the establishment of predefined goals for units to monitor their actions and performance. Lastly, mutual adjustment refers to continuous communication across functions during the whole project (Mello et al., 2015).

3.1.5 Dimensions of quality which causes project failure

The lack of effective and efficient team communication can result in delays, misunderstandings, mistakes, confusion, and finally failures. The article by Ganis & Waszkiewicz, (2018) distinguished five main causes of failure in relevance to the quality dimension which are mentioned below in Table 4:

Table 4: Causes of project failure.

Causes of project failure	Dimension of quality
Ineffective decision making in managing changes	Organization quality
Project schedules with unachievable delivery dates	Process quality
Excessive scope creep	Product quality
Ineffective coordination worth subcontractors and suppliers	Organization quality
Ineffective control and communication	Process quality

In conclusion, effective and efficient team communication is crucial for project success. The article by Ganis & Waszkiewicz (2018) identifies five main causes of failure related to the quality dimension. Addressing these causes of failure can significantly contribute to the success of a project and mitigate the risks of quality-related issues.

3.1.6 Challenges related to project management

The benefits of projects are clear and can contribute to great development for the company, it is important to reflect on the negative aspects described by Julian (2010) as project work is fraught with uncertainty and risks. In addition to being able to navigate through a changing social and political landscape, the literature elaborates on the essence of learning to work with new people, new technologies, and new business processes across time zones and cultures as work becomes more geographically distributed.

Furthermore, project organizations also face the challenge of changing internal and external conditions as the pressure is constant regarding cost reduction, more efficient timelines, and increase productivity. The literature states that the problem for many project organizations is that systematic learning happens either after the conclusion of a project or when the damage already has been done. Project organizations that do not possess effective mechanisms for learning often leave improvement, innovation, and problem-solving to chance (Julian, 2010). The result of this, according to the literature, is "red-light learning" where project teams hastily assemble to find out what went wrong. The outcome of such a learning process is an environment driven by political controversies, threats to individual jobs and careers and both the people involved and the organization lose. Other obstacles regarding the process of designing, documenting, and implementing a PM methodology are mentioned by Wysocki (2004) and relate to the cultural and organizational barriers to change, replacing existing PM habits and solid individualism of technical professionals. Furthermore, Wysocki (2004) emphasizes the importance of organizations not standing still and expecting PM to continue to function at expected levels of effectiveness. All organizations working with PM need to continuously improve processes or they will fall into misuse or no use at all.

3.1.7 Lean project management

Gubinelli et al. (2022) describe the management of a project as lean when the system is structured to deliver the product, maximizing the value and minimizing waste. The lean philosophy is

therefore seen as a complementary element to the existing PM techniques, focusing on eliminating waste and creating value as well as reorganizing the common structure of knowledge in PM focusing on relationships, shared knowledge, and common goals. This is also supported by Cruz Villazon et al. (2020) who state that the important exercises within lean PM are the identification of value-added (VA) and value-enabling (VE) activities. VA activities are tasks that advanced the completion of the project and the customer is willing to pay for these activities. Enabling-task, on the other hand, are tasks that are required to complete the project but may not be considered worth paying for by the customer. Waste tasks refer to tasks that are not desired by the customer e.g. over-designing a product with a specification not asked for. This is further acknowledged by Dalal (2011) who elaborates on the fundamental principle of lean and its purpose to identify waste and separate it from VA activities and necessary non-VA activities. Figure 1 below shows the lean management process which is described by Dalal (2011).

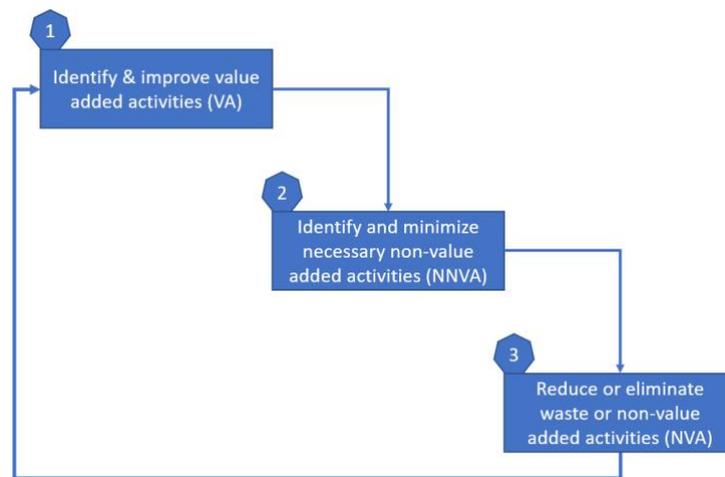


Figure 1: Lean project management process

3.1.8 Agile teams in projects

When establishing teams in projects, the aim is to increase the innovation, efficiency, and overall satisfaction of the employees (Moe et al., 2010). The traditional way of conducting teamwork in a project context is to coordinate hierarchically. This style allows for a clear separation of roles and the work is coordinated by a leader. The agile way allows for teams to be more self-managed as the team itself determines how to structure all the activities. Additionally, this means that the separation between roles is not as clear as the traditional way, as the agile style calls for more collective responsibility. Even though agile project management (APM) is mostly practiced in the software industry, it has slowly been adopted in other domains as well. The agile method is a result of increased competition and increased complexity within the business environment (Ciric et al., 2018). APM has proven to be successful in innovation management and product development within different industrial sectors as well. The benefits from previous projects within different manufacturing sectors are summarized in Table 5 and prove that APM has potential outside of the software industry (Ciric et al., 2018).

Table 5: Benefits with APM:

Benefits with APM
Greater flexibility
Reduced cost and schedule
Reducing planning time
Improving communication
Higher effectiveness and speed in the pre development stages
Flexibility to deal with uncertainty in innovation efforts

There is also a separation between traditional PM and APM when it comes to teams. Agile teams are more collaborative and rely more on great communication. Team members receive new experiences and widen their knowledge each day as they interact with their team members. Furthermore, Drury-Grogan (2014) argues that agile teams allow for more empowerment since everyone is involved in the decision-making. Agile teams are also considered favorable in large projects with interdependent activities. Since knowledge is shared it helps coordinate activities and make sure that all decisions are focused to satisfy the customer. This also changes the manager’s traditional role from a decision-maker to a coordinator for the team. Hoda & Murugesan (2016) summarize the agile methods as collaborative, people-oriented, and could be seen as an enabler for cross-functional collaboration.

Agile teams do not only come with improvements and benefits, but it also has some challenges related to the implementation. Previous research has proven that teams are struggling with a commitment to the decisions, conflicting priorities, and unstable resource availability (Drury-Grogan, 2014). Hoda & Murugesan (2016) also mention the challenges related to the project managers and the lack of clarity in their roles. Here the issue is related to establishing a healthy balance between empowering with autonomy and guiding.

In the article by Moe et al. (2010), a study was conducted to transition from traditional to agile teams in projects. One of the findings from this study was that highly specialized skills would act as a barrier to transitioning. Highly specialized skills would in this case mean that the group wanted less interaction and communication with other team members. Instead of widening their knowledge, the focus would remain on deepening their knowledge in their specific field.

3.2 Collaboration and integration within organizations

The upcoming section aims to explore key aspects of internal collaboration within organizations. This is crucial to gain a deeper understanding of the benefits and challenges associated with collaboration, as well as the methods that organizations can use to promote a healthy and productive collaborative environment. It is worth noting that effective collaboration is a critical element in PM success. Therefore, comprehending the details of collaboration and its significance in PM is essential. To achieve this, the relevant literature will be explored in this research, providing insights into how organizations can cultivate effective collaboration and its impact on PM.

3.2.1 Collaboration definition and cross-functional integration

The term collaboration is defined in the dictionary as “working together” and requires that two or more parties are involved (Bedwell et al., 2012). Furthermore, collaboration cannot be one-sided and requires constant involvement and a mutual understanding regarding the collective processes (Bedwell et al., 2012). Successful collaboration is highly dependent that groups/individuals having shared and agreed-upon goals (Graham & Barter, 1999). Collaboration is not limited to a single level, but instead, it could occur at multiple levels. For example, individuals, teams, departments, and organizations. Meaning that collaboration can occur between different entities (Longoria, 2005).

Cross-functional integration has been a known subject for many years and the concept is applicable in two different ways. Firstly, integration can occur among different organizations but also within the supply chain partners. Secondly, integration can occur within an organization among departments or functions (Pellathy et al., 2019). The concept has gained attention from many organizations as more start to realize the potential benefits of overcoming internal functional silos (Pellathy et al., 2019). Previously, organizations gained benefits from "silos" as they enabled efficiencies and specialization. Nowadays, instead of silo-thinking, organizations and their functions need to be managed more holistically to improve performance (Pellathy et al., 2019).

Breaking silos and collaborating across boundaries is not easy and it requires a balance between vertical- and horizontal communication (Casciaro et al., 2019). Furthermore, it is recognized that cross-boundary collaboration has the possibility of increasing profit margins. Silos could be a result of the organizational structure to increase specialization and increase efficiency but this limits peoples' ability of understanding and relate to others' processes. Changing structures may not solve the issue as a new structure could bring other challenges (Casciaro et al., 2019).

There are in general three reasons why an organization requires integrating its functions. These are goals, activities, and knowledge. Within an organization, there are local goals for each function which differ between the different functions. These goals are area-specific which means that from a holistic perspective, there is variation of different objectives. The problem here is that local objectives might not support other local goals, which in turn means that there is a lack of mutual understanding of the overall company goal (Pellathy et al., 2019). In terms of activities, all the organization's functions are interdependent and rely on others' activities. The output of one function is another function's input which means there is a great need to align the activities to create an optimized flow of inputs and outputs (Pellathy et al., 2019). Lastly, information could be seen as an essential resource for an organization as it is the foundation of value creation and avoidance of problems. The problem is that companies are having problems with sharing information that is relevant and on time (Pellathy et al., 2019).

Cross-functional integration could be broken down and analyzed into five different tenets of interaction. These are boundary-spanning activities, integration factors, formality/informality, level of integration, and impacts of integration (Lopez Pimenta et al., 2016). The first relates to points of interaction where internal functions require participation, information, or opinions to support internal processes. Integration factors are mechanisms that support organizational integration. Formality/informality refers to the application of integration, whether is developed spontaneously or implemented by top managers. The integration level is describing the level of intensity of the integration and the cross-functional relationship. Lastly, the impact represents the outcomes of the individual departments and the organization as a whole from cross-functional integration (Lopez Pimenta et al., 2016).

3.2.2 Cross-functional collaboration effects

Cross-functional collaboration and integration are often referred to as the level of information sharing, coordination, and involvement of different company functions (Troy et al., 2008). Cross-functional integration has the advantage of creating a better flow of information by increasing the frequency of communication. Research has also pointed out the importance of informal integration as it has been shown to increase the frequency of information sharing within units (Lee, 2020). Cross-functional collaboration also has the benefits of risk management (Cuijpers et al., 2011). Since the collaboration creates better information streams and improves the capability of processing the information it is possible to earlier anticipate risks. This involves risks such as product development and market constraints which enables the company to earlier identify and mitigate the risks (Cuijpers et al., 2011). Cross-functional integration is essential for companies since it can improve overall performance (Enz et al., 2019). This is achieved since cross-functional integration can remove barriers and recognize different functions' goals, and thereafter align efforts towards an overall organizational goal. Furthermore, regular information sharing within the

company functions can extend existing knowledge and give useful insights into other functions' perspectives.

3.2.3 Cross-functional integration challenges

Even though cross-functional integration may lead to many company advantages it may also come with disadvantages. Increasing the collaboration and integration within company functions could end up with increased decision complexity and confusion (Troy et al., 2008). Another challenge is the negative impact collaboration could have on responsibilities, as clear function responsibilities and boundaries could be blurred out (Lee, 2020). Also, establishing collective communication patterns could lead to more time-consuming processes which in turn decreases the company's productivity. Another important aspect to consider when a company is trying to increase cross-functional collaboration is the increasing workload. This could affect employee satisfaction as new tasks are created to improve collaboration (Karlsson & Åhlström, 1996).

When considering the option of increasing the cross-functional integration companies must consider two aspects (Tushman & Nadler, 1978). The company could either improve cross-functional collaboration by increasing the information processing capability. This will increase company control and decrease response time. Else, the company could avoid cross-functional collaboration with the cost of lost control and increased response time, but with less coordination cost (Tushman & Nadler, 1978).

Furthermore, interdepartmental collaboration often comes with hidden costs. This includes cross-functional conflicts and changes in established working structures. Meaning, what is gained in performance at the organizational level could be lost within the different functions as a result of the collaboration (Lee, 2020). It is also important to understand that information is being dealt with differently depending on the location within the organization. Increasing the collaboration among departments in terms of sharing information also includes transferring and translating the information so it could be usable for others (Lee, 2020).

3.2.4 Creating a collaborative environment

To create an organization that could be considered collaborative, three different dimensions need to be fulfilled (Schuh et al., 2014). Collaboration is broken down into communication, cooperation, and coordination. Each dimension is then broken down into two practices to facilitate collaborative organization. Communication refers to sharing information and enabling sense-making. Enabling sense-making refers to the ability of an organization of handling information to deal with complex situations and create an understanding of the following consequences (Schuh et al., 2014). The next dimension coordination is broken down into resource pooling and goal congruence. Goal congruence refers to the mutual understanding between company functions of the overall company goal. The higher the goal congruence within an organization, the higher productivity will be achieved (Schuh et al., 2014). This dimension focuses on managing the dependencies and aligning tasks within the organization. This also includes supporting and coordinating activities across the different company functions. Lastly, cooperation focuses on the empowerment of the employees and aligning cross-functional activities (Schuh et al., 2014).

3.3 Communication and information quality

As previous Chapter 3.2 outlines the importance of healthy cross-functional collaboration it could also be argued that the collaboration is highly dependent on communication. Therefore, this section will explore effective communication and how the quality of information plays a crucial role in the success of any project. Poor communication and inadequate information quality can lead to delays, misunderstandings, and ultimately project failure. Therefore, it is essential to explore the relevant literature on communication and information quality to gain a deeper understanding

of their importance in PM. This section of the literature study will delve into the theory related to communication and the quality of information within projects.

3.3.1 Communication management

The works of Ying & Pheng (2014) argue that communication is both a process and an activity and as such, it requires a holistic understanding of its underlying mechanisms and intentional objectives. The authors contend that communication is a process that involves the exchange of information through the utilization of shared symbols, signs, and behaviors. Moreover, as an activity, it encompasses the identification and clarification of communication needs and expectations within the context of a project. The authors highlight that successful communication requires not only the formulation of a plan but also the implementation of this plan through ongoing engagement with stakeholders. This perspective is further supported by Zulch (2014), who describes communication as a process of acquiring, interpreting, and disseminating information to relevant parties. To ensure effective communication, Zulch (2014) identifies three key components: the transmitter, the channel, and the receiver, emphasizing that all components must function harmoniously to avoid misunderstandings or misinterpretations. The article by Ying & Pheng (2014), and Zulch (2014) both states that inadequate communication during a project can result in significant negative impacts on the project schedule, budget, and overall delivery outcomes. As noted by the authors, effective communication is a critical component of project success, and inadequate communication can lead to misunderstandings, miscommunications, and increased project risk. As a result, project managers and teams must prioritize effective communication strategies and techniques to mitigate these risks and ensure the successful delivery of the project. This may involve the implementation of communication plans, the use of appropriate communication tools and technologies, and ongoing engagement with stakeholders to ensure that information is being shared and understood in a timely and effective manner.

The works of Ying & Pheng (2014) emphasize the significance of communication in organizational life and its crucial role in facilitating the proper functioning of an organization and its interactions with the external environment. The authors distinguishes organizational communication into two distinct dimensions: internal and external. The internal dimension prioritizes effective communication within the organization, including communication between managers and employees, as well as communication among employees across different departments and divisions. On the other hand, the external or inter-organizational dimension focuses on information exchange with external stakeholders, such as customers, partners, suppliers, and other organizations. These two dimensions highlight the importance of considering both internal and external relationships in the design and implementation of effective organizational communication strategies. Rajhans (2018) argues that effective communication management constitutes a deliberate set of measures aimed at systematically planning, monitoring, and regulating the various communication channels within an organization. The author delves into the topic of effective communication management within the context of stakeholder relationship management, emphasizing its crucial role in facilitating efficient information exchange and ensuring that the project or activity in question receives the necessary information to effectively manage stakeholder expectations.

3.3.2 Cross-departmental communication

Pinto & Pinto (1990) emphasized the crucial role of communication in successful project development, yet the correlation between communication patterns and cross-functional cooperation in new program management remains under-investigated. Furthermore, the authors mention the importance of cross-functional cooperation achieved within a project as this has showed to generate a significantly higher incidence of project success than teams with low cross-functional cooperation. Darawong (2015) delves into the importance of new product development (NPD) teams in high-technology manufacturing firms as the competition in the market becomes increasingly fierce. The study sheds light on the many advantages of cross-functional communication, which is conceptualized as the exchange of work-related information between team members from different functional

areas to achieve the objectives of an NPD project. The research highlights the significance of promoting cross-functional communication in NPD teams to enhance their ability to absorb and utilize new information effectively.

The article mentions communication as a well-documented source for building and maintaining a productive interface between functional units, and also how lack of communication has been linked to problems in new product development and project failures (Pinto & Pinto, 1990). According to Pinto & Pinto (1990), communication is the vehicle through which personnel from multiple functional areas share information that is so critical to the successful implementation of projects. Communication as a process is essential to all managerial activities. Pinto & Pinto (1990) suggest that the key managerial skills of interaction, allocation, monitoring, and organizing, which are critical to the successful implementation of new programs, can only be effectively executed through communicative activity. In other words, communication is how managers carry out their work and achieve their goals.

Effective communication is crucial to the success of the new product development process. During this process, team members must communicate with a range of stakeholders both inside and outside the organization, including personnel from diverse functional areas, advertisers, customers, and distributors. Effective decision-making involves not only gathering but also sharing information to enhance team interactions and project outcomes. Communication acts as the cornerstone of this process by fostering the exchange of information and collaboration among team members (Pinto & Pinto, 1990). In the article authored by Weinrauch & Anderson (1982), the complexity of the relationship between industrial marketing and engineering in the context of a rapidly advancing technological society is discussed and brought to the forefront. It is further stated that when workload tasks, goals, and objectives are different, interdependent, or unclear between two departments, there is a strong tendency for disharmony. As previously mentioned, the communication barrier between departments can create tension, and a formal meeting between selected i.e., marketing and engineering people should be held periodically.

