Investigating Project and Asset Management Integration

Ensuring Reliable Handovers in Production Projects

Master's thesis in Production Engineering

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DEPARTMENT OF INDUSTRIAL AND MATERIALS SCIENCE

CHALMERS UNIVERSITY OF TECHNOLOGY

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Abstract

Efficient management of resources, ensuring reliable operations, has become increasingly important for Swedish Match. A critical aspect of achieving this is the transition from project development to implementation. Challenges often arise during the handover due to unclear processes, missing information, and inadequate planning, leading to inefficiencies. This thesis analyses project structures and responsibilities. Identifying problem areas in the different project phases, the thesis aims to find ways to ensure operational reliability and effective data management. The purpose is to find critical areas in the project process that hinder production and operation & maintenance from managing the production equipment over its lifecycle.

The thesis addresses key challenges in the handover of production projects concerning project management and asset management integration, and investigates solutions that can be implemented. The methodology includes a literature study, a case study, and a process study. The case study involves analyses of documented processes and structures, alongside interviews. The process study supports the findings by following an ongoing project and gathering information through documentation analysis and observations.

The analyses identified several areas of improvement and challenges concerning project handover. These include the necessity of clear roles and responsibilities. Setting higher standards by the steering committee, overseeing prioritization, and continuously reviewing ongoing and previous projects. Involvement of the receiving organizations in project orders was identified as important, together with detailed handover requirements to reach satisfaction from both parties. Establishing a standard for project documentation was also identified as necessary, alongside ensuring effective and reliable communication channels.

Keywords: Project management, Asset management, Project handover, Project structure

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Declaration of the use of AI-tools

All quotes presented in the result chapter and the questions asked during the interviews, which are presented in Appendix B, were all originally made and written in Swedish, and have with help of tools such as, ChatGPT, Microsoft Copilot and Google translate been translated to English to use the same language throughout the report. Throughout the report, the writing tool Grammarly has been used to improve the language of the text, suggesting changes to sentences alongside highlighting and changing misspelled words. The AI tool ChatGPT has only been used to improve language and add clarity to our sentences, helping to formulate them more understandably. No content in the report has been generated by any AI tools.

Daniel Ingvarsson & Filip Johansson, Gothenburg, June 2025

List of Acronyms

Below is the list of acronyms that have been used throughout this thesis listed in alphabetical order:

FAT	Factory Acceptance Test
LCC	Life Cycle Costing
OEE	Overall Equipment Effectiveness
OM	Operations & Maintenance
PAT	Production Acceptance Test
PMI	Philip Morris International
PMM	Project Management Methodologies
PPP	Project, Programme and Portfolio
QAT	Quality Acceptance Test
SAT	Site Acceptance Test
SWOT	Strengths, Weaknesses, Opportunities and Threats
VSU	Vertical Start-Up

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1
Introduction

This chapter introduces the thesis by providing background information on the research topic and describing its relevance and scope. The purpose and objectives of the thesis, alongside two research questions, are presented to clarify the focus and intended contributions. Limitations are also described to specify the project scope.

1.1 Background

Efficient management of resources, ensuring reliable operations, has become more important for Swedish Match. A critical aspect of achieving this is a reliable transition from project development to implementation in production. Challenges often arise during the handover, often due to unclear processes, missing information, and inadequate planning. These challenges lead to inefficiencies, increased non-value-adding work, and production disturbances that negatively impact long-term operational reliability.

Swedish Match originates from Svensk Tobaks AB and Svenska Tändsticka AB, which were founded in 1915 and 1917[4]. These two businesses were emerged and became part of a concern in 1992 and changed their name in 1994 to Swedish Match. Since 2022, Swedish Match has been part of and owned by Philip Morris International (PMI) and has 7,500 employees all over the world. The primary markets are in the United States and Scandinavia. Swedish Match is the largest manufacturer of snus in Scandinavia and a major producer of nicotine pouches, cigars, and matches. In the United States, Swedish Match is the biggest actor within nicotine pouches with its brand ZYN, and the largest manufacturer of chewing tobacco.

In Sweden, Swedish Match is producing snus, nicotine pouches, and nicotine-free products[4]. The production of Swedish snus contains three main steps: it starts by grinding the tobacco, preparation through heating and mixing, and the last step is packing in either small pouches or cans[5]. Key brands produced in Sweden are ZYN, General and Göteborgs Rapé[4].

A common issue the company faces is the lack of standardized procedures for transferring essential project data, such as equipment specifications, maintenance plans, and performance metrics, to production teams. Missing or incomplete data further complicates equipment registration and long-term asset management. Additionally, a lack of training for production and maintenance personnel has caused delays and operational inefficiencies during the implementation and early production stages. Bottlenecks in these workflows hinder efficiency and reliability, making it difficult to optimize asset performance over time.

Projects within the process development department have a given project structure that should be followed. This project structure consists of five different phases, each with a gate where a steering group must approve the work in that phase before proceeding to the next step in the project. The project structure includes the following phases: pre-study, definition, development, implementation, and closure.