3.3.3 Communication tools and techniques

The article by Mnkandla (2013) characterizes project communication management as the coordination of activities involved in the generation, collection, dissemination, presentation, and preservation of information within the context of a project and its related environment. Effective project communication management is deemed a critical competency for the successful coordination of a project, as its mismanagement can lead to project failure. Mnkandla (2013) also notes that communication tools in project communication encompass the technologies and devices employed to support the collection and dissemination of project information, while communication techniques refer to the procedures utilized to facilitate communication within the project and among its stakeholders.

According to the article by Ganis & Waszkiewicz (2018), the choice of communication channels and tools influences project deliverables and the current digital transformation effort affects almost every type of activity within a project team. In all cases, communication between members of the interdisciplinary team is crucial as it helps them to work effectively in a modern and dynamic environment (Ganis & Waszkiewicz, 2018). By the application of organization quality attributed to project leadership, communications, and people-related issues the situation related to project failures can be significantly improved. According to the literature by Ganis & Waszkiewicz (2018), project teams must choose the communication tools, and the term tool is further defined as “instruments for communication through which certain sorts of communication are enabled” (Ganis & Waszkiewicz, 2018). Goparaju (2012) elaborates on the fact that effective communication is widely recognized as a crucial success factor in software projects, as it significantly impacts the outcome of the project. How communication is utilized within a software project reflects directly on the results achieved, making it imperative that appropriate communication strategies, tools,

and techniques are selected and employed effectively.

3.3.4 Information quality

Lee et al. (2002) describe information quality as a critical factor in organizations, particularly given the growth of data warehouses and the increased accessibility of information from various sources by managers and information users. The authors Batini & Scannapieco (2016) note that poor quality of information can have widespread consequences, which may be experienced in everyday life, though the connections between these consequences and the root causes may not always be clear. Both Lee et al. (2002) and Batini & Scannapieco (2016) concur that information quality has a significant impact on the efficiency and effectiveness of organizations and businesses, with an estimated cost of 600 billion dollars per year for US businesses due to information quality problems. Miller (1996) states in the article that information quality occurs along ten dimensions and is defined by the information's customer and is constantly changing over time. The article further describes ten dimensions of information quality and how they can be used as benchmarks to improve the effectiveness of information systems and to develop information quality strategies for all organizations. Miller (1996) states that at first, quality information is a concept that seems obvious but as previously mentioned by Lee et al. (2002), Batini & Scannapieco (2016) there is still disagreement as to what the term means.

Miller (1996) defines the first dimension of information quality to be relevance, which covers whether the information addresses the needs of the customer. Irrelevant information does not equal poor information quality, but it indicates that the information is of a different class than what was expected. The second dimension of information quality is Accuracy, which pertains to the correctness of the information. Inaccurate information is widely recognized as a problem by information system professionals and is addressed throughout the entire life-cycle of the system, from design to implementation to maintenance. However, it is also possible for the information to be overly precise, resulting in increased costs for the information system, confusion for the users, and a loss of credibility for the system.

The third dimension of information quality, Timeliness, refers to the dynamic and evolving nature of information. New information is continually arising and replacing outdated information, and the speed at which this cycle occurs depends on the ability of the information system to process and disseminate the updated information to its intended audience. Timeliness is interrelated with the accuracy of information, and the notion of what constitutes timeliness is constantly evolving. The fourth dimension of information quality, as described by Miller (1996), is Completeness. Incomplete information poses a significant risk of misleading the customer and can lead to negative consequences. It is important to note that what constitutes complete information may vary from person to person, as individuals have different objectives and goals that influence their perceived level of completeness.

The fifth dimension of information quality, Coherence, refers to the cohesiveness and consistency of the information. The presence of irrelevant details or confusing metrics can result in misinterpretation or rejection of the information by the recipient. The consistency of information and its presentation, as described by the sixth dimension, Format, both play a significant role in determining the overall quality of the information. The format in which information is presented can greatly affect its perceived quality and its effectiveness in communicating its intended meaning. The last four dimensions in the article are accessibility, compatibility, security, and validity where accessibility refers to the ease with which information can be retrieved and used. Information that is accessible and readily available to its intended audience is considered to have high quality. On the other hand, information that is difficult to obtain or is restricted in some way is considered to have low quality.

Compatibility pertains to the compatibility of the information with the needs and requirements of the user. Information that is compatible with the user's needs and preferences is considered to

have high quality, while information that is incompatible with the user’s needs and preferences is considered to have low quality. Security refers to the protection of information from unauthorized access or tampering. Information that is secure and protected from unauthorized access or tampering is considered to have high quality, while information that is vulnerable to unauthorized access or tampering is considered to have low quality. Validity refers to the accuracy and reliability of the information. Information that is accurate and reliable is considered to have high quality, while information that is inaccurate or unreliable is considered to have low quality.

In conclusion, all dimensions are crucial aspects of information quality that organizations and businesses must take into account to guarantee that the information they utilize is of top quality and can be relied upon for informed decision-making. As emphasized by Lee et al. (2002) and Batini & Scannapieco (2016), the impact of information quality on the efficiency and effectiveness of organizations and businesses is substantial. Miller (1996) posits that the ten dimensions of information quality can serve as a benchmark to enhance information systems and formulate information quality strategies for organizations. Despite its significance, the definition of information quality continues to be the subject of ongoing discourse.

3.3.5 Information quality management

The article by Baskarada & Koronios (2014) addresses the importance of assessing and improving the quality of information and how most organizations depend on quality information for their everyday business operations. Furthermore, the article elaborates on the competitive advantages that can be gained which are starting to be recognized in companies. The negative economic impact of poor information quality (IQ) has shown to average annual losses of \$8.2 million per year. This is also addressed by Xu (2001) where the negative effects of inaccurate and incomplete information results in competitive disadvantage and a critical impact on the social and business importance of the organization. It is further stated that the traditional view of information quality has been described from the perspective of accuracy, but as organizations are starting to understand the significance and value of IQ, it should be identified as encompassing multiple dimensions.

3.3.6 Information waste management

In the article by Verhagen et al. (2015), four examples of issues concerning information quality are defined and the poor quality of information is described to cause significant waste in information system processes. Decentralized information provisions can lead to a high level of manual actions to combine information from various systems to execute a specific task. Secondly, poorly defined process workflow and responsibilities lead to a high level of communication to support the engineering process. The third example stated in the article regarding information waste is related to the fact that information is not shared immediately upon its creation. According to Verhagen et al. (2015), this leads to a reduction in the time needed to verify created information for its accuracy. Lastly, Hicks (2007) describes the issue of incomplete information communication leading to extensive search and abandonment of the standard procedure to solve the issue of missing information. Moreover, four types of information waste are defined in the article and listed in Table 6.

Table 6: Types of information waste

Failure demand	Resources and activities necessary to overcome lack of information
Flow demand	Time and resources spent identifying information that needs to flow
Flow excess	Time and resources to overcome excessive information
Flawed flow	Resources and activities necessary to correct or verify information

In addition to the types of information waste mentioned, Hicks (2007) elaborates on four fundamental causes of waste which include:

- Information that cannot flow because it has not been generated, a process is broken or a critical process is unavailable.

- Information is unable to flow because it cannot be identified and flow-activated or shared processes are incompatible
- Excessive information is generated and maintained or excessive information flows, and as a consequence, the most appropriate and accurate information cannot be easily identified.
- Inaccurate information flows resulting in inappropriate downstream activities, corrective action, or verification.

Hicks (2007) further mentions that from an organizational perspective, the objective of information management is to ensure that valuable information is acquired and exploited to its fullest extent. The critical dependency of organizations on information, improving its overall management can yield significant operational benefits to all areas of an organization and more importantly its overall efficiency, competitiveness, and responsiveness.

3.3.7 Information in new product development

Effective information sharing among different actors is an essential condition for successful new product development (NPD) projects, and it is the responsibility of project managers to ensure such sharing occurs. Empirical studies have demonstrated the critical role that information sharing plays in the achievement of NPD objectives. Both internal and external actors must be involved in information sharing for the project to progress smoothly and achieve its goals (Jepsen, 2013). Furthermore, the author mentions how effective information sharing allows team members to understand the project's requirements and objectives, clarify expectations, and identify potential risks and opportunities. Such sharing fosters communication and collaboration among team members, leading to better decision-making, higher-quality outcomes, and greater innovation.

Additionally, the findings of the research by Jepsen (2013) indicate that the project manager's information sharing with core actors evolves, and this evolution is affected by the project's complexity, the project manager's leadership style, and the team's experience. In the early stages of the projects, the project manager mainly relies on formal communication channels to share information with core actors. However, as the project progresses, the project manager adapts their communication strategy to incorporate more informal communication channels, such as face-to-face meetings and ad-hoc conversations, to enable better knowledge sharing and collaboration among core actors. The study concludes that project managers must be flexible in their communication approach and adapt to changing project circumstances to facilitate effective information sharing and enhance NPD project success.

3.4 Procurement in project management

This section provides an in-depth review of the literature on procurement in PM, with a specific focus on the role of procurement, its significance in project success, and how it can be leveraged to enhance project performance. Furthermore, the section delves into how procurement can be effectively utilized as a tool for improving overall project performance. The literature review aims to provide a comprehensive understanding of the importance of procurement in PM and its potential impact on project outcomes.

3.4.1 The role of procurement in projects

Kafle & Fore (2018) present a comprehensive overview of project procurement management, emphasizing its importance as a systematic approach to establishing and maintaining relationships with external suppliers for procuring the necessary goods and services required for a project. Procurement management involves the use of contracts to ensure the timely delivery of goods and services that meet the standards set by the procurement organization. The authors emphasize the crucial role of procurement management in ensuring the availability of resources necessary for the successful completion of a project. The authors also address the challenges faced in procurement in today's rapidly expanding and increasingly competitive PM environment. These challenges include demands for increased volume, unexpected orders, budget constraints, inflexible suppliers,

and rushed purchases, among others. These challenges are not limited to procurement organizations but also extend to suppliers, subsidiaries, logistics, and manufacturing companies involved in the exchange of goods and services.

Moreover, the article by Kafile & Fore (2018) describes the need for a comprehensive and coordinated approach to effectively address the challenges inherent in procurement and guarantee the successful delivery of projects. The multifaceted nature of procurement and the interrelated nature of procurement challenges highlight the importance of considering all factors when formulating strategies to overcome these challenges. This highlights the need for a strategic and well-coordinated approach to managing procurement, emphasizing its central role in project success.

The impact of procurement decisions on supply chain performance and market success is widely recognized, especially in project-oriented supply chains, such as those operating in the construction and engineer-to-order industries. To effectively fulfill customer orders in these environments, the procurement decisions of the focal firm must be aligned with the production activities (Moretto et al., 2022). Furthermore, the literature suggests that the trend toward project-based operations is becoming increasingly widespread in contemporary society. This shift towards "projectification" enables organizations to foster innovation and ideas for new products and services, formulate market campaigns, and optimize internal processes. Additionally, Moretto et al. (2022) describe project-based companies as characterized by variable, uncertain, and complex supply chains, where procurement functions as a key strategic player.

Moretto et al. (2022) delve into the increasing importance of procurement department activities for companies striving towards market success and their consequential impact on the financial performance of the organization, as well as the efficiency and effectiveness of production activities. Moretto et al. (2022) highlight the significance of the degree of decentralization in procurement and how it affects the allocation of responsibility within an organization or buying unit. A carefully crafted organizational design strategy is imperative in facilitating the harmonious interaction between project and procurement functions, ensuring that both are working towards a common objective. As per the study, there exists the possibility of misalignment between project and procurement functions. This misalignment may stem from the decentralization of authority on the project side and the procurement side's incapacity to exert influence on local project decisions, which poses a challenge to achieving central procurement objectives.

Macbeth (2012) describes that the field of procurement has been evolving since the Toyota Production system began to be studied which has resulted in the conclusion that the need for closer management of the flows of material and information is necessary in any organization. Lindstrom (2014) highlights procurement as the purchase of materials, products, or services in a business environment. Furthermore, procurement is a major part of any company's strategy and to simplify the main objective of procurement, Lindstrom (2014) explains that the amount of money that a company pays for goods and services must be less than the profit it makes. The outcome of the procurement activities is highly associated with the communication and since the expectation differs from all parties involved such as sponsors, end users, team members senior executives, and procurement professionals communicating is one crucial aspect of successfully procuring products or services. Lindstrom (2014) also describes that expectations and scope are not synonymous and the risk of not communicating expectations clearly may result in scope creep. The term scope creep, as described in the article, relates to subtle and not-so-subtle changes in scope and when these are left unaddressed they will affect the procurement and cause it to fail.

3.4.2 Procurement performance

The article by Kakwezi & Nyeko (2019) describes how procurement performance start from purchasing efficiency and effectiveness in the procurement function to change from being reactive to

being proactive to attain set performance levels in an entity. Furthermore, the article highlights that purchasing performance is considered to be the result of two elements: Purchasing effectiveness and purchasing efficiency. To improve a company's purchasing performance, both strengths and weaknesses will have to be analyzed to form a goal and initiate improvements to reach this goal. According to the authors, the performance of the purchasing unit should be considered a means to a more effective and efficient purchasing function. Moreover, effectiveness is related to the organization doing the right things, and efficiency to the organization doing things right. From the implementation of performance measurement, Kakwezi & Nyeko (2019) imply that benefits such as cost reduction, enhanced profitability, assured supplies, quality improvements, and competitive advantages will be noted throughout the company. Amaratunga & Baldry (2002) supports the claim of the importance of measuring performance in their article as well as adds that measurement provides the basis for an organization to assess how well it is progressing towards its predetermined objectives, helps to identify strength and weaknesses, and decides on future initiatives.

Eriksson & Westerberg (2011) suggest in their article that cooperative procurement procedures such as joint specification, selected tendering, soft parameters in bid evaluation will generally have a positive influence on project performance (cost, time, quality, and environmental impact). Furthermore, Eriksson, Atkin & Nilsson (2009) elaborate on the higher levels of cooperation in partnering approaches and the potential solution this acts as for a range of problems in the construction sector. According to the authors, this sector has long been an area characterized by problems, resulting in delays and high costs.

3.5 Project cost estimation and delays

This section provides a comprehensive review of the relevant literature to deepen the understanding of three key areas of PM: cost estimation, causes of project delays, and definition of delay factors. By delving into the literature and critically analyzing existing knowledge, this research aims to provide a solid foundation for further exploration and investigation of these factors.

3.5.1 Cost estimation in projects

Cost estimating, as described by Nussbaum & Mislick (2015), is a multifaceted process that involves collecting and analyzing historical data, and utilizing quantitative models, techniques, tools, and databases to predict future costs for items, products, programs, or tasks. It is an art and technology that approximates the probable worth or cost, extent, or character of something based on available information at a given time. To ensure the accuracy and reliability of a cost estimate, the authors highlight several key elements that need to be considered:

- **Historical Anchoring:** A good cost estimate should be rooted in historical program performance, drawing on data from prior and analogous experiences. These specific data sources should be cited, providing confidence to the user that the estimate is based on relevant and appropriate past experiences.
- **A Process and Design Improvements:** A good cost estimate should reflect the current state of processes and potential future improvements in design or methodology. This ensures that the estimate takes into account any anticipated changes that may impact the cost of the item, product, program, or task.
- **Comprehension:** A good cost estimate must be easily understandable by program and business leaders who may not have technical expertise. It should be presented clearly and concisely, using appropriate language and avoiding jargon, to facilitate effective decision-making.
- **Risk and Uncertainty:** A good cost estimate should explicitly address the risks and uncertainties inherent in the program plan. This includes identifying and quantifying risks, as well as incorporating contingency plans or allowances to account for potential uncertainties that may impact the cost estimate.
- **Project Description:** A good cost estimate should be based on a well-defined project scope with identifiable risk areas. This includes a clear and comprehensive description of the

project's content, objectives, deliverables, and constraints, which serves as the foundation for the cost estimate.

- **Validation:** A good cost estimate should be subject to validation by independent means, such as peer review, benchmarking, or comparison against similar projects. This helps to verify the accuracy and reliability of the estimate and provides additional confidence to stakeholders.
- **Traceability and Auditability:** A good cost estimate should be traceable and auditable, with transparent documentation of the data, assumptions, methodologies, and calculations used in the estimation process. This allows for easy verification and auditing and ensures that the estimate can be reproduced or updated as needed.

The article by Doloi (2011) mentions a chronic issue across most projects, cost overruns, which have a substantial effect on decision-making, cost scheduling, and resource management. Moreover, the article mentions that almost a third of the projects in the sample had cost overruns of 150-200%, with an average overrun of 189% of the original cost estimate. One of the reasons for the inaccurate cost estimates is that there is often neither sufficient data nor sufficient time and resources to prepare an accurate cost estimate. Even if the cost estimate is done correctly, management may determine that the costs are too high, reducing the cost estimation without a corresponding reduction of the project scope.

The uncertainty and challenges in cost estimation are also brought up in the article by Torp & Klakegg (2016). To tackle the uncertainty of projects, which possesses a dynamic nature, different approaches have been developed over the years. Although cost estimation processes aim to establish a realistic overview of the total project costs and their uncertainties, project cost overruns are still seen. Uncertainty is defined, based on economic terms, as the difference between the information needed to make a decision in certainty and the information available at the time of making that decision. The authors also imply that all projects involve risks of different nature and magnitude and therefore define risk as an uncertain event or condition that, if it occurs, has a positive or negative effect on the objective of the project (Torp & Klakegg, 2016). Wu et al. (2022) support the statement of previous authors and further elaborate on the issues of efficient and accurate modeling of costs concerning the early phase of aircraft development. In this business sector, it is difficult to develop robust and efficient cost models, specifically in the conceptual design phase, due to a lack of detailed product and process information.

3.5.2 Defining project delays and their implication on project performance

Ghorbani & Khanachah, (2020) define the variance between the estimated project completion time and the actual completion time as project delay. This delay is typically equal to the sum of the delays of the existing activities on the critical path. A delay can be caused by various factors such as an action or event that prolongs the time specified in the contract to perform a particular activity. This can manifest in several ways, such as prolonging the duration of the activity, delaying its start date, or changing some aspects of the work. According to Park (2021), cost overruns and schedule delays are one of the most common reasons for project failure. Moreover, findings from previous research show that the average level of underestimation for work is approximately 17%. This implies that there is a high level of optimism in project estimations. It should be noted that the project implementation environment is very complex and dynamic and numerous stakeholders and factors are involved in the implementation of each project which ultimately increases the likelihood of project delays (Ghorbani & Khanachah, 2020). Delays in projects can arise due to various reasons, including errors, faults, or events that are beyond the control of the parties involved. Depending on the nature and cause of the delay, the consequences and remedies may differ.