In the pre-study phase, the current state and future needs are assessed. Concepts are developed, and the purpose of the pre-study is to determine the feasibility of the project and enhance understanding of its potential effects. During the definition phase, the project is formally initiated. This phase aims to define the project scope, objectives, limitations, and other key conditions. The project is also planned to ensure an efficient workflow. In the development phase, the project starts to take shape. Activities identified in the definition phase are planned and developed into final concepts ready for execution.

The implementation phase is where the project is realized. The work from previous phases is put into practice and delivered to production and operations & maintenance (OM). At this stage, the project team and the organization have agreed on an execution plan, and the project is integrated into daily operations. The project results are then utilized and maintained by the organization after implementation.

The project is officially closed when all activities in the closure phase are completed, if no other decision is taken. The organization is officially responsible for the project outcome, and any remaining open issues are addressed by the designated function.

The acquisition of Swedish Match by PMI also underscores the importance of reliable transitions in industrial operations. Since PMI integrates Swedish Match into its global portfolio of companies, efficient knowledge transfers are of high importance, standardized processes, and well-structured project handovers will be critical to maintain high-performing production and optimize long-term asset performance.

1.2 Purpose

The purpose of this thesis is to analyze how the project structure is organized and the responsibilities of individuals involved in projects. By identifying problem areas in the project definition-, development-, implementation-, and closure phases, the thesis aims to ensure long-term operational reliability and effective data management. Problem identification aims to find critical areas in the project process that hinder production and OM from having the conditions necessary to manage the production equipment over its life cycle.

1.3 Objectives

In this section, the research questions and objectives are presented. The research questions for this thesis are:

- ***RQ 1:*** *What are the key challenges in the handover of production projects concerning the project management and asset management integration?*
- ***RQ 2:****What solutions can be implemented to ensure an efficient and reliable handover between the project and receiving organization?*

These are the objectives and goals aimed at answering the research questions:

- Conduct a thorough analysis of current workflows from project definition to fully operational equipment in technical projects
- Identify bottlenecks and obstacles within these processes that hinder a clear, efficient, and reliable handover from the project group to the production and OM
- Develop recommendations that can ensure reliable handover, effective data management, and improved project outcomes

1.4 Limitations

The thesis does not analyze the production processes themselves, but instead focuses on identifying the factors that cause production stops related to technical projects. The study examines current workflows and internal structures within technical projects at Swedish Match. In this context, technical projects are defined as process development initiatives, meaning the implementation of new technologies and solutions rather than improvements to existing processes.

The thesis does not consider the pre-study. The scope of the thesis starts at the project definition phase, where the project goals, requirements, and limitations are established. Communication channels are defined, and the responsibilities of different stakeholders are established.

The thesis investigates the project structure until Gate 5, see Figure 1.1. Focus was put on identifying bottlenecks in the project structure and integration of project and asset management, which could hinder a reliable handover. The thesis also aims to investigate how projects comply with the structure and what responsibilities there are within projects. It focuses on projects regarding the production of snus and nicotine pouches and does not examine facility projects. Instead, focus was put on production and OM, emphasizing how projects handle aspects such as operational reliability and maintainability. The thesis does not include factors such as human behavior, motivation or culture in the analysis of the results.

Figure 1.1: Thesis scope

2
Theory

This chapter presents the theoretical framework for this thesis. It includes subjects such as project management, asset management, and quality management.

2.1 Project management

Organizations are performing work to achieve different objectives[6][7]. The work can be performed either as an ongoing operation, project, or programme[7]. The work could also be organized as a portfolio alongside other related work. These organizational activities and their focus areas are summarized and presented below.

- **Operations** are performed by relatively fixed teams through ongoing and repetitive processes, with the focus of sustaining the organization.
- **Projects** are executed by temporary teams whose work results in different deliverables, outputs, outcomes, or benefits. A project could be managed individually within an organization or as part of a programme or portfolio.
- **Programmes** contains groups of correlated components (projects or related work) and are managed to create and support common strategic and operational objectives and benefit from each other.
- **Portfolios** are the sets of projects, programmes, and other work-related activities performed to help the organization achieve its strategic objectives.

The concepts presented below should work as a foundation and guide the governance and management of projects, programmes and portfolios (PPP)[7]. These concepts include but are not limited to:

- **Strategic alignment:** Projects, programmes, and portfolios should be directly linked with organizational strategy and objectives.
- **Continuous justification:** Business justification should be continuously assessed to ensure that benefits can be realized and risks are being managed, and if justification is no longer supported, it should stop.
- **Appropriate framework:** Governance and management frameworks should be suitable for the activities, the associated risks, and the level of risk the organization is willing to accept.
- **Stakeholder engagement and communication:** Deliverables, outputs, and outcomes should align with the sponsoring organization´s requirements, which should be accepted by stakeholders.

- **Clear roles and responsibilities:** Across all levels of a project, programme or portfolio, authority and responsibilities should be clearly defined, assigned properly, consistent and traceable.
- **Appropriate planning and management:** Effective planning, managing quality actively alongside tailoring the activities within the work environment impacts the success of a project, programme or portfolio.
- **Continuous improvement:** To enhance the performance of future projects, programmes, and portfolios, lessons learned should be documented and shared within the organization.