Delays could happen for several reasons and their impact on the project outcome could vary. It is possible to classify different types of delays depending on their nature. Ansah & Sorooshian (2018) use four categories to distinguish delays. These are compensable, excusable/non-compensable, non-excusable, and concurrent delays. Compensable delays refer to delays that are generated by the owner and the representatives which then allows for the contractor to get additional time and budget. Excusable/non-compensable delays are usually caused by nature and none of the parties

are responsible for the delay. Non-excusable delays are caused by the contractor and do not get any time extension or additional budget. In this case, the only solution is for the contractor to accelerate the work to make up for the delay. Lastly, concurrent delays are the type of delays when two or more types of delays occur at the same time. This happening could cause conflicts about whether or not the contractor should receive additional time and budget. Similarly, Ghorbani & Kanachah (2020) present a similar way to distinguish between different types of delays. The concept of forgivable/reimbursable, forgivable/irreparable, and unforgivable/irreparable delays. Forgivable/reimbursable delays are caused by the fault of the customer or employer, and as a result, the contractor is entitled to both an extension of the project timeline and compensation for the delay. Forgivable/irreparable delays refer to those caused by reasons beyond the control of both the employer and the contractor. In such cases, no party is held responsible for the delay, and as a result, the only remedy is to extend the project timeline without incurring any penalty. On the other hand, unforgivable/irreparable delays occur due to the error or fault of the contractor or contractor, and as a consequence, the project timeline is not extended, and the employer is entitled to claim damages (Ghorbani & Khanachah, 2020).

Furthermore, Ansah & Sorooshian (2018) explain that delays could be categorized into four categories depending on the source of delay. These are project-related, practices, participants, and procurement. Project-related refers to delays that occur as a result of the project scope, complexity, time, and other factors that are related to the nature of the project. Practices refer to delays that have occurred as a result of poor PM tools. Participant, on the other hand, means that delays have happened as a result of adequate skills, lack of experience, and poor management skills. Lastly, procurement-related delays refer to time extensions that occur as a result of poor procurement practices. For example, lack of supervision and delivery problems (Ansah & Sorooshian, 2018).

3.5.3 Project risk management and internal collaboration

Risks refer to problems that have not yet occurred but could in the future (Cervone, 2006). Risk management is a technique that a project manager could adopt to manage these future problems. Risks that occur in projects could for example result in a schedule deviation which could lead to a loss in profit (Ahmed et al., 2007). Risk management is a method to identify weaknesses in the project process where there is a probability that problems may occur. The risk management process consists of different stages. These are risk identification, risk analysis, risk evaluation, and risk treatment (Ahmed et al., 2007). Risk identification is the process of realizing what situations could go wrong in a project. This means that identifying the potential sources of risks need to be identified to understand how to approach them. Risk analysis is the process of understanding the consequence and the characteristics of the risks. This involves understanding the probability and the magnitude of the impact. Risk evaluation is the process of prioritizing the different risks. This could be based on experience, lessons learned, or standard practices. Budgets, strategic decisions, and schedules are considered to decide an optimal mitigation plan. Lastly, risk treatment refers to strategies to mitigate the risks. For example, by minimizing the likelihood, transferring the risk, etc (Ahmed et al., 2007).

Cervone (2006) discusses the importance of risk prioritization and presents a structure to rank different project risks. This is done by analyzing three dimensions, which are impact, probability, and discrimination. Discrimination adds perspective to the risk as it explains the impact on the overall objective (Cervone, 2006). Depending on the risk that is being analyzed, points are assigned to each dimension. The impact is ranked from critical risk (5 points), serious risk (4 points), moderate risk (3 points), minor risk (2 points), and negligible risk (1 point). Probability is ranked from high probability (5 points), medium probability (3 points), and low probability (1 point). Discrimination is ranked from high effect (1 point), medium effect (3 points), and low effect (5 points). These scores are then analyzed in terms of the overall risk by using the formula:

$$\text{OverallRiskFactor} = \frac{\text{Probability} * \text{Impact}}{\text{Discrimination}} \quad (1)$$

Cervone (2006) argues that this method is necessary and useful for organizations to understand and prioritize the different risk scenarios. Depending on the point outcome, organizations could develop different contingency plans for different point-interval. Cervone (2006) also points out the importance of post-project reviews as great sources of information to update risk prioritization and to improve project success in future projects.

As supply chains have become more vulnerable in recent years, companies are being more aware of the implications that incidents bring to their supply chains. To prevent delays or interruptions, companies apply risk management (Duhamel et al., 2016). But these practices are usually focused on external sources such as suppliers or carriers. Little attention has focused on the internal perspectives and collaboration and how it is connected to their supply chain risk management (SCRM). Supply chain risk management is a process where risks are analyzed in four steps: risk identification, risk assessment, risk mitigation, and risk monitoring. Good external SCRM is based on good collaboration with partners both down- and upstream since this enables a better opportunity of anticipating and dealing with risks. The same goes for the internal part where collaboration makes the foundation to risk management (Duhamel et al., 2016). Internal risk identification is referring to the process of identifying risks and the following consequences in joint efforts. That involves creating a mutual understanding of the implications and how they interact within different departments. Internal risk assessment is also referring to the joint effort of understanding the probabilities and consequences. Next, internal risk mitigation refers to joint efforts toward dealing with risks reactively or proactively (Duhamel et al., 2016). Lastly, internal risk monitoring means building a system of control with a more holistic perspective which involves the different functions

3.6 Summary of important findings from literature review

The literature review is a critical component of any research project, as it enables researchers to conduct a comprehensive and critical analysis of existing knowledge on a particular topic. In the case of this research project, the literature review was conducted to gain a deeper understanding of the complexity and variability of PM. The literature review revealed that PM is a multifaceted and complex phenomenon that can vary significantly between organizations, departments within organizations, and even among project managers. This variability arises due to a range of factors such as the size and industry sector of the organization.

Given this complexity, it is essential to recognize that PM cannot be approached as a one-size-fits-all approach and that it requires careful consideration of the unique context in which the project is taking place. The literature review has therefore provided valuable insights into the theoretical and empirical foundations of PM, allowing researchers to identify gaps, inconsistencies, and areas for further investigation. By understanding the complexity and variability of PM, organizations can develop effective PM practices that align with their goals, objectives, and culture. Consequently, this research project seeks to contribute to the existing body of knowledge on PM by examining the impact of PM practices on project success, in the context of a specific organization.

Furthermore, PM cannot be considered a standard practice available to apply to every project. The complexity of PM is what makes this subject dependent on other aspects discussed in this chapter. These factors are essential to all project managers and project-based organizations but are described in this research in relevance to the company being investigated. In addition to understanding the complexity and variability of PM, the literature review also revealed several specific areas that require careful attention in PM. These areas include communication challenges, cross-functional collaboration, procurement involvement, and project delays.

Effective communication is essential to a successful PM, as it enables all stakeholders to be informed about project progress, changes, and issues promptly. Cross-functional collaboration is also critical, as projects often require input and expertise from multiple functions within an orga-

3. Literature review

nization. Procurement involvement is another important factor, as it enables the project team to acquire the necessary resources and materials for the project in a timely and cost-effective manner.

Finally, project delays can have a significant impact on project success, both in terms of costs and timelines. The research conducted during the literature review highlighted a knowledge gap to be found related to the impact of internal delays on project performance. Although research on project delays is abundant, the focus has primarily been on external delays, such as those caused by suppliers, rather than internal delays that are within the control of the project team. Delays can result in increased project costs due to prolonged project timelines, increased overheads, and additional labor costs. Moreover, internal delays can also lead to missed project deadlines, fines, lower quality outputs, and reduced stakeholder satisfaction.

Overall, the literature review provided valuable insights into the complexity and variability of PM, as well as specific areas that require careful attention in PM. By addressing these factors, organizations can increase the likelihood of project success, and ensure that projects are completed on time, within budget, and to the satisfaction of all stakeholders.

4 Empirical Findings

The upcoming chapter will present the results of the interviews conducted within the company. The principal objective of this chapter is to offer a comprehensive understanding of the various subjects that emerged during the interviews. The topics will be examined in detail, taking into account the viewpoints of the employees who participated in the interviews. The findings from the interviews aim to provide valuable insights into the employees' experiences and opinions, with the ultimate goal of enhancing comprehension of the issues at hand.

4.1 Qualitative data findings from interviews

This section describes the main themes that were identified across the majority of the interviews presented. They are presented in no particular order, and each theme is presented in its paragraph. From the interviews, these themes emerged as significant factors that contribute to the overall experiences and perspectives of the employees. By presenting these themes, the aim is to provide a clearer understanding of the key issues and to highlight areas where improvements could be made.

4.1.1 Qualitative data findings on internal collaboration

The first theme emerging from the interviews was the internal collaboration among departments. The interviews provided information regarding procurement and their challenges in achieving and understanding the objectives of each project as their involvement tended to be product or component specific. Additionally, most of the interviewees raised concerns about the company's structure, citing that the organizational restructuring had further distanced the procurement department from other departments, making collaboration more complicated.

The physical distance between departments was mentioned as an issue according to the majority of interviews and acts as a significant barrier to collaboration, particularly when it comes to procurement's involvement in projects. When procurement is not located close to other departments, communication can become challenging, making it harder to share critical project information and collaborate effectively. This is caused by the limited face-to-face communication which decreases the learning and understanding of the counterparts' strengths and weaknesses between departments and people. Increased distance between departments will therefore limit the ability of one part to support where the counterpart might be struggling. The interviews also reveal that early involvement in a project is fundamental for establishing a shared understanding of the project's objectives and goals. This was mentioned to be an important stage to provide a solid foundation for collaboration. According to one employee at the procurement department, the result of not being involved in the early stage of the project is that they are focusing solely on its specific component or product needs, rather than contributing to the overall objectives of the project.

Therefore, to enhance collaboration, people from engineering, production, and planning expressed the need to facilitate closer physical proximity between departments. Additionally, involving procurement in the early stages of projects and providing opportunities for more personal contact between them and other departments can help break down barriers to collaboration and ensure that they are better integrated into the project team. This is something that the majority of interviews described as crucial and ultimately can result in better-informed decisions, improved efficiency, and higher project success rates.

Employees from the production, planning, and engineering department all expressed the benefits of being able to have a physical conversation during meetings. These meetings could be optimized and only take a few minutes, compared to having to book a meeting time via Skype and then spending time explaining the problem and also making sure both parties understand each other. These small meetings enable all participants of the project to be updated on the project's progress.

The interviews further revealed that transparency among departments and the shared understanding of objectives are critical factors that influence project outcomes. One example of this was presented during an interview with the purchasing department, which emphasized the importance of negotiating with suppliers to reduce costs and save money. However, during a separate meeting with employees from engineering and production, these individuals did not consider cost reduction, and the need for good prices, as a priority. Instead, their primary concern was ensuring the timely delivery of high-quality components, with price being of secondary importance. The majority of interviews described the difference in priorities between departments and the importance of creating clear communication channels and ensuring that all departments have a common understanding of the project objectives and key performance indicators (KPIs). Without this shared understanding, projects can become less effective, leading to potential delays, increased costs, and suboptimal outcomes.

The lack of insight into each other's goals and KPIs was identified as a significant barrier to collaboration among departments and described as essential for the company to establish a culture of transparency, openness, and effective communication to ensure that all staff members have a clear understanding of their roles and responsibilities within the project.

4.1.2 Qualitative data findings on communication

The interviews revealed that communication between different departments, such as production, engineering, and planning, could be improved, but this wasn't the major reason for delays and miscommunication. The majority of communication-related issues were instead attributed to the procurement department. The decentralized location of the procurement team made it challenging for employees to reach the right person and obtain timely and accurate information, causing frustration and delays in project execution. The recent organizational restructuring, which relocated the procurement team away from the office where the thesis is conducted, was identified as a significant barrier to effective communication. To improve communication, the majority of interviews emphasized the importance of implementing measures to streamline communication channels and ensure that the procurement team is accessible and responsive to employees' needs.

Moreover, another issue regarding communication was mentioned in the interviews with a majority of the employees from engineering and production. They have been instructed not to communicate directly with procurement but to go through the project planner, which has resulted in a more extended information chain and poorer communication. One employee mentioned that the process of getting information from someone in another department could vary from hours to weeks depending on whether they chose to go through the information channels established within the company or whether they chose instead to personally seek out the right person and take the "wrong route". Taking the "wrong route" meant cutting off the communication link that should be used, but instead, it meant that the person in question could get an answer to a question within an hour or so instead of having to wait for the right answer for several weeks.

The engineering and production department have stated during the interviews that they feel that they should have the freedom to communicate directly with procurement to streamline information exchange and reduce the likelihood of miscommunication. However, according to interviews with procurement, direct communication between departments is discouraged to maintain the integrity of the information chain. Furthermore, the employee explains that the engineering and production department's desire for direct communication with procurement is understandable since it may expedite the decision-making process and reduce the time required to resolve issues. However, it is equally crucial to maintain a centralized communication system to ensure that all relevant stakeholders are informed and that the company's processes are consistent.

The interviews also highlighted the need for improving information about whom to contact for different matters. Many employees reported that their ability to connect with the right person

within different departments was due to their experience within the company. However, new employees lacked this experience and found the process of finding the right person to communicate with time-consuming and challenging. To address this issue, one employee claims that the company must establish clear communication protocols, including guidelines on whom to contact for specific matters and provide new employees with the necessary training and support to navigate the communication channels effectively.

As noted in the previous section, the hybrid format of having some people working from home and the rest in the office is mentioned as one thing that decreases the efficiency of projects. Communication can be challenging when some members of a group are physically present, while others are working remotely from home. Several interviewees have noted that the lack of eye contact in virtual meetings can make it difficult to determine whether all participants are fully engaged, understanding the discussions, and actively participating. This is described as a phenomenon that results in a feeling of disconnection or exclusion of hybrid workers and can hinder the effectiveness of communication as a whole. Hybrid working also limits the employees' ability to have a quick meeting for a couple of minutes and instead, they have to schedule a meeting.

During the interviews, another issue mentioned was the lack of meeting rooms in the company's facility. This inconvenience is described to lead to a complicated communication process, as employees need to spend time searching for available rooms and suitable spaces to hold meetings where they can communicate freely. As a result, some people may miss parts of meetings, or in some cases, may not attend them at all. Moreover, effective communication between employees who are physically present in the office and those working remotely requires an environment where everyone can express themselves freely and be actively involved. This can be challenging when working in an open-plan office with constant noise and distractions around. Therefore, having adequate meeting spaces is essential to facilitate productive communication and ensure that all team members feel included and engaged in discussions.

Lastly, according to one of the interviewees, interdepartmental communication appears to be effective, largely due to the individual's utilization of their experience to acquire information. Nevertheless, there is evidence to suggest that interactions between the DPL's and procurement departments are adversely affected by a negative interpersonal attitude during times of heightened stress, a concerning phenomenon that requires acknowledgment and prompt intervention. According to an employee working at the procurement department, it is imperative to establish and maintain a workplace culture that prohibits inappropriate expressions towards employees and other staff members, particularly in cases where the underlying circumstances are not fully understood. Such behaviors are incompatible with a healthy and respectful organizational environment, and should not be condoned under any circumstances. During stressful projects when time is critical, procurement staff have noticed an increasingly negative tone in conversations between them and the DPL's in the engineering function. This is described by procurement personnel as incredibly stressful as a lack of respect between departments increases the distance between departments and leads to poorer working conditions for all involved.

4.1.3 Qualitative data findings on information quality

Interviews provided different insights into information quality within the company where some interviews described the information shared within the department as high quality, while others didn't share this opinion. The people satisfied with the quality of information mentioned that some of it still was considered excessive but they have managed to accept this fact and know how to scan through emails to find relevant information. They further stated that the information was well provided in meetings with the heads of different departments and during these meetings, all questions and possible ambiguities were answered. During the interviews, some project leaders discussed how the company's use of increased information flow has benefited the company by breaking down project details into smaller, more manageable pieces of information. This approach has helped facilitate the work of those involved by providing clearer direction on how to complete

the work. This is accomplished through the addition of a layer in the project hierarchy that solely focuses on breaking down large quantities of information.

However, not all project leaders agreed with this view. Some expressed concerns about the excessive nodes in the flow of information, which can lead to information becoming more unclear as it moves through multiple sources. Specifically, these concerns were related to how customer requests for projects are communicated and broken down through a baseline program before being delivered to sub-project leaders within each project. As a result, some project leaders felt that this approach could create inefficiencies and cause confusion, rather than facilitate the work involved. Adding layers is also mentioned as a risk factor where information could get stuck.

During the interviews, employees from various departments expressed concern about the overwhelming volume of emails circulating in the company. They pointed out that navigating through numerous emails to find relevant information is time-consuming and can result in important matters slipping through the cracks. Additionally, the excessive amount of emails can lead to information overload, stress, and frustration. Furthermore, some employees felt that the number of meetings held in the company is excessive and unproductive. They suggested that streamlining the process and reducing time and effort could be achieved by inviting only relevant staff to meetings. However, some participants expressed that the general perception is that inviting more people than necessary to meetings is done out of uncertainty over who handles specific issues or who should be included. This lack of clarity in communication can lead to inefficiencies and confusion. Therefore, employees would benefit from clear guidelines on who should attend meetings, to avoid unnecessary attendees and ensure productive meetings.

Regarding the quality of information, the majority of employees interviewed expressed concerns about the lack of clarity on what information is required from other departments to carry out their work effectively. Specifically, those in the purchasing department explained how the information requested is already available on the "internal planning system", but those requesting it either do not know where to find it or prefer to receive it via email. This puts an additional workload on the purchasing department, who are unable to fulfill all the requests due to their existing workload.

In contrast to the perspective of the purchasing department, project managers described the situation as the necessary information not being readily available, requiring them to request it from other departments. The lack of personal contact between departments only worsens the situation, as emphasized by both sides. Moreover, the interviews with procurement revealed that PM is not effectively utilizing the planner, whose role is to act as an intermediary between departments and facilitate workload management. Additionally, the decision to prevent direct contact between purchasing and PM has created a further divide between the two departments, leading to an "us vs. them" mentality. As the procurement department can be involved in multiple projects with multiple project managers, having all of these frequently asked questions about deliveries from suppliers instead of utilizing the "internal planning system" and the project planner increases the workload and decreases their ability to perform and deliver to the project.

4.1.4 Qualitative data findings on project management

The majority of the interviewees expressed their dissatisfaction with the internal process structure for projects as they found it to be overwhelming and more of a hindrance than a help in managing projects effectively. It was noted that most project leaders valued the freedom to lead projects in their way. They emphasized that each project is unique and therefore requires a tailored approach to ensure its success. Thus, they believed that it was crucial to have the flexibility to act according to the specific needs of each project. Therefore, while the company has a process structure in place, the interviewees highlighted the importance of having the autonomy to manage projects in a way that is best suited to their specific requirements.

During the interviews, it was mentioned that the employees are simultaneously working on multiple projects, given their project-based nature. However, several areas are mentioned by the workers during the interviews as needing improvement for the company to achieve greater success. One recurring theme in all interviews was the time management issue between production, planning, engineering, and procurement. Personnel from the procurement department highlighted the need for earlier involvement in projects as their job is time-consuming, and negotiations with suppliers cannot be done overnight. According to purchasing, construction, and design take up much of the project time, resulting in purchasing having to make up for the lost time in other segments of the project. As a result, purchasing does not have the optimal conditions to negotiate with suppliers, which can ultimately impact the cost estimate by compromising the ability to arrange favorable prices and delivery conditions. Purchasing argues that project managers need to take a bigger responsibility for distributing time between different activities appropriately. Furthermore, they mentioned that when one function is not able to keep up with its timeline, many project managers use the procurement function as a way to make up for lost time.

The majority of interviews described that the structure for estimating costs was a critical issue that had a major impact on the cost performance of the projects. According to those responsible for initial cost estimation, the data is gathered in a relatively short period, sometimes during two weeks, to start negotiations with the customer. However, the project may not begin until 2-3 years after the cost estimate has been made. During this time, many of the factors that were included in the cost estimate may have changed, such as materials, products, suppliers disappearing from the market, and time estimations. Meaning, that the project managers are already from start pressured by a tight deadline from upper management. This means that the prerequisites for managing a project properly and following guidelines are difficult. The majority of interviews conducted with DPL's mentioned this as an unsustainable problem that needs to be addressed for them to be able to meet the customer demands. Similarly, one significant issue raised by the purchasing department was the alarming increase in staff turnover attributed to unsustainable working conditions. Although this problem mainly affects certain product categories, it remains a critical concern since the department handles components that are crucial and consistent in all of the company's products. Which they mentioned was a result of the top management's desire to stay competitive in the market and accept contracts with tight schedules.

Empirical findings suggest that the company is experiencing a high turnover in staff, as reported by employees from both procurement and engineering departments during interviews. The participants discussed the challenges that arise due to the high turnover, including the loss of valuable knowledge and expertise, delays in project timelines, and increased workload for remaining staff. Since the projects have tight schedules, many employees argued that the new employees get involved too quickly with the projects. They mentioned the importance of giving the new employees a solid introduction to their duties and responsibilities but also creating a holistic understanding of other functions' challenges and problems. The interviews further state that different functions within the company are highly interconnected and decisions made in one department will have an effect on other departments involved in the project. Therefore, creating a holistic understanding of all functions is key to project success.

The procurement function has identified that the experience and skill levels of the DPL's in the engineering functions vary significantly, and this variance can have a direct impact on not only the success of their current project but also on other projects in the organization. They mentioned that some DPL's inability to follow processes related to orders is a recurring issue. What happens is that the leaders that have placed the order too late will risk not being able to keep up with the timeline. As a measure, the leader pressure procurement for that specific component/product which eventually will give the leader the component/product that belongs to another project. This has become an issue in the procurement function, where leaders get punished for others' mistakes. Unfortunately, it has become a prevalent notion that individuals who raise their voices the most tend to receive preferential treatment. This approach prioritizes volume over merit and may lead

to a skewed distribution of resources and attention. It's important to cultivate a culture where everyone's needs are heard and valued, regardless of their ability to make noise. Furthermore, the procurement department mentioned that they do not know which project to prioritize, which can lead to less important projects receiving extra attention instead of those projects who should be prioritized.

The decline in working conditions is said to have been caused by a reorganization that was implemented a year ago, where the purchasing organization was centralized for all offices in the country. As a result, employees have been subjected to unfavorable working conditions that have led to dissatisfaction and high turnover rates. The company's high staff turnover rates have resulted in the recruitment of inexperienced individuals who lack knowledge and understanding of the company's operations. This is concerning since the company has established a complex process that requires time and effort to learn and master. The addition of new, inexperienced staff members in a workplace where morale is already low poses a significant challenge in meeting customer demands and adhering to cost estimates.

Concerning teams, it was mentioned that there are no homogeneous teams. Instead, for each new project, the DPL's estimates their demand and what competencies they will need to deliver their part of the project. This is expressed to the managers in charge of each "competence team". This new collection of competencies will then form a temporary team during the project. Some interviewees mentioned that they believe this hinders the creation of successful collaboration since it is only temporary. Also, one interviewee mentioned that it is a high risk that the knowledge gained during the project will be lost since the members will be assigned to new teams with new challenges. One thing that many of the interviews mentioned was that the company possesses a lot of talent with specialized skills. Since the company is organized according to specific competence it is possible to retain the knowledge within the team and improve the products in that specific field. One employee mentioned that the way the company improves the knowledge is similar to hockey, where goalies practice with goalies, defenders with defenders, and forwards with forwards. Meaning that they allow for great competence within their specific fields but less overall awareness.

Some interviews expressed concerns regarding the premises that the company accepted all types of customer contracts. It was mentioned that the company allows for too much differentiation since they move out of the way just to get the contract. The result of this is too complex projects with too much uncertainty which then leads to delays and loss of profitability. According to some employees, changes are needed to the current product strategy to improve profits but also organizational efficiency. Instead of focusing on the projects, the main focus must be on the product. One common suggestion that comes up is to modularize the product and only allow differentiation up to a certain percentage. This means that all focus will be on the main product. If a customer demands a certain design or function that the company believes will bring more competitiveness in the market they should integrate that into their standard product.

4.1.5 Qualitative data findings on procurement involvement

The interviews revealed that the involvement of procurement in projects can make or break the project's success. A well-executed procurement strategy can lead to successful project delivery, whereas a poorly executed procurement process can result in costly delays, low-quality products or services, and even project failure. One of the most significant benefits of effective procurement that was mentioned in the interviews with personnel from this department was cost savings. As procurement's job is to reduce project costs by negotiating favorable prices with suppliers, optimizing delivery schedules, and ensuring that the purchased goods or services meet the project's quality standards, the project needs to involve procurement personnel earlier in the project. All interviews with employees from the procurement department resulted in the same information, where procurement felt that they got involved and included too late to help the projects achieve benefits related to deliveries and cost.

4. Empirical Findings

According to the interviews conducted, the timing of procurement activities has a significant impact on project success. However, the company currently lacks effective procurement timing strategies. All employees from procurement emphasized the importance of early involvement in the project planning phase to ensure that the procurement strategy aligns with the project's objectives and timelines. The interviews with one procurement employee highlighted that being involved in 25 projects simultaneously can impact the ability to equally engage in all projects. This can create challenges for procurement personnel in terms of prioritization, workload management, and ensuring that all projects receive adequate attention.

According to the interviews with the engineering leaders, there is a successful collaboration between their team, production, and planners. However, collaboration with procurement is facing challenges due to physical and collaborative distances between departments. After the reorganization, physical distances have increased, making it more difficult to involve procurement in projects. Engineering, production, and planning all agree that procurement needs to be involved in the projects to succeed. Procurement is also aware of this. The problem that arises during the interviews relates to the level of involvement and how to include procurement in the projects without risking unsustainable working conditions.

During the interviews, a DPL pointed out that the high turnover rate of staff within procurement has added another layer of complexity to the involvement. Since projects can be lengthy, spanning over 2-3 years, involving procurement personnel in these projects can be quite challenging. Moreover, procurement personnel assigned to operational tasks for projects based in one location may be located in other areas, which can create logistical difficulties in involving them in project-related activities. This, in turn, can create a feeling of detachment and lack of engagement among procurement personnel, making it difficult to get their input and involvement in project decisions.

Moreover, a DPL in the engineering department mentioned an example of why procurement needs to be more involved in projects and act more proactive. This example refers to an important component in one of the development projects where the acquisition of this specific product was crucial for the project to continue. As the DPL ordered this component, procurement couldn't find this product within their "normal" suppliers which would have resulted in a significant delay in the project. Instead, the DPL asked an employee from the construction team to search for this product elsewhere, and was found just shortly after by a different supplier. This solution is irrational since the normal processes of procurement were overlooked but the DPL stresses the importance of getting procurement to think outside the box and seek solutions to keep up with the timelines. A similar example was mentioned by another DPL in production where the order was finally placed with a different supplier other than the normal supplier. The other supplier who had access to the right material was not possible to order from the company due to contract details, which meant that an irrational path had to be chosen and the normal supplier had to carry out this order for the company.

To mitigate these issues, the employee mentioned that it may be necessary for the PM team to develop strategies to engage procurement personnel and create a sense of ownership and responsibility for project outcomes. For example, this could include regular communication channels, involvement in project planning and decision-making, and training and development programs to foster cross-functional collaboration between departments. By creating a collaborative work environment, the PM team can improve procurement involvement and contribute to the overall success of the projects.

Finally, after interviews with the purchasing team, it was discovered that employees from the production, planning, and engineering departments have approached them to participate in projects. The goal of such interactions was, according to interviews, to improve the team's understanding of the project and their contribution toward its successful completion. Although, the employees interviewed from the procurement department couldn't provide a clear answer to why this hasn't

been fulfilled lately and why they currently do not utilize this to improve insight and knowledge regarding certain projects.

4.1.6 Summary of the qualitative data findings

The main findings and the most recurrent problems are summarized in Table 7. Based on the interviews conducted with employees, it was found that internal collaboration within the project is challenging when valuable knowledge is missing among different functions. The majority of the interviewees mentioned that functions often fail to recognize the significance of each other's goals and how they contribute to the overall project objective. Based on the interviews conducted, it was found that poor understanding among employees leads to a lack of involvement and a sense of "loss of ownership and entitlement of the project" as expressed by some interviewees. In addition, the distance between functions also impacts collaboration as it hinders frequent communication and understanding among employees. Therefore, interviews emphasize the importance of communicating frequently and have a good understanding of their respective roles and goals.

The study's key findings on communication processes indicate that the current mode of communication is insufficient and cannot keep up with the demands of today's fast-paced world. Waiting for email responses is no longer a viable option, and individuals require timely feedback. Therefore, there is an urgent need for more efficient communication processes. The impact of hybrid work arrangements on communication processes emerged as a prevalent theme in the interviews conducted. Participants noted that the lack of face-to-face interaction inherent in hybrid work models can complicate communication, particularly in instances where prompt and efficient communication is essential. Communication gaps caused by the inability to have quick face-to-face communication can lead to delays, missed opportunities, and decreased productivity.

Another recurring topic in the interviews was unproductive meetings. Participants highlighted that poorly structured meetings not only waste time but can also negatively impact employee morale and engagement. Therefore, those responsible for organizing meetings must take a more significant role in ensuring that meetings have clear objectives and that only relevant stakeholders are invited to participate. This approach can enhance the effectiveness of meetings and prevent unnecessary time-wasting activities that may hinder the attainment of organizational goals.

Regarding information quality, the interviews revealed that unnecessary information was circulating within the organization, which caused confusion and wasted time. This led to employees forgetting important information and making mistakes. Additionally, it was challenging to find the right people to contact, resulting in longer information flows and involving people who should not be involved. Employees with a broad network and experience within the company mentioned that this ensured quick information loops. However, many employees stated that they needed to chase information and believed that there was a lack of proactivity in the information flow. Another concern was the unclear rules surrounding procurement, and when it is appropriate to contact them.

In terms of project management, the interviews highlighted concerns about the company's high staff turnover rate, which affected project efficiency. New employees needed time to adjust to their roles and become familiar with the project, which resulted in delays since projects were often on a tight schedule. Several employees emphasized that new staff required a better understanding of other functions to gain an overall perspective of the project. Additionally, the interviews revealed a large difference in project leaders' capabilities to manage projects and teams, with some lacking guidelines and supporting tools. The poor prerequisites for success in a project were also a significant issue, attributed to the organization's competitiveness in the market.

Lastly, a common theme from the interview was the procurement involvement in the projects. Poor transparency and high staff turnover make it hard to establish a mutual collaboration since there is a lack of clear contacts. The late involvement of procurement in projects means that there is no time to scan the market for the best prices. There is a common understanding from all interviews

that procurement plays a big role in the projects and needs to be involved to be successful. The problem arises on what level of involvement is sustainable for both parties. In some projects, procurement could be involved in as many as 25 projects, which means that time management is crucial.

Table 7: Summary of qualitative findings

TOPIC	PROBLEMS			
Internal Collaboration	Lack of project understanding: Employees act without understanding the scope	Lack of transparency: Inability to relating to others' processes	Physical distance: Hinders formal and informal collaboration	Poor understanding of goals: Relating local goals to the overall project goal
Communication	Slow feedback processes: Does not keep up with the urgency of the project	Unproductive meetings: Meetings must have clear agenda	Hybrid working: Complicates the communication	Lack of office space: Valuable time is lost
Information quality	Excessive flows: Time spent searching for valuable information	Lack of proactivity: Information does not get shared naturally, it is chased	No clear contacts: Time wasted searching for the right contact	Unclear rules and guidelines: Functions are not allowed to be contacted
Project management	Staff turnover: Loss of efficiency	Guidelines and tools: Large difference in managers' capabilities and skills	Poor introductions for new employees: Does not focus on other functions	Poor prerequisites from top management: Tight deadlines on project contracts
Procurement involvement	No clear contacts: Time spent finding the right purchaser	Low proactivity: Creativity is needed to keep up with the deadlines	Level of involvement: Can't keep up with other functions' expectations	Late involvement: Lost time for procurement

4.2 Empirical findings from interviews on internal delays

The following section will present the empirical findings from the interviews connected to internal delays. The interviews conducted with participants provided insights into the occurrence of events that have impacted projects. Through these interviews, specific examples of such events were recounted by the participants, which provided a better understanding of the types of events that can have an impact on project outcomes and where these occur. In Table 8 all internal delays are listed that were brought up during the interviews including functions involved, what happened, and the reason why the situation occurred. The examples provided by the participants illustrate the various ways in which project delays can occur.

4. Empirical Findings

Table 8: Internal delays mentioned in interviews

What happened?	Why did it happen?	Between what departments?	Result
Procurement took the decision to buy JIT (Just in time) - Procurement wasn't aware of the specifics type of project, which in this case was a development project. Products should not be bought JIT due to short project timelines.	No lesson learned was conducted prior to the delay, reason for delay unknown.	DPL - Procurement	Project delayed several months
No component assurance was made and therefore products were not delivered to the company in time.	Miscommunication	DPL - Procurement	Project delayed several months
DPL was not notified about component shortage at a supplier	Miscommunication	DPL - Procurement	Went through an internal designer to locate and order from another supplier
A request was made, but the procurement department never executed the order to the supplier, which was discovered later in the project.	Miscommunication	DPL - Procurement	Consequence unknown
Requirements released for material too late - Procurement could not acquire the material from supplier in time as the lead times were too long.	DPL has poor visibility of suppliers' and vendors' schedules and workloads. Poor communication and understanding between departments mean that work processes can differ depending on components and people.	DPL - Procurement	Consequence unknown
The procurement order was not placed because the supplier had a shortage - This was not communicated to the person responsible for the project.	After order was placed, the DPL in production assumed that the material would be delivered on time.	Production - Procurement	Order was placed with a different supplier but was delivered later than expected
Orders get stuck in procurement and are not placed when needed.	No lesson learned was conducted prior to the delay, reason for delay unknown.	Planner - Procurement	Order placed later than expected, consequence unknown
Component assurance was placed but not considered as a real order by procurement. - The DPL found out that the component was placed and order when the full order was placed. The components that were needed earlier were not ordered when needed.	No lesson learned was conducted prior to the delay, reason for delay unknown.	DPL - Procurement - Planner	Consequence unknown
People release their requisitions at very different times. - The order process is not followed by all DPL's	Poor project execution and planning by DPL	DPL - Procurement - Planner	Late deliveries, other projects get deprioritized when more urgent projects need their material.
Procurement have requested DPL's to enter which project the order belongs to in the internal order system but all DPL's do not fulfill this request. - This increases the workload for the procurement department and causes delays.	DPL does not have time for this and considers it a procurement task.	DPL - Procurement	There are orders in the system with no attachments that takes time to resolve and delays daily work and decreases the efficiency at procurement

After conducting the first round of interviews at the company, various delays were mentioned and how they occurred. The interviews increased the understanding of the research on how and where problems occur within the company. To dive deeper into these delays and understand how they affect projects, further interviews were conducted with DPL's from five different projects. These specific projects were chosen because they had expressed clear reasons for delays and how they ultimately affected the project. These delays will be presented in detail in the following sections.

4.2.1 Internal delay 1: Example of internal delay caused by procurement processes in development projects

The first example of an internal delay that was brought up during the interviews happened between a DPL in the engineering function and the procurement function. The project in this case was a development project which means that orders placed to procurement will end up in a separate flow than normal customer projects. The DPL also pointed out that components or materials that are ordered must get delivered as quickly as possible to keep up the development and eventually reach the market. To gain time in the projects, the company conducts material assurance processes which enable them to lower the lead times. This means that components that the DPL knows or believes will be part of the module are ordered in advance. Worst case scenario, a component is ordered in advance which not will be used and the company will have to own that expense. The engineering function had prepared all work and requisitions and was ready to place the order but was stopped by the organization's purchasing function. They claimed that orders needs to be placed by their subcontractor which the DPL did not know. The DPL also claimed that procurement could not explain the reason why the order could not be placed by the organization. According to the same person, this is a matter of principle and formalities, which then only affects the company's efficiency. Furthermore, it is mentioned that this is a situation that has happened several times but those other instances were not documented by the person. If the purchasing function placed the order in-house rather than transferring orders to be made by a subcontractor, the DPL argues that much time could be saved during the development projects. When the order is placed by an external function the DPL loses insights into the progress and how orders get prioritized which affects the project timeline. The DPL further explains in the interview that this problem lies within the procurement function since it is their processes and reasons why this occurred this time and the previous times.

4.2.2 Internal delay 2: Miscommunication leads to delays in a development project involving multiple departments

During another interview, a second delay was identified in a development project that involved engineering, production, and procurement departments. The project aimed to update an existing product for a customer and had a tight timeline, making it vulnerable to complications in the process. The delay occurred due to miscommunication between the engineering, production, and procurement departments. Specifically, production did not communicate to procurement that a material assurance was required for one of the three components needed early in the process. Consequently, all three components were ordered at the same time, creating complications for the subcontractor as they had different lead times.

In the context of a project involving the production of multiple cards, it has been previously communicated that one of the cards requires early submission, and a material assurance had been provided. However, it has come to light that the dates for delivery have subsequently disappeared, and there has been a rearrangement of the production schedule without proper communication with the relevant parties. This action appears to have been taken by an individual without clear justification or explanation. The discovery of this situation was made by chance, during a purchasing conversation with the production team. The person responsible for placing the order did not appear to comprehend the importance of prioritizing the production of specific cards, such as those that have already been materialized and are ready for development. Consequently, all cards have been treated as though they are part of a uniform production sequence, with no consideration given to the unique requirements of individual cards.

Therefore, the subcontractor was unaware of the criticality of delivering the components at different times, as this was not communicated by procurement, and production did not realize that the project was a development project which requires different handling than a customer product project. According to the DPL, production should have understood that only one of these components should be ordered, but that wasn't the case in this specific situation.

In summary, the delay in the development project was due to miscommunication and a lack of understanding of the project's requirements by different departments. The project's tight timeline made it vulnerable to such complications, highlighting the importance of effective communication and collaboration among teams in development projects.

4.2.3 Internal delay 3: Delay in an engineering project due to procurement negligence in material insurance

The third interview is an internal delay that happened between DPL at the engineering department and the procurement function. The delay is rather similar to the previous example since it involves a material assurance that did not get executed promptly. The DPL mentioned that all information regarding this accident is not clear and therefore the underlying reason for the delay could not be concluded. What is known from the DPL part is that the material assurance was made correctly and sent on time to the procurement function. So the issue was either procurement's fault since they forgot to transfer the order to the subcontractor, or it could be the subcontractor that forgot to place the order, with a combination of lack of following-up from the procurement function. The DPL further argues that this delay had nothing to do with the engineering function and it is not their job to make sure that procurement does their job. Since it is procurement's responsibility the DPL has not spent time evaluating the situation to understand what went wrong. The DPL also points out that there is a difference between working as a DPL and in the procurement function and therefore you can't overlook others' responsibilities to make sure that they get done. On the question of whether an analysis has been made to understand the root cause, the DPL answered that it is not their responsibility to do procurement's job. The DPL also mentions that they only look for solutions to these problems as they occur and do not focus on the actual root cause.

4.2.4 Internal delay 4: Procurement and engineering ordering process misalignment resulting in delay

This delay example occurred between the functions of procurement and engineering and involves the ordering process. In this project, engineering had to go through with changes to some of their products. This means that a large percentage of the original product remains the same but one part gets updated. From engineering's aspect, this requires a large amount of work which means that when these work packages are done, they need to be ordered quickly. The part of the product that will be updated could for example consist of five products. This means that engineering will work on one product, order it, and then continue to work on part two. When this part is done it gets ordered and this process continues until all five parts are done and ordered. The problem arises since this way of working is not supported by procurement routines and systems. To move forward and find a solution, a meeting was held with procurement, engineering, and the inbound control function. Since the manager of the engineering's construction function could not attend the meeting, a team leader from construction was present. The meeting resulted in a solution that was communicated to the manager, which did not approve the new solution. The manager then informed procurement that they did not support this solution since it was not an appropriate way of working. The DPL from engineering that was involved in this project assumed that these conversations would continue and that the functions could come up with a new solution that would fit both parties. Instead, the conversations stopped and the DPL found out three weeks later during a conversation with the subcontractor that nothing had been ordered yet. According to the DPL, this is totally up to procurement to solve since it is their responsibility. This situation then escalated and became a problem for the company, since this was a crucial phase of the project. A new meeting was then held, and after fifteen minutes a solution was reached that all parties could agree on.

The DPL further argues that the procurement function was well aware of how crucial this product was in terms of the project and that this situation was not a case of a lack of common understanding. It was also mentioned that the first solution that was rejected by the manager meant that

engineering would have to take responsibility for parts that involves procurement assignments.

4.2.5 Internal Delay 5: Challenges in decision-making and responsibilities cause delays in a complex project

The last incident was described by the same project manager and relates to how decisions are taken within the organization and who is responsible for making sure that the actions taken are correct. The project manager described an issue in a project which is currently ongoing where the company has realized that one component, part of a larger product, has quality issues and needs to be reproduced. To resolve the contract with the customer and deliver on time, the company will conduct updates on the previous product which results in a better quality and a satisfied customer. This process is done by a supplier and due to complex processes and questionable results they have refused to accept this project. To make sure that the supplier fulfills their assignment, the company decided that a contract should be written between them and the supplier, assuring that they will be free from possible complications of this update.

After the contract was signed, another business area within the company became aware of this process and refused the contract as a way of assuring that the component was produced accurately. According to the project manager, the contract wasn't enough and they also had to have employees visiting the supplier to control the process as they produced this component.

According to the project manager, this is a problem caused by not being aware at an early stage of the project of how long it takes to produce a product that the customer is satisfied with, while problems arise during the project that needs to be solved. There is no clear template for how to act in all these cases, but sometimes you choose to make a decision, as in this case when the company chose to sign a contract with the supplier. This was not a sustainable solution and had this not been addressed, there is a risk that more complications would have arisen later on.

4.2.6 Summary of internal delays from a qualitative perspective

As a result of the interviews conducted, it became clear that the primary cause of internal project delays in the organization was a communication breakdown between the procurement function and the DPL's in production and engineering. The examples provided during the interviews mostly involved material assurances, which appeared to be a problematic process leading to delays. However, there was a variation in knowledge about incidents during the interviews, and some examples were not discussed in detail due to a lack of documentation or personnel changes. Among the reasons mentioned for project delays were miscommunication, poor planning by project managers, and a lack of time to fulfill assignments. The examples provided during the interviews can be a valuable resource for organizations seeking to improve their project management practices by gaining insights into specific factors that contribute to project delays and developing effective strategies to address them.

4.3 The impact of internal delays

The following section will follow up on the findings of internal delays that were presented in Section 4.2 which addressed where and why the internal delays occurred. This part will focus on the actual impact and how the examples affected the project performance. Since the data quality differed between the interviews, there will be a difference in specificity between the examples.

4.3.1 The impact of delay 1: Example of internal delay caused by procurement processes in development projects

The first delay that was mentioned was between the engineering and the procurement department. This delay was due to a miscommunication between the two parts which resulted in a delay. The

initial project timeline had planned for 40 days lead time until the product ordered would arrive at the organization. This was due to the miscommunication extended and arrived instead after almost 3,5 months which is a delay of 2 months. The initial duration for this development project was 18 months which means that 11% of the work time was lost. Since the project was not able to regain this time the whole project had to be extended with two months. On top of this, the interviewed DPL mentioned that this delay affects the engineers since they get stuck and can't keep progressing. Also, it is mentioned that when delays are longer, they come with additional hidden costs for 'pausing' and 're-initiate' the projects. This cost is very difficult to estimate, but the impact of this type of cost affects the project both financially and on its schedule.

4.3.2 The impact of delay 2: Miscommunication leads to delays in a development project involving multiple departments

The second delay was a miscommunication and a lack of understanding of the project scope between the functions of procurement and production. For this development project, an initial plan was made which meant that the project would last for 18 months. The internal delay that occurred resulted in the extension of 6 months which accumulates for 33% of the total work time. The DPL mentions that this delay is substantial and it is not still clear if it is possible to regain the lost time and meet the deadlines. So the effects of time are still not known today. This delay also means that efforts have to be placed to regain this time which will act as an additional cost outside the original cost estimation. These actions are calculated by adding the cost of estimated hours required by employees, which the DPL mentioned is on the lower side and will probably increase. Meaning that these hours were not needed initially but were added to regain the loss of time. With regards to the initial cost estimation, this will add almost 13%. The internal delay will also affect other parts of the project since all planned assignments will be pushed forward in the schedule. According to the DPL, this means that there is a large risk that the test that needs to be conducted to ensure that standards are being met is now scheduled during the summer. This could in turn affect this phase as well since people are on vacation and there is a risk that things will be forgotten or left out. This could be negotiated and therefore allowed to be conducted at a later stage if they get an agreement. Similar to the first example, the DPL also mentioned that they also will suffer from the hidden costs for 'pausing and re-initiating the project. Lastly, the DPL mentioned that there could be a risk that not being able to meet the deadline according to the contract could result in a fine. Since the DPL is not involved with any details about the contract with the customer, it could only be concluded that fines were a potential impact.

4.3.3 The impact of delay 3: Delay in an engineering project due to procurement negligence in material insurance

The third delay was a situation that not have been analyzed since it was believed by the DPL at the engineering department to be procurement's fault and their responsibility to understand what went wrong. The situation that was a material assurance that did not get placed to the subcontractor resulted in an internal delay. The time that was lost according to the timeline was 5 months. The DPL mentioned in the interview that the person did not know the length of the whole project so it is difficult to understand the actual impact of losing 5 months. The DPL also mentions that it is possible to regain the lost time by using external resources from other projects but it is not possible to estimate the cost or time for this.

4.3.4 The impact of delay 4: Procurement and engineering ordering process misalignment resulting in delay

The result of this specific event was a one-month delay to the project which during the interview was described as something that can have profound effects on the schedule and ability to deliver to customers on time. The total project length was 18 months which means that this delay wasted around 6% of work time. On the question of whether it is possible to regain lost time, the DPL answered that is highly unlikely. This is because the product order is placed with a sub-contractor

and therefore it is not possible to work to make up for lost time. Furthermore, additional costs for adding resources from other projects, and potential fines from end-customer are likely to affect the project as well.

4.3.5 The impact of delay 5: Challenges in decision-making and responsibilities cause delays in a complex project

According to the project manager, the final delay encountered was a result of the prolonged process of finalizing the contract and deciding on the optimal course of action. The project manager reported that this process took over two months, during which no work was undertaken on the product, leading to a significant delay in the project's completion.

After the contract was signed, another division within the company became aware of this process and refused the contract as a way of assuring that the component was produced. The project manager reported that the contract failed to meet the project's requirements and was, therefore, deemed inadequate. Instead, they had to have employees visit the supplier controlling the process as they produced this specific component. The process took over 6 months and has caused a serious delay on the project which currently will delay the delivery to the end customer. The result of this process has so far caused major issues within the company where resources have been relocated to solve the issue and these mitigating measures have not been able to make up for a lost time, which can have serious financial consequences as well as damaging the company's reputation and the relationship with this customer.

4.4 Summary of the impact of internal delays in projects

Based on ongoing projects and monthly averages for each project, this study presents estimated figures to determine the economic costs of potential delays. The varying duration of each project, which can range from one to several years, makes predicting delays challenging. However, most interviewees have stated that it is possible to make up for lost time later in the project, even in the event of material delays. The figures presented in this study should be viewed as a benchmark for quantifying potential losses that could arise within the company. Additionally, indirect costs related to factors such as tied-up capital, start-up costs, and resource pooling will likely have a substantial effect on the outcome of each project. These indirect costs are difficult to quantify and are therefore not included in the results of delays mentioned in the previous section. Start-up costs are particularly challenging for every project when delays occur, as employees from one project leave their work to help in other projects because their project has stalled or because another project is considered more critical to complete. These indirect costs will have an economic impact on the project's result. Finally, it is important to note that penalties and fines may be imposed if projects experience delays and the delivery to the customer is not made on the stipulated date. These fines should be regarded as additional costs to the project and should be taken into account in efforts to mitigate internal delays that may arise within the company. It is important to underscore that these fines are not within the authorization of DPL's in the department where the project is being executed but are typically handled by senior managers at a higher level within the company. Consequently, these penalties and fines will not be quantified in this report.

5 Analysis

In the following chapter, a comprehensive analysis will be presented which aims to delve into the issues brought up during the interviews. Since the issues are quite many and resources at the company are limited, a prioritization need to be made. This will enable the company to focus on the most important issues first. The prioritization is based on the frequency with which they have been mentioned in the interviews and how the issues impacted the delay-examples presented in Section 4.3. To further strengthen the prioritization and make sure that the company points its attention to the right issues, relevant literature has been used.

5.1 Determining critical factors for project success

In Section 4.1.6, the researcher has summarized the factors that were identified as the most frequently mentioned problems in the interviews in Table 7. These problems were reported by employees as having a significant impact on the projects and their performance. To prioritize and allocate resources more effectively, these issues stated were color-coded in three different colors based on their importance. The color code was decided on the impact on project performance as well as the frequency of these problems being mentioned during interviews. Red means that the organization needs to deal with this quickly since it is affecting project performance and that they were frequently mentioned by employees during the interviews. Yellow means that this is a problem that also affects performance but not to the extent as red, the frequency of these problems being mentioned was slightly less than the red problems. Green means that actions are not needed instantly but employees should still be aware of these issues. The green color problems were not frequently mentioned during the interviews compared to the yellow and red problems. In Table 9 all factors are colorized accordance to their importance for improving project performance. Since it is not viable or possible to deal with all problems at the same time, the focus will remain on the problems marked as red. This means that problems mentioned in the interviews and marked as yellow and green will not be considered for the remainder of the report. The following sections will explain the reasoning behind the colorizing.

Table 9: Prioritization of identified problems using color-coding according to frequency and impact on project performance

TOPIC	PROBLEMS			
Internal Collaboration	Lack of project understanding: Employees act without understanding the scope	Lack of transparency: Inability to relating to others' processes	Physical distance: Hinders formal and informal collaboration	Poor understanding of goals: Relating local goals to the overall project goal
Communication	Slow feedback processes: Does not keep up with the urgency of the project	Unproductive meetings: Meetings must have clear agenda	Hybrid working: Complicates the communication	Lack of office space: Valuable time is lost
Information quality	Excessive flows: Time spent searching for valuable information	Lack of proactivity: Information does not get shared naturally, it is chased	No clear contacts: Time wasted searching for the right contact	Unclear rules and guidelines: Functions are not allowed to be contacted
Project management	Staff turnover: Loss of efficiency	Guidelines and tools: Large difference in managers' capabilities and skills	Poor introductions for new employees: Does not focus on other functions	Poor prerequisites from top management: Tight deadlines on project contracts
Procurement involvement	No clear contacts: Time spent finding the right purchaser	Low proactivity: Creativity is needed to keep up with the deadlines	Level of involvement: Can't keep up with other functions' expectations	Late involvement: Lost time for procurement

Although communication was not marked as red in Table 9, it is important to note that communication plays a critical role in project success. The previous sections 4.2 and 4.3 highlighted how miscommunication can lead to costly delays. Therefore, it can be argued that the communication aspect is in urgent need of improvement. However, this thesis argues that poor communication is often a result of other underlying issues, and it is essential to address the root cause. One of the major issues identified in this research is the lack of internal collaboration and the "us vs them" mentality mentioned in the interviews. This issue may be one of the root causes of poor communication within the organization. This theme emerged repeatedly throughout the interviews, with employees expressing frustration over the feeling of being unable to work collaboratively across teams. This can create barriers to effective communication, hinder collaboration and innovation, and lead to a lack of understanding of how different parts of the organization work together toward a common goal. Essentially, it means that employees are working in isolated "silos" rather than being part of a collaborative, integrated team. Furthermore, the level of procurement involvement is also seen as a root cause of poor communication. Effective communication is crucial for the success of any project. As the procurement department is becoming less involved in projects, it is important to ensure that all departments collaborate and communicate effectively throughout the project's life cycle to prevent problems from escalating and affecting the project's outcomes. This becomes more challenging when the level of involvement from one department decreases, as

evidenced by the examples provided in the previous chapter. Thus, it is imperative to prioritize communication among all departments involved in projects.

5.2 Analysis of the company in terms of internal collaboration

Through conducting interviews, this research has shed light on one of the most commonly mentioned issues related to project execution within the company. The results indicate that internal collaboration between departments has become less successful in recent years. Employees cited two primary areas of concern: a lack of project understanding and a lack of transparency between departments. These issues are further illustrated in Figure 2, which visually displays the challenges associated with internal collaboration within the company. The findings suggest that addressing these issues is critical for improving project outcomes and overall organizational success. The following Sections 5.2.1 and 5.2.2 will analyze the reasoning behind why they were prioritized and marked as red.

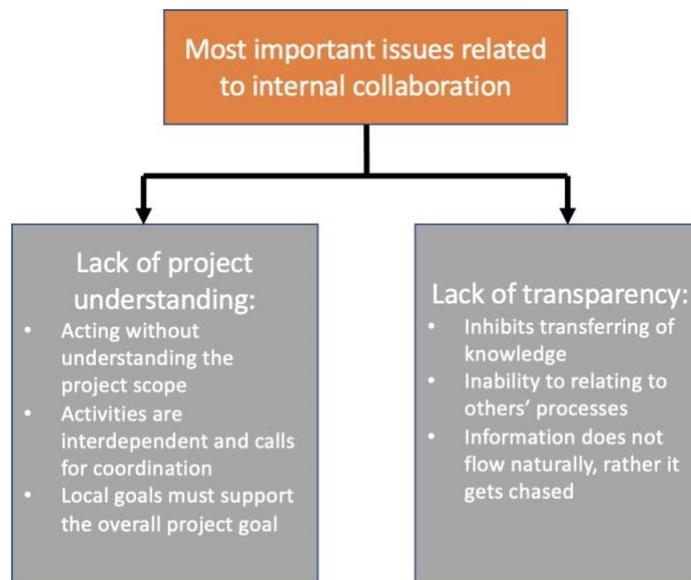


Figure 2: The most frequently mentioned issues regarding internal collaboration during the interviews

5.2.1 Lack of project understanding

During the interviews, it became clear that creating a mutual understanding of the project is crucial, as demonstrated by the internal delays presented in Section 4.2. Delay 2 serves as an example of this, where the production team acted without fully comprehending the project's scope. The team failed to realize that the project was in the development phase and that one particular card was needed urgently. As a result, the company suffered a significant delay of several months. To prevent similar delays in the future, it's important to ensure that all stakeholders involved in the project have a clear understanding of the project's objectives, timeline, and critical milestones.

Moreover, delays in the procurement department have often resulted from a lack of communication from engineering about specific project requirements, leading to confusion and errors in the procurement process. During the interviews conducted with various departments, the researchers noted a prevailing attitude of separation that is acting as a barrier to effective collaboration. This attitude is creating an environment where departments are not willing to work together towards common goals, leading to a lack of cooperation and coordination.

Furthermore, projects consist of activities that span over multiple company functions, and the result is dependent on coordination and collaboration. This is mainly due to the project understanding and making sure that all parts are well aware of success factors but also aware of consequences that might arise. For example, understanding urgency to keep up with the timeline similar to the delay presented in Section 4.2.4 or how actions taken in one function will affect the project outcome. This is also a common reason why many organizations need put efforts into integrating their functions which are mentioned by Pellathy et al. (2019). These authors mentioned three reasons which are goals, activities, and knowledge which is similar to this case. It is important to understand that activities are interdependent and actions in one function will affect others (Schuh et al., 2014). Furthermore, collaboration is the foundation for ensuring that information gets distributed between functions and Pellathy et al. (2019) argue that information is the source of avoiding problems. The majority of delays described in Section 4.2 are related to miscommunication and poor collaboration between departments which ultimately causes losses on the projects.

5.2.2 Lack of transparency

The importance of transparency was a frequent topic during the interviews, as employees realized that focusing on one function alone is not sufficient for improving project outcomes. Rather, it's essential to direct collective efforts toward improving as a whole. This was exemplified during delay 1, where the DPL lacked knowledge and visibility into the procurement function's processes. While the DPL needed to ensure development progress, procurement had rules and processes to follow, highlighting the need for mutual understanding and collaborative effort to achieve improvement. Similarly, during delay 3, where the procurement department forgot to place an order, the lack of transparency was again evident, as no discussion had taken place between departments and the reason for the delay was unclear. These incidents underscore the importance of transparency in preventing delays.

The issue of transparency is closely tied to the procurement concerns discussed in the first interview round. Procurement is responsible for acquiring high-quality materials at the lowest possible cost within the shortest possible lead time. However, in the current situation, procurement feels that their role in the project timeline is not being given enough priority and they are being overlooked in terms of cost. This highlights a clear disparity in how different functions prioritize various goals. It is essential to recognize and acknowledge the contributions of each function and ensure that they feel valued and heard. Failure to do so could result in a loss of stakeholder support and engagement. Thus, transparency and open communication across all functions are crucial to prevent such issues from occurring.

Lack of transparency is similar to the previous issue as it explains the lack of insights into problems and challenges other functions are facing. This also includes local goals that different departments are measuring. Separating different functions does not help with this matter since this only limits people's ability to relate to other's processes. This is also mentioned by Enz et al. (2019) as they pointed out that this was crucial for removing barriers between functions. Lack of transparency also limits the company's ability to transfer knowledge and conduct improvement that spans several departments. Eventually, this only leads to local improvements and knowledge is not transferred within the company for everyone to act upon.

Transparency in an organization is not limited to just providing information to stakeholders outside the company, it is also crucial to ensure that each department within the organization is aware of the priorities of other departments. Problems occur when the local objective does not support other local goals, which in turn means that there is a lack of mutual understanding of the overall company goal (Pellathy et al, 2019). When departments do not have a clear understanding of each other's priorities, it can lead to a lack of coordination and collaboration, which can ultimately affect the success of the organization and each project. Moreover, if departments are not aware of each other's priorities, it can lead to internal conflicts and unnecessary competition. Departments may end up working towards different goals, which can lead to inefficiencies and redundancy. This

can lead to a lack of trust and morale issues, which can further impact the overall productivity and success of the organization.

5.3 Analysis of the company in terms of project management and execution

The next major issues of the company that the researchers discovered during the interviews were related to PM and execution. The areas that will be analyzed in the following section are displayed in Figure 3 and concerns the company’s ability to provide new employees with a proper introduction to the company’s different functions, but also the effects of poor prerequisites from top management.

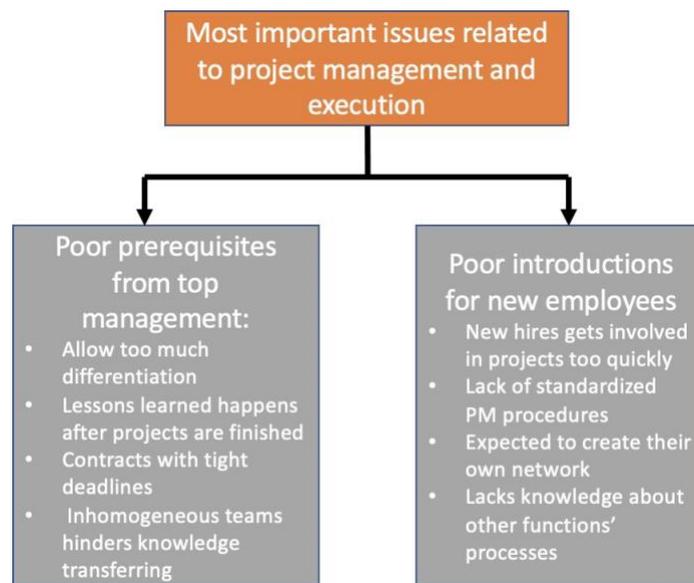


Figure 3: The most frequently mentioned issues regarding PM during the interviews

5.3.1 Poor introductions for new employees

The lack of proper on boarding for new employees was identified as a significant issue during the interviews with employees across various departments, including engineering, production, planning, and procurement. The absence of a structured introduction to project work and company functions left new hires to navigate tasks on their own, leading to confusion and errors. New hires must not be rushed into their roles without a proper introduction. This introduction should not only cover the processes and functions specific to their role but also bring awareness of other functions within the company. Unfortunately, the current introduction process is lacking in this regard. The interviewees noted that this resulted in a reliance on informal knowledge transfer, where experienced employees shared information with new hires. However, this approach was not always effective and led to inconsistencies in understanding and practices among team members. Furthermore, new hires are expected to create their internal network.

Inadequate on boarding processes for new employees can have detrimental effects on both individuals and the organization as a whole. Insufficient training and orientation can cause new hires to experience higher stress levels, lower job satisfaction, and feelings of disconnection from their role and the company. Furthermore, the lack of standardized procedures can lead to inconsistencies in how tasks are performed, ultimately impacting project quality and efficiency. During interviews with procurement department employees, it was apparent that there is significant variability in

the skill level of project managers. While some are meeting expectations, others are not performing at the required level. The interviews conducted shed light on a possible correlation between the inadequate on-boarding process and the sub-optimal performance of certain project managers within the organization. It was revealed that these project managers may not be receiving sufficient support during their initial phase of employment, which could be hindering their ability to effectively carry out their responsibilities.

Incorporating the lean philosophy, as described by Gubinelli et al. (2022), into onboarding processes for new hires may help to address these negative consequences by emphasizing the importance of a structured approach to onboarding. This can include training on company policies, culture, and PM methodologies. Additionally, establishing standardized procedures can help ensure consistency in how tasks are performed, leading to more efficient and effective project outcomes. Therefore, organizations need to prioritize the development of effective onboarding processes for new hires, incorporating principles from PM and the lean philosophy to ensure a structured, consistent approach that supports new employees and contributes to the overall success of the organization.

Lastly, proper onboarding and introduction of new employees can contribute to effective PM by enhancing the transfer of knowledge and experiences within the organization. This can further support the establishment of standardized practices that are tailored to organizational preferences, thus enhancing project effectiveness and promoting customer satisfaction and profitability (Kaufmann & Kock, 2022). The impact of PM on complex projects is crucial, as the level of PM applied is suggested to have a significant effect on the project outcome in terms of profitability (Kaufmann & Kock, 2022). By promoting effective PM practices, organizations can maximize the potential for project success, minimize waste and errors, and transfer knowledge and experience into organizational learning (Monteiro de Carvalho et al., 2015).

5.3.2 Poor prerequisites from top management

Inadequate prerequisites from top management can significantly impact a project and a project-based organization in various ways. Firstly, it can result in inconsistencies in task execution due to the absence of standardized procedures. As a result, this can increase the likelihood of errors and waste, reducing project efficiency and hindering organizational learning. Moreover, during the interviews conducted, it was highlighted that the projects have an excessively short timeline, causing high levels of stress for employees. In ETO environments, projects are designed to satisfy unique customer needs, often involving product differentiation to meet specific requirements. However, one of the challenges faced in these environments is the extended lead times for delivering customized products. This issue was also highlighted during interviews as a concern, as customers may have excessive input into product customization, leading to prolonged lead times and potential delays in project delivery.

During the interviews, it was also noted that time is often limited in projects, and the constant pressure to deliver products can result in lessons learned and evaluations not being prioritized. This can pose a significant challenge to systematic learning within the organization. In fast-paced project environments, where deadlines are tight and resources are limited, it is mentioned that project teams often prioritize completing tasks and meeting deadlines over reflection and learning from past experiences. The urgent need to deliver products on time results in a culture where learning and evaluation are seen as time-consuming activities that detract from the immediate focus on project execution.

The root of the problem lies in the dynamic nature of project organizations, where employees frequently move between different project groups. This constant reshuffling of teams and personnel results in the transfer of knowledge from one project to another being inconsistent and unreliable. Lessons learned from previous projects may not be effectively communicated or applied in subsequent projects, leading to the repetition of mistakes, missed opportunities, and sub-optimal performance.

The customization aspect of ETO projects can be both a strength and a weakness. On one hand, it allows for tailoring products to meet individual customer needs, enhancing customer satisfaction and potentially creating a competitive advantage through product differentiation. However, on the other hand, extensive customer involvement in customization decisions can result in complexities and delays in project execution. Increased lead times do not only affect customer satisfaction but also the profitability of the projects (Mello et al, 2015). Any small mistake can have a significant impact on the final delivery to the customer due to projects having tight deadlines. This was seen in Section 4.3, delay example 5, where the complexity of the project required the project managers to sign additional contracts due to the demands of customization from customers. As this wasn't dealt with in time, this caused the project to be delayed for several months.

5.4 Analysis of the company in terms of procurement involvement

Given the multifaceted nature of the procurement, it is essential to consider all related factors when formulating strategies to overcome procurement challenges. The importance of procurement in the overall success of a project necessitates a well-coordinated and strategic approach to its management and the most frequently mentioned issue at the company is displayed in Figure 4.

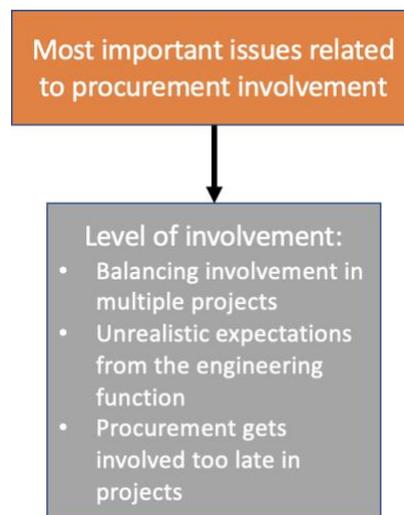


Figure 4: The most frequently mentioned issues regarding procurement involvement

Based on the interviews conducted, it has become evident that the company is facing significant challenges due to poor communication between the purchasing department and other departments. The majority of interviews from engineering and production departments point towards the disconnect between purchasing and the rest of the organization as a key contributing factor. However, according to the purchasing department, project managers' competency also plays a significant role in the issue. Effective communication within an organization is a critical factor that directly impacts project performance, and the lack thereof often hinders cooperation between departments. The interviews have highlighted that one of the primary reasons for this communication breakdown is the lack of early involvement of the purchasing department in the project's planning phase, which has led to issues during the execution phase and reduced engagement from the purchasing side. Therefore, it is imperative that the purchasing department is involved early in the project planning process, and the communication channels between departments are strengthened to ensure effective collaboration and the success of the company's projects.

Additionally, the interviews have revealed significant differences in perspectives between the purchasing and engineering departments regarding support from each other's departments. From the engineering side, there is a strong desire for regular feedback and constant communication with the purchasing department. However, the purchasing department views constant communication as a hindrance to their ability to focus on their tasks and responsibilities. In addition, the number of projects in which procurement employees are involved can vary greatly, ranging from just a few to as many as 25. This disparity in communication expectations can create challenges in the collaboration between the two departments. Engineering may feel that they are not receiving the necessary information and support from purchasing while purchasing may feel overwhelmed with excessive communication demands that disrupt their workflow.

One of the key factors contributing to the disparity in communication expectations between purchasing and other departments is the consequence of distancing purchasing from the rest of the departments after the reorganization. The interviews have revealed that purchasing has been more focused on the product and component level rather than the project level. As a result, the emphasis has been on performing their tasks related to products and components, rather than prioritizing the results and lessons learned from projects. This narrow focus on product and component-level tasks can indeed lead to a lack of integration and collaboration with other departments, such as engineering and production. The interviews describe that this has resulted in a siloed approach where each department operates independently, without effectively sharing critical information or insights from projects.

To achieve optimal outcomes, such as reduced costs, improved supply chain performance, and customer satisfaction, it is crucial to ensure that the level of procurement involvement in the project aligns with the project's objectives, goals, and production activities. Unfortunately, the level of employee involvement in procurement has been decreasing, affecting ongoing projects' efficiency and the overall success of the company. Therefore, it is essential to involve procurement in the project early in the process to improve the success rate of project-based organizations.

5.5 Challenges in prioritizing and addressing yellow-marked issues

For creating a healthy internal collaboration, a lot of the employees mentioned during the interviews that physical distance was a problem. This issue was mainly related to the procurement function and the recent organizational restructuring that was conducted approximately a year ago. This restructuring has made it more difficult to establish a collaboration and also put additional pressure on procurement. The original idea was to enable procurement to work cross-site and therefore be able to focus on a specific task to achieve operational excellence. The problem is that all sites work differently and the projects are very different. This means that procurement has to learn and adapt according to several sites which makes up for unnecessary efforts. This affects the function's ability to relate to overall project goals. All functions agree during the interviews that this restructuring does not yet seem successful. But it is important to remember that restructuring is costly and requires a lot of effort. This is also mentioned by Casciaro et al (2019) as they argue that changing organizational structure is not always an answer to the issues that are being faced. Casciaro et al (2019) instead argue that each company structure will impose challenges on the employees and functions and it is important to understand which challenges the company could handle the best.

Lopez Pimenta et al. (2016) discuss the different types of collaboration which also is related to this issue regarding the physical distance. This is the importance of informal collaboration and communication. Jepsen (2013) also argues that informal communication is crucial to stimulate knowledge sharing and collaboration. Working cross-site or even at physical distances within one site will limit the level of informal communication and collaboration. Improving the current issue with physical distances that affects the level of collaboration and communication requires large

efforts. This involves studies on how the current structure strengthens or weakens each site, and function as well as the collective. Following the argument by Casciaro et al. (2019), the company needs to analyze whether changes could be implemented to the current structure to improve the situation or whether the organization further needs to undergo a restructuring. Also, to understand what challenges this new structure will bring and how they compare to the current challenges they are facing. This issue is regarded as too big to be handled in this thesis.

Slow feedback processes were also mentioned during the interviews as a problem that needs to be improved. It is well understood that the projects that the organization is dealing with are under tight schedules which means that all activities and coordination need to follow the same pace. Miller (1996) emphasizes the importance of timeliness and how crucial it is that information is getting spread around the organization for people to act upon. In this case, it was noticeable during the interviews that the problem did not seem to point to individual people that were lacking pace. Instead, it may have been due to a lack of understanding that individuals often have multiple projects to manage simultaneously, which can sometimes impact their ability to respond as promptly as desired. Instead, it is argued that this issue lies within a bigger problem that people have unrealistic expectations and is lacking knowledge regarding reasonable time frames for other function to conduct their work and respond.

For information quality, issues regarding lack of proactivity, no clear contacts, and unclear rules and guidelines were mentioned. This is supported by Verhagen et al. (2015) as the author points out the importance that information gets shared immediately when it is discovered. The findings from the interview also point out this issue as much information does not flow naturally between the functions. Instead, employees need to seek the information. This could also be argued to be part of a larger problem as Troy et al. (2008) argue that internal collaboration and integration are fundamental for establishing a solid information flow with high frequency. No clear contact is also an issue that employees mentioned and there are no current solutions for this matter. Currently, you need experience and you need to build a network within the organization to understand who to contact for what matter. This is a similar issue to Verhagen et al. (2015) as this extends the information flow and information does not move as fast as it could be. Rules and guidelines could also be linked to this issue as the organization is using planners to release some pressure from procurement. The idea was that DPL's should contact planners instead of the procurement as the procurement function was dealing with excessive information flows as mentioned by Hicks (2007). But this has harmed some employees as they feel that the planners are lacking understanding and information. This will in turn affect the completeness of the information quality which Verhagen et al. (2015) mentions as an important aspect of communication. The reason why this is classified as yellow is that it could be linked to a larger problem.

With regards to PM, the problems of staff turnover and guidelines and tools were marked as yellow. The interviews revealed that the company has experienced a high staff turnover which ultimately affects the efficiency of the projects. The reasons for staff turnover could be many and the problem is not unique for the organization. The problem, in this case, is that projects are very long, complicated, and hard to standardize. Therefore, it takes time for new employees to get familiar and comfortable with their responsibilities. For this matter, it could be argued that the company could either focus on retaining their employees and making sure that they stay within the organization for a long time or put efforts into establishing more guidelines and tools that can support employees with their duties. But since it has been established during the interviews that all projects are very unique it is hard to establish guidelines that will help in all projects. This requires that the organization is moving towards more standardized products and projects. Instead, it is more crucial to make sure that new employees get the right prerequisites to succeed by giving them proper introductions to products, processes, functions, etc.

Lastly, regarding procurement involvement, three issues were marked as yellow. No clear contact was a recurrent theme during the interviews since many employees felt that they did not under-

stand that function. They felt that information regarding people leaving or getting hired was not communicated to the rest of the organization. They also felt that it was hard to navigate among the different component families and to find the responsible purchaser. The more experienced personnel all agree that their experience helped in getting in touch with the right people. Creating a solid network within the organization was mentioned as one key to making sure that no time is wasted trying to get hold of the right people. This is a problem that could be fixed by establishing a website or similar which aims to help people navigate quicker and easier among the different purchasers. Also, this problem did not seem to be the root cause for the delays that were explained earlier.

It was clear during the interviews that the purchasing function felt that they were mistrusted and that there was a perception from the DPL's that they did not work proactively enough. This issue is important but it is highly related to the fact that there is a lack of transparency. Some DPL's mentioned this during the interviews, the fact that it could be because they did not understand how much time it takes for purchasing to do their job. Meaning that there might not be an issue, rather it is a question of what is possible for purchasing to accomplish. Additionally, the concern of late involvement was raised by several employees, and it was observed during interviews that this issue was more related to a knowledge gap, resulting in a yellow rating. From the perspective of the engineering team, involving procurement early in the process is challenging as the required components are not yet determined.

5.6 Challenges in prioritizing and addressing green-marked issues

Firstly, it should be noted that the researchers do not consider communication to be less important. However, as previously mentioned, it could be argued that the problems within the company are more complex than simply a lack of communication. While communication is undoubtedly a critical factor in the success of any organization, it is often just one piece of the puzzle. Other issues such as inadequate resource allocation, ineffective PM, and lack of employee training and development may also contribute to delays and project setbacks.

During the interviews, various issues that could potentially cause delays in projects were discussed under the topic of "communication". Two specific issues that were mentioned were unproductive meetings and hybrid working, which have been increasing inefficiency in the company. Effective communication is vital for any organization's success, and Zulch (2014) identifies three key components for achieving it: the transmitter, the channel, and the receiver. These components need to function in harmony to prevent misunderstandings and misinterpretations. Currently, the company faces communication problems in different areas. One of these problems is that too many people are included in meetings who do not have a significant role to play, leading to unproductive meetings. Additionally, the channel used for communication does not require employees to use web cameras, which makes it challenging for both the transmitter and receiver to fully understand each other. Seeing the person to whom you are speaking is a vital part of communication, and this aspect is missing in such scenarios. Overall, the company must recognize these communication issues and take steps to address them.

Employees from the engineering department also highlighted the issue of inadequate office space. They felt that the office was too small, and finding available rooms for meetings was often overwhelming. This is a problem that the researchers themselves have observed while spending time at the company for the project. However, while this issue may cause inconvenience and frustration for employees, it is not considered to be a critical factor in preventing delays in projects. In other words, while it may be challenging to find rooms for meetings and there is a risk of missing small parts of a meeting as a result, it is not likely to have a significant impact on project timelines or performance.

Another issue that was mentioned during the interviews was the excessive flow of information

within the company. While this issue may not have been brought up as frequently as others, it is still considered an important matter that should be addressed. Both Lee et al. (2002) and Batini & Scannapieco (2016) agree that information quality has a significant impact on the efficiency and effectiveness of organizations and businesses. In the case of this company, employees from all departments reported an overwhelming amount of emails being sent, which has led to some individuals missing important information. While some employees may find this manageable, others have been negatively impacted by the excessive flow of information.

6 Discussion

This chapter aims to provide a comprehensive discussion of the data gathered and offer insights to the company on how they can leverage the findings to enhance their PM process while minimizing project-related costs. The discussion will delve into the findings from the data gathering and compare the results with relevant literature. By comparing the results, this section aims to evaluate how the case company's approach differs from what is suggested from a literature perspective. The section will primarily discuss whether the company should even study internal delays, followed by targeting how the delays were seen in the company. Lastly, this discussion will evaluate how this thesis has contributed to the literature and what findings are new, contradicting, and earlier findings confirmed.

6.1 The importance of studying internal delays

As mentioned by Kaufmann & Kock (2022), PM aims at ensuring profitability for organizations and to make sure that customers are satisfied. It has been observed when conducting this research that the organization is dealing with very time-consuming and complex projects. On top of this, it should be noted that the employees are all involved in multiple projects which essentially puts additional pressure to comprehend deadlines and the tight schedule. From the interviews, it was observed that the mindset and perception differentiated between the employees. Even though most of the employees were well aware of their company's weaknesses, some employees felt that it was unnecessary to focus on internal aspects such as collaboration and communication. Instead, they felt that these are "soft factors" that do not affect the result. This contradicts what Mnkanla (2013) describes where effective project communication is considered a critical competence for the successful coordination of a project, as mismanagement can lead to the failure of the project. Furthermore, both Lee et al. (2002) and Batini & Scannapieco (2016) mention that information quality has a significant impact on the efficiency and effectiveness of organizations and companies, with an estimated cost of \$600 billion per year for US companies due to information quality issues. Also, there was a perception that some of the employees had their focus on fixing problems rather than taking care of the actual root cause. It is important to understand the impact of the internal aspect which highly affects the organization's ability to perform. As mentioned by Mello et al. (2015), it is argued that competitive advantage does not only come from the ability to coordinate external delays. Rather, it is mentioned that the internal aspects are as crucial for companies to be successful. It is also important to understand that a project's success is highly affected by the customer's perception and satisfaction. As mentioned by Gido & Clements (2014), one important factor is the company's ability to meet deadlines and deliver on time. This further strengthens the importance of pointing the attention inwards and making sure that internal processes are not causing delays.

Internal delays can have a significant impact on the success or failure of a project and ultimately the profitability of the company. This is because delays can lead to increased costs, missed deadlines, dissatisfied customers, and potentially damage to the company's reputation. The research findings suggest that delays in projects can vary significantly, with estimated delays ranging from one to six months. As mentioned by Gido & Clements (2014), being able to understand the risks associated with each project is a key element in project success. This further proves the importance of understanding the impact and the root cause of internal delays.

Based on the interviews, it has been determined that the duration of a project can significantly impact the severity of the consequences caused by a delay. Even a relatively short delay of one month can have a substantial negative impact on the outcome of a project, which may be difficult to recover from. However, a delay of six months may still be recoverable if appropriate measures are taken over time. It is, therefore, crucial to address delays promptly and effectively, regardless of the project's duration, to minimize their impact. Identifying and addressing internal delays early in the project life cycle is crucial to avoid or minimize their negative impact. Doing so can improve the overall efficiency and effectiveness of the project team, resulting in increased productivity, im-

proved work quality, and ultimately contributing to project success and company profitability.

Overall, internal delays are a crucial factor to consider when managing projects. By addressing them proactively, the company can improve its chances of success, gain a competitive advantage in its industry, and achieve its project objectives efficiently and effectively.

6.2 Understanding and addressing internal delays in project execution

Understanding internal delays are key to establishing the right measure to avoid them in the future (Ansah & Sorooshian, 2018). Furthermore, it is fundamental to understand the actual root cause of the delays to make sure that the risk of future delays is eliminated (Sweis et al., 2020). As mentioned by Ansah & Sorooshian (2018), this involves understanding when and where the delays occur. After analyzing the interviews, it can be argued that the term "when" specifically pertains to the ordering process of the organization under investigation. On a general level it can be concluded that delays occur when communication fails to deliver important information. Furthermore, when individuals fail to confirm orders and follow-up on the progress of that specific order. Considering that procurement was mentioned in every delay in Table 8, it is reasonable to argue that "where" falls under the domain of the procurement function. But on a general level it could be argued that delays occur in various functions and with managers who can't perform at the expected level.

The problem does not lie in identifying the source for this case. Instead, it is very hard to establish the correct measures to improve the situation. From the interviews, it was noticed that the DPL's had different opinions regarding lessons learned and collective improvements. In certain instances, DPL's believed that the root cause of delays lay entirely within the procurement function, and it was not their responsibility to resolve the issue or assist in mitigating it due to time constraints. However, in other cases, DPL's made efforts to collaborate with procurement to address the issue collectively, but unfortunately without success. It is unclear whether the lack of progress was due to time constraints or a lack of willingness on the part of procurement to assist. Returning to the argument mentioned by Mello et al. (2015), key players and top management must push for collective efforts for improvements. Since competitive advantage comes from the company's ability to coordinate internal activities and processes.

Furthermore, "why" could be answered with the help of the findings from the interviews listed in Table 9. Compared to the article by Radujković & Sjekavica (2017), three success factors are mentioned that highly affects the project outcome. These are "PM competence", "organizational structure and culture", and "methods and tools". During the thesis, it was noted that these factors highly affect the organization's ability to avoid internal delays. The current structure seems to impose several challenges for collaboration which then leads to delays. Also, the management competence and knowledge seem to vary between the different DPL's which affect negatively the stakeholders involved in the project and their ability to perform. This was mentioned during the interviews with employees from procurement where they emphasized the importance of having an experienced and skilled DPL for the success of projects. The difference between DPL's at the company has a huge impact on the ability of other departments to perform. During the interviews with the purchasing department, one example that emerged highlighted the impact of seemingly small details on project efficiency. Specifically, some project managers spent a little extra time to ensure their orders were entered into the internal system in a way that made it easier for purchasing to identify which order belonged to which project. This small effort made a significant difference in the efficiency of the purchasing team's work. Interestingly, some project managers did this automatically without needing to be reminded or instructed, while others actively chose not to do it, believing it to be procurement's responsibility rather than their own. The former group is likely more collaborative and understands the importance of cross-departmental collaboration to achieve project success. The latter, on the other hand, may have a more siloed approach to their work and fail to see the big picture. This attitude highlights the importance of fostering a culture of collaboration and responsibility across different departments within an organization.

By recognizing and addressing such challenges, companies can create a more cohesive and efficient working environment, leading to improved productivity and better outcomes for all stakeholders involved.

Lastly, the interviews conducted as part of the research project have provided interesting insights into project managers' views on the use of templates in PM. Some project managers explicitly reject the use of templates, preferring to rely on their experience and judgment to manage projects. These managers may believe that templates can be too rigid and that they may not apply to every project or situation. On the other hand, some project managers argue for the use of templates to guide how projects should be managed.

This finding is quite contradicting the argument presented by Kaufmann & Kock (2022) that PM tools are essential to enhance the effectiveness of projects. Also, the outcome of complex projects is highly influenced by the level of PM established in the company. This suggests that the experienced managers in the company may require more support to avoid internal delays, despite their confidence in their abilities. Furthermore, Radujković & Sjekavica (2017) argue that an organization's PM methods and tools are critical elements for achieving project success in project execution. This implies that the company in question may be missing out on the potential benefits of adopting a more structured and standardized approach to PM.

It is important to note that the decision to use or not use templates may depend on various factors, including the complexity of the project, the organization's culture, and the DPL's personal preferences and experience. While some managers may thrive on the flexibility provided by not using templates, others may find that templates help them stay organized and ensure that important tasks are not overlooked. Currently, the use of templates in PM is a matter of personal preference and organizational culture. The company should consider the pros and cons of using templates, as well as the specific needs and goals of their projects, before deciding whether or not to use them. In Figure 5, a visualization is presented that shows how the internal delays in the company could be targeted and answer the three questions "when", "where", and "why".

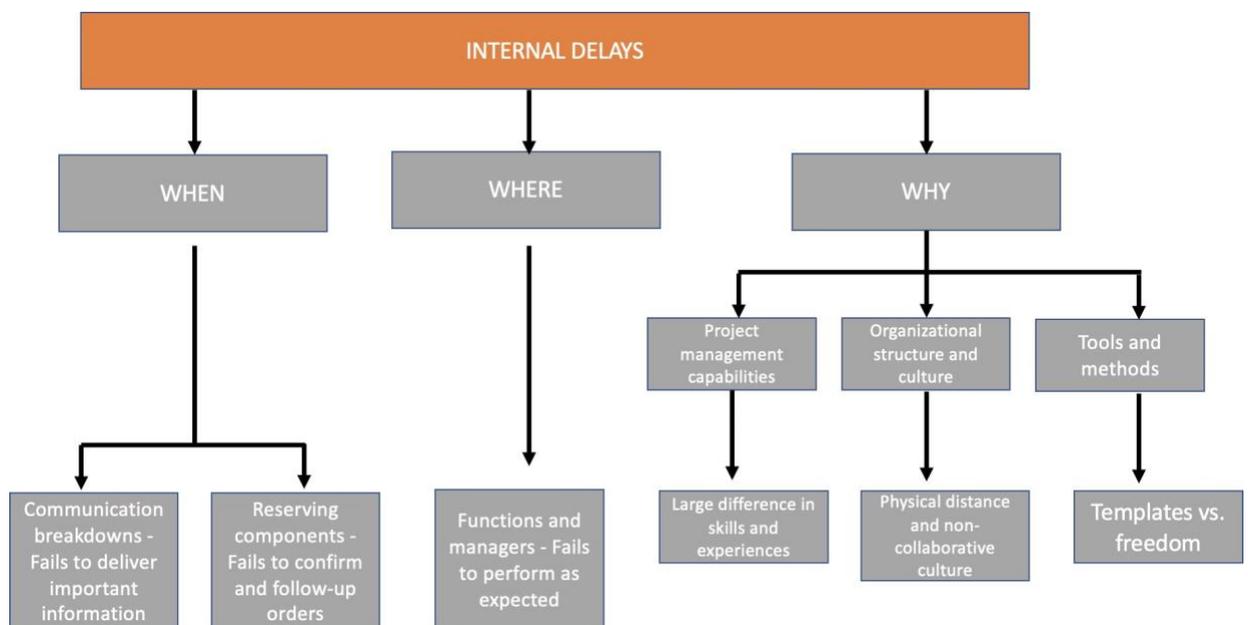


Figure 5: Targeting the internal delays

Following the article by Ansah & Sorooshian (2018), it could be argued that the internal delays that

were found in this research are all non-excusable. This means that no additional time extension is given and the only solution is for the organization to make up for the loss of time. Furthermore, Ansah & Sorooshian (2018) give insights on how to categorize the actual source of the delay and use it to understand the nature of the impact. The insights from the interviews show that most internal delays are either related to the procurement or participants. Therefore, the literature points out the importance of having adequate skills, experiences, and management capabilities to avoid delays related to participants. Concerning procurement, Ansah & Sorooshian (2018) argue that continuous supervision is key for avoiding issues related to time extensions. In Table 10, the delays are categorized accordingly with their respective impact on performance.

Table 10: Categorized delays from the case company which highlights the sources of delays

Category	Example	Cause of delay	Time lost [months]	Delay/project [%]	Cost of delay/budget [%]
Procurement	Delay 1	Procurement process	2	11,1	11,1
	Delay 3	Procurement negligence	5-6	-	-
Participants	Delay 2	Miscommunication	6	33,33	12,75
	Delay 4	Process misalignment	1	5,56	5,56
	Delay 5	Responsibility in decision-making	6	-	-

6.3 Understanding the impact of internal delays to apply appropriate measures

The purpose of this thesis was to investigate the actual impact of internal delays on the project’s performance and cost estimation. Table 10 shows that internal delays could have a very large impact on the cost estimation but also the performance since crucial time is lost. Table 10 also presents that the impact could be very different in size which then opens up for an important discussion. What measures should be applied to avoid internal delays in the future given this varying range of impacts? It is important that the measures applied could be justified from an economic point of view and that this development will eventually lead to improvements. Even though Ansah & Sorooshian (2018) state that additional cost is an outcome of time overruns it is still important to understand how costly they are. In Figure 6, all factors that play a role in an internal delay are presented. These are the main factors that were visible in the delays that were found in the organization.

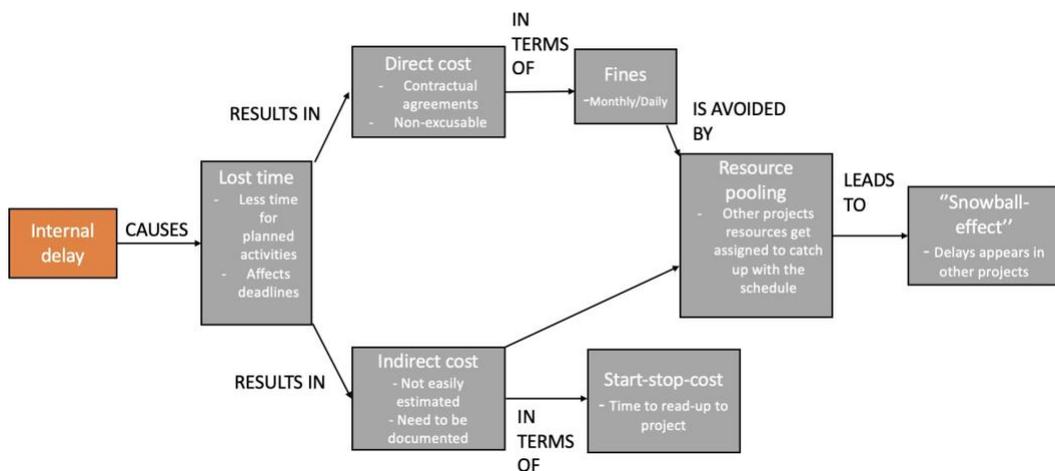


Figure 6: How different types of costs are an outcome of a time overrun

Building on the statement from Ansah & Sorooshian (2018), the first factor "Lost time", was one

of the main factors that were easy to find and understand in the different projects that have been studied. As mentioned in Section 4.1.4, projects do already have tight schedules from the start since the organization has decided to pursue a strategy that will eventually make them a competitive player on the market. Therefore, it is obvious that losing months of valuable work time could have a substantial effect on the project and eventually customer satisfaction. As a consequence, employees are often reassigned to different projects in an attempt to compensate for lost time. This practice carries the inherent risk of creating a "snowball effect", as employees who are already occupied with their projects are required to pause their work to support the struggling projects. This may result in further delays and ultimately lead to a cycle of projects falling behind schedule. This effect is very hard to estimate as it requires well-documented information about the project.

The direct cost is also easy to understand since it is clear from signing the contract what the implications are for not being able to fulfill the agreement. Since the financial part of the fines is confidential, they can not be presented in this thesis. What could be mentioned is that the fines are substantial since the projects are large and time-consuming. All fines will to a large extent be avoided by the organization since this will affect the profitability of the project. But similarly, this increases the risk of resource pooling and is also a reason that projects that are currently keeping up with the timeline might face problems at a later stage.

During the interviews with DPL's, it became clear that the issue of indirect costs was a common theme that many were aware of. However, the complexity of estimating these costs poses a significant challenge and can have a significant impact on project reliability and efficiency. The impact of indirect costs on projects cannot be underestimated, as transitioning from one project to another is not an instantaneous process. Work must be paused and then re-initiated, resulting in delays, additional expenses, and decreased productivity. This can have a ripple effect on the entire project, leading to further delays and increased costs.

It should be noted that most of the DPL's did not understand how to estimate these types of costs which makes up for a lot of room for estimations. Here, the question arises whether it is necessary to understand these indirect costs. Also, what is required by the company and the DPL's to establish the right prerequisites so that estimation could be made in the future? If this proves to be the way moving forward, the company needs to establish the right prerequisites for an accurate estimation of indirect costs.

Another aspect that needs to be considered to be able to justify measures for avoiding internal delays is to understand the frequency of internal delays. This aspect is missing in this thesis which eventually will affect the justification of the recommendations. In Table 8, 8 examples of internal delays have occurred in projects that are either ongoing or recently finished. To understand on a greater level how internal delays affect the organization, more information is needed to understand how many of the organization's projects are experiencing delays. If that aspect would be neglected, it could be argued that the organization urgently needs to implement measures to avoid future delays. Losing up 33% of the project timeline, which is visualized in Table 10, calls for actions immediately.

6.4 Connecting the cost of internal delays to project cost estimation

Returning to the discussion in Section 6.3, it could be argued that there is a significant amount of uncertainty regarding the cost aspect of the delays. All costs are not clear and the numbers that are presented can be seen as somewhat unreliable as they are estimates. On top of this, an additional dimension is needed to understand the collective economical impact of all ongoing projects. Therefore, it is hard to give a strong recommendation on how the organization should act to remove the possibility of internal delays in the future. With the knowledge that the recommendation is economically justified and that the investment made will be regained with avoidance of potential future delays. Building on the argument in Section 6.1, where Mello et al. (2015) argue that in-

ternal improvements are just as crucial as external improvements to ensure competitive advantage and profitability. It should be noted that understanding the costs and the frequency of internal delays is fundamental for improving the organization's cost estimation ability. It could be argued that the process of learning from delays should be prioritized and discussed more often during the course of the project, and not postponed until later when the projects are already completed.

As mentioned by Nussbaum & Mislick (2015), the estimation of costs in projects is a process where you collect and analyze historical data. As seen in the previous Section 6.3, it could be argued that the DPL's are lacking knowledge regarding the actual cost impact of delays and also understanding the frequency of the delays. According to Nussbaum & Mislick (2015), good cost estimation is grounded in previous experiences and data, which all users could utilize with confidence, no matter if the person is newly employed or experienced. Additionally, the same article stresses the importance that a good estimation should have identifiable risk areas and implications. For example, since many of the DPL's were aware that costs arise when projects need to be paused, increasing the understanding of probability and impact could be an extra factor that improves the reliability of the cost estimation. To be able to improve within this area of PM, employees must be aware that these events need to be documented to analyze them.

6.5 Our perception about the current situation

After conducting interviews, it became clear that the issues faced by the organization were primarily related to the new structure of the procurement function. A recent restructuring effort was undertaken to centralize the procurement department, but it has had negative consequences on the projects' performance and employee morale. It's important to note that this restructuring only regarded the procurement function and not the entire organization. The feedback from interviewees, regardless of their position, was overwhelmingly negative towards the restructuring. The consensus was that it has hindered collaboration and isolated the procurement function from the rest of the organization. This is a significant concern as it suggests that the restructuring has negatively impacted the organization's overall performance. In Figure 7 a visualization is made of the believed expectations of the restructuring of the organization. It also presents how the recent work at the organization, with the help of interviews and observations, has made us perceive the result of the restructuring.

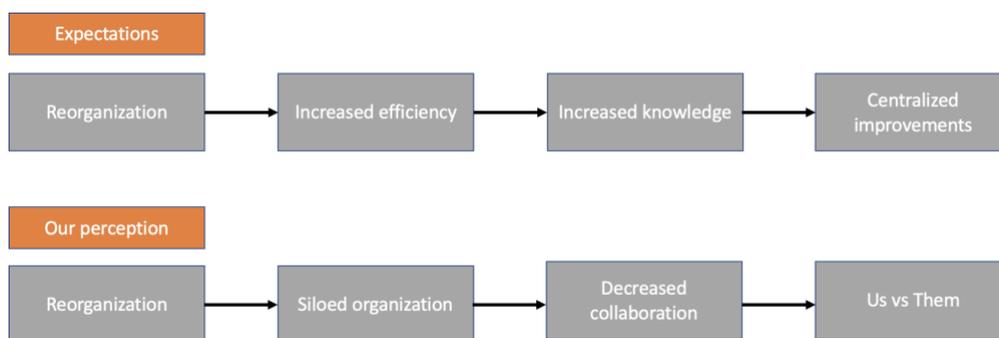


Figure 7: Expectations and perceived results from the restructuring

It could be argued that the current situation with the organizational structure does not live up to the expectations and that measures are required to improve. As mentioned by Casciaro et al. (2019), another restructuring is not always the right answer and each restructuring come with high cost and risks. Meaning that establishing a new structure could lead to other challenges that could affect the project's performance. Additionally, questions arise since this restructuring got realized over a year ago. During the thesis, there was no information on whether this new structure had yet reached its full potential or why the organization has not taken the decision to return to the

old structure. Since there was no time to investigate this matter it could only be assumed that the top management is yet hopeful that the new structure will bring benefits eventually. Alternatively, the financial benefits of restructuring the purchasing function may outweigh the negative impact on project efficiency and the employee environment. Furthermore, it was explained to the researchers during an interview with one employee from the procurement function that complaints have been raised about the new structure. It is also perceived that the discussions that are held do not help to change the situation. Lastly, it is mentioned that no evaluation has been made post-restructuring. Regarding cross-functional integration, it is important to mention that even though it may lead to many company advantages it may also come with disadvantages. Increasing the collaboration and integration within company functions could end up in increased decision complexity and confusion (Troy et al., 2008). Another challenge is the negative impact collaboration could have on responsibilities, as clear function responsibilities and boundaries could be blurred out (Lee, 2020). In summary, while cross-functional integration can offer many benefits to a company, such as improved communication, innovation, and efficiency, it is important to be mindful of potential disadvantages. Companies should carefully assess and manage these potential drawbacks to ensure that the benefits of cross-functional collaboration are maximized and any negative impacts are mitigated.

6.6 Considering agile teams for improving the current state

The use of agile teams seems to be a viable option for the case company since it has the potential of improving cross-functional collaboration. As mentioned by Ciric et al. (2018), APM has potential in the industrial sector and could provide benefits such as reduced cost, and schedule but also in general improving the overall effectiveness. It was mentioned during the interviews that employees sometimes could feel less entitled and feel less ownership of the project since they did not understand the overall goals, agile teams could be a way forward. Drury-Grogan (2014) mentioned that agile teams allow for more empowerment since everyone is involved in the decision-making. On the other hand, there is a risk that this decreases the efficiency of the project. Since Troy et al. (2008) argue that increased collaboration also comes with increased decision complexity and confusion.

An establishment of homogeneous agile teams could also foster the learning process in the organization. Currently, there seems to be a problem in ensuring that experiences gained during projects are transferred to knowledge and stored within the organization. This is mentioned as an important aspect by Monteiro de Carvalho et al. (2015). Agile teams have the possibility of ensuring that knowledge is transferred across functions and not just within one function. Julian (2010) also points out the challenge with projects which is the need for working with new people. This gives rise to additional challenges in the projects which are already complex enough on their own. Therefore, the company should consider using more homogeneous teams.

Furthermore, Drury-Grogan (2014) argues that great communication is needed to utilize agile teams. In this case, communication is struggling, particularly between procurement and other functions. It was also mentioned during the interviews that the organization has deeply skilled teams. This is mentioned by Moe et al. (2010) to be a barrier when transitioning from traditional project teams to agile teams. This is because the teams have less desire to widen their knowledge and the consequence is an undesire to communicate with others. Hoda & Murugesan (2016) also point out the importance of supporting project managers. Since agile teams are supposed to be self-managed the organization needs to support the current DPL's in case of a transition. Managers need to find clarity in their roles and balance autonomy and guidance. Even though agile teams come with challenges mostly during the implementation phase, Murugesan (2016) argues that agile teams are an enabler for improved cross-functional collaboration.

6.7 Evaluation of the case-company, with the literature review as the point of reference

After reviewing the case company for several months, it could be argued that this is no unique case. Much of the literature highlights the problems that the company is currently facing. This section aims to discuss how the findings relate to the overall literature and discuss what findings that are new, contradicting and how it is contributing to an area within PM that is researched rather limited.

6.7.1 Validation of prior literature on internal processes in project management

From the articles by Ganis & Waszkiewicz (2018) and Ansah & Sorooshian (2018), poor communication has been identified as a significant reason for internal delays in projects. This research has further strengthened this argument by demonstrating that communication is one of the cornerstones for successful projects. Pinto & Pinto (1990) state that effective communication is crucial in ensuring that everyone involved in the project is on the same page, understands their roles and responsibilities, and has access to the necessary information to make informed decisions.

This study further strengthens the argument by Kafile & Fore (2018), who argue that challenges faced by procurement must be addressed in a coordinated manner. Furthermore, Kafile & Fore (2018) argue that procurement plays a central role in project success which means that other functions and stakeholders are highly affected by the outcome. This is visible in this case where many functions rely on procurement efforts to make progress. Meaning that problems and challenges faced by procurement need efforts and support from other functions to find a solution.

6.7.2 The thesis contribution to literature in the context of project success

The thesis has made a contribution to the literature by highlighting the importance of studying internal delays in projects. While it is common for organizations to focus on external risk factors, such as supply chain disruptions caused by global events like COVID-19 and the Russia-Ukraine situation, the thesis has shown that internal delays can also have a significant impact on project success. In fact, the thesis has demonstrated that poor internal processes, collaboration, and communication can lead to delays and ultimately jeopardize the success of a project. This is a critical insight because it suggests that organizations must not only focus on external factors but also examine their internal processes, collaboration, and communication to improve project outcomes.

In conclusion, the thesis highlights that companies need to shift their focus towards studying their internal processes to develop them, rather than solely or primarily examining external processes and their outcomes. This would entail investing time and resources into understanding their internal workings and identifying areas that need improvement. Consequently, once the global supply chain returns to a more stable state, similar to pre-covid, the thesis has proven that companies must shift their focus internally.

The present study has uncovered new insights regarding the learning process within project organizations, building upon Julian's work (2010). It has been found that systematic learning often occurs only after project completion, which can hinder the organization's ability to deliver high-quality products to customers. Since employees frequently work on multiple projects concurrently, learning during the project's lifespan becomes critical, but is often overlooked due to time constraints and a fast-paced work environment. The study emphasizes the importance of prioritizing learning during projects, which has been found to be lacking in current practice. Additionally, the research highlights the significance of proper onboarding processes for new employees, which the organization has been found to lack. This finding is consistent with the observations by Wysocki (2004) on cultural and organizational barriers to change.

6.7.3 Findings from the thesis that has opened up for further research

According to Park (2021), cost overruns and schedule delays are one of the most common reasons for project failure, but the actual economical result of a delay is hard to estimate for complex projects. This study aimed to improve understanding of this issue and provide insights on how organizations can address it. By shedding light on the connection between internal delays and project cost overruns, this research highlights the importance of taking a proactive approach to managing internal delays.

The literature has traditionally focused on external factors such as supply chain disruptions, market changes and stakeholder demands. However, the impact of internal processes on project success has received less attention. Ghornbani & Khanachah (2020) highlights the consequences of contractor errors or failures, which can lead to project delays and increased costs for the company. This thesis has discovered that internal delays can lead to months of lost time, which ultimately affects planned activities. Therefore, the literature on project management could benefit from a greater emphasis on internal processes. By recognizing the importance of effective communication, collaboration and learning during projects, project organizations can create a strong internal foundation that supports their operations.

The research has not provided any specific results on the economic impact of internal project delays. This is an area that needs further investigation, as it has the potential to provide valuable insights into the costs of internal delays. What has been discovered in relation to the financial consequences of delays are the frequency and effects of indirect costs. These have a large impact on projects and are common to all projects examined with typical results such as resource pooling and start-up and stoppage costs. According to recent interview results, it has become evident that the company lacks visibility into the costs associated with internal delays. As the impact of these delays on project timelines and budgets remains hard to predict, it is crucial to conduct a prompt review to better understand and manage their contribution to project costs. Furthermore, emphasizing the importance of addressing internal delays is crucial. While external delays may be more visible and receive greater attention, internal delays can have significant cumulative effects on a company's performance and profitability. Therefore, future research should focus on developing strategies to prevent internal delays and establish clear metrics for measuring their impact on the company.

6.7.4 Examining conflicting results in project management literature

Following the argument from Moretto et al. (2022), it should be mentioned that some of the findings from this thesis is contradicting. Moretto et al. (2022) argues that procurement plays a central role for financial success in the projects but the findings from this thesis points to the opposite. In this company the focus was on ensuring short lead times to keep up with the deadlines or catch up on the schedule. Like mentioned in the interviews with the procurement, there was a feeling of not being able to deliver to their full potential. This could be a result from the global disruptions in the supply chains from covid-19 and Russia-Ukraine, which has lead companies to point their attention to lead times. But with the tight deadlines that the company is dealing with, it raises questions whether the company will return to focus on prices and when that will happen.

7 Conclusion and recommendations

The following section will provide the researchers' conclusions regarding research questions 1-3. The conclusion is based on the interview data together with the literature findings. Each research question will be addressed separately. Following the conclusion, a future recommendation will be provided which will finally answer RQ4.

7.1 Research question 1: What does the current state look like in terms of structure and information flows within company projects?

The current state of the company is characterized by its incredible ability to innovate and develop new solutions that meet changing customer demands. However, this constant pursuit of innovation has made standardization challenging, which has led to inefficiencies within its internal processes. The problem does not arise from the competence of the company, but rather that the market for military and defense products is highly dynamic and fast-paced. The study has revealed that the competitive market together with the fact that each function sits on deep knowledge within their assignment is causing issues. The lack of relatedness for other functions processes, goals, and challenges has led to sub-optimizations which inhibits the company to reach its full potential. Since the company is project-focused, this makes them vulnerable to problems since activities are interdependent and stretch over many functions.

7.2 Research question 2: Why do internal delays happen and where in the organization do they occur?

The study has identified that the majority of internal delays are related to the procurement function. Procurement is currently facing significant challenges in managing multiple projects while complying with different ways of working and systems. Consequently, procurement personnel are feeling overwhelmed, which has created an imbalance in attention between procurement and other functions. While other functions rely on procurement's expertise for success, procurement is struggling to meet its expectations. This has resulted in miscommunications and difficulties in prioritizing between projects, leading to internal delays.

7.3 Research question 3: How much do internal delays affect the performance and cost estimation of the project?

The present research reveals a shortfall in estimating the costs associated with internal delays. However, the data highlights the significant impact of such delays, particularly in the context of severe contractual deadlines where a few months' delays can have a substantial effect on planned activities. This is exemplified in the case examples analyzed, where the company experienced an average delay of four months due to internal delays. In light of these findings, the company must prioritize addressing internal mistakes and communication issues to minimize the damaging effects of delays.

7.4 Future recommendations (RQ4): What actions should the company employ to prevent further internal delays?

What could be seen throughout this research is that the internal delays are a result of the current situation that involves problem areas that affects the daily processes and procedures. Poor communication, lack of collaboration, and high variability in skill levels for managers are among the issues that need to be addressed. Our recommendations aim at improving the learning regarding the impact of internal delays, establishing better templates that minimize the variability in skill level for managers, establishing clear rules regarding prioritization between projects, and lastly evaluating if procurement is in the right position to perform to their ability. Figure 8 presents all recommendations, and further explains what should be done, how it should be done, and why it should be done.

6. Conclusion and recommendation

Recommendations	What Should Be Done?	How Should it Be Done?	Why Should it Be Done?
Recommendation 1	Upgrade current project management tools	Experienced worker reviews available tools with the new worker and makes sure that what is needed is available	Improve the introduction phase for new employees and overall project performance, making use of the high level of knowledge already present in the company
Recommendation 2	Evaluate current organization restructuring	Evaluation of the restructuring with employees from departments with input and experience.	Interviews have pointed towards a less successful restructuring which have affected people from many departments
Recommendation 3	Integrate systematic learning with all departments	Lessons learned should be carried out during project with all parties involved	The market is constantly changing which means that the company needs to learn and adapt to stay competitive
Recommendation 4	Document all actions that leads to delays in projects	Implement or update current tools for documenting delays	Facilitate future studies on how and why delays occur and their consequences
Recommendation 5	Establish clear rules regarding prioritization between projects	Top management decides on the rules for prioritization between projects	Remove the attitude and behavior linked to "individuals who raise their voices the most to receive preferential treatment"
Recommendation 6	Improve communication between engineering, production and procurement	Involve procurement in projects early phase. Remove the "us vs them" mentality	Communication was a common reason behind every delay that occurred. The company needs to improve the communication to be more successful

Figure 8: Recommendations for the company based on the data collection and analysis

7.5 Final note

During the research, it has been noted that the company needs to break old patterns and start to develop new ways of working and interacting to change the culture and establish a new mindset. Interviews have proven that negative communication, in terms of poor language, is affecting others' well-being. Instead of being proud of the entitlement that comes with working in this successful company and realizing that everything is conducted in teams, the focus is now on us vs. them. We believe that to break this pattern, the company should start an introduction program that focuses on creating more awareness within the company. This entails that people from the engineering function would get to follow around production and procurement for example and witness how they are working and how they are affected by decisions. Creating transparency regarding the different challenges that the different functions are facing could open up new solutions that could benefit more than one function. On top of this, the program is a solid opportunity for newly employed to create a network within the company and increase informal collaboration. In Figure 9, a visualization of this recommendation is presented. In comparison to the recommendations presented in Section 7.4, the researcher is well aware that this recommendation is more time-consuming to deploy but also to follow through since everyone is busy with their projects.

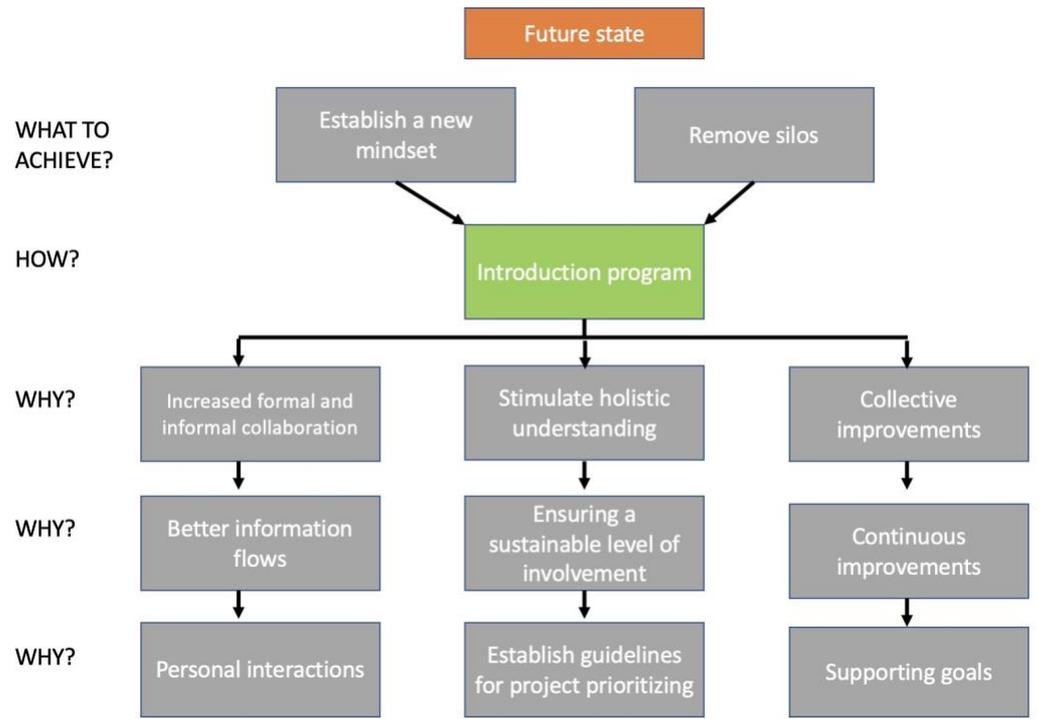


Figure 9: Potential with introduction programs

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