Incorporating these concepts into an integrated management and governance approach could help create a common picture of the strategies, objectives, and plans of the organization[7]. It also helps pinpoint the activities needed for reaching the objectives, alongside allowing transparency and alignment towards these. It also enhances communication, resource allocation, and justification, but also provides clearer insight into project progress through standardized reporting, decision gates, and problem-solving procedures.

The project management standard ISO 21502 provides guidance on concepts and practices for the successful delivery of projects[7]. The governance standard ISO 21505 offers guidance on improving accountability, transparency, and the authorization, direction, empowerment, oversight, and control of projects, programmes, and portfolios.

2.2 Guidance on project management

The objectives of a project are achieved through a combination of different deliverables, outputs, outcomes, and benefits, depending on the governance framework and the context of the project[1]. The objective should contribute to the intended outcomes of internal and external stakeholders. Projects can look different depending on several factors such as objectives, context, desired outcomes, provided outputs, and stakeholders. The complexity, resources allocated, and constraints within the project environment and its processes are other factors that impact the project.

The practices required to direct, initiate, plan, monitor, control, and close a project, alongside managing resources and keeping personnel motivated, are integrated into project management to achieve the intended objectives[1]. Incorporating necessary processes and activities related to the project is essential in project management, and these should be carried out through structured methods.

2.2.1 Business case

Project governance uses the business case as a foundation, justifying the initiation and continuation of a project[1]. The objectives of a project should be included in the business case to clarify the expected outcomes and align them with the organizational strategies. Establishing metrics for evaluating the project outcome and specifying the acceptable level of risk for the organization is conducted in the business case. Detailed budget, schedule, quality requirements, and the impact on other organizational operations should be taken into account. Stakeholder engagement and management of relations should be addressed, as well as the utilization of resources for both material and human resources. The required knowledge, skills, and capabilities need to be identified, as well as the scope and potential scenarios. The business case should include a proposed approach of management and asses the organization´s ability to sustain business and organizational activities during change.

2.2.2 Project lifecycle

When defining the lifecycle of a project, several factors should be considered, including governance for both the organization and the project, risk management, control factors, and the type of project, alongside other organizational and environmental factors[1].

The structure and phases of a project depend on the type of project, governance requirements, and risks[1]. The phases could have different delivery approaches, such as predictive, iterative, incremental, adaptive, or a combination of all these. Each phase should have a defined start and end, with specific milestones with a corresponding decision gate, key deliverables, outputs, or outcomes. Decision points are often referred to as "gates" and are a key foundation in project governance since they help ensure that the project meets defined criteria before moving on to the next phase. The criteria for passing through these gates depend on the organizational context, lifecycle model, governance framework, and, in some cases, overlapping phases due to the complexity of the projects.

Figure 2.1 highlights how decision gates and phases should be structured, but may change due to the organizational and external environment, funding, benefits required, risks, and constraints[1]. Figure 2.1 further demonstrates the relationship between the project lifecycle, integrated project management practices, and overall project governance.

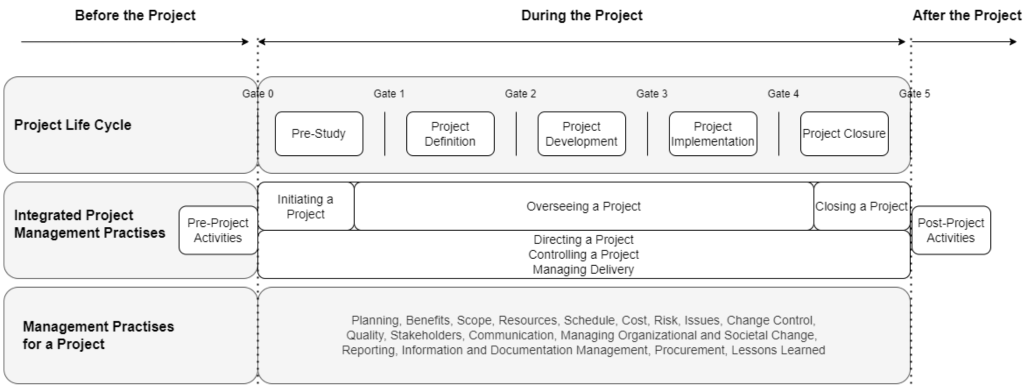

Figure 2.1: Relationship between project lifecycle, integrated project management practices, and management practices for a project, inspired by[1]

2.2.3 Project organization

A project organization is a temporary framework designed to outline roles, responsibilities, and authority in a project[1]. Individuals are assigned a specific role to ensure a clear and reliable process. The project organization should establish clear reporting ways, get approval during the project from the project sponsor or project board, and also forward information efficiently to all involved stakeholders.

The context, organizational environment, and requirements from stakeholders impact how the structure of a project organization looks[1]. The structure should be detailed enough for all individuals to understand the roles and responsibilities of their co-workers. The responsibilities within the project should be consistent and able to be traced back. Informal aspects such as organizational culture, team motivation, and interpersonal dynamics should be considered. Figure 2.2 provides an example of a project organization structure.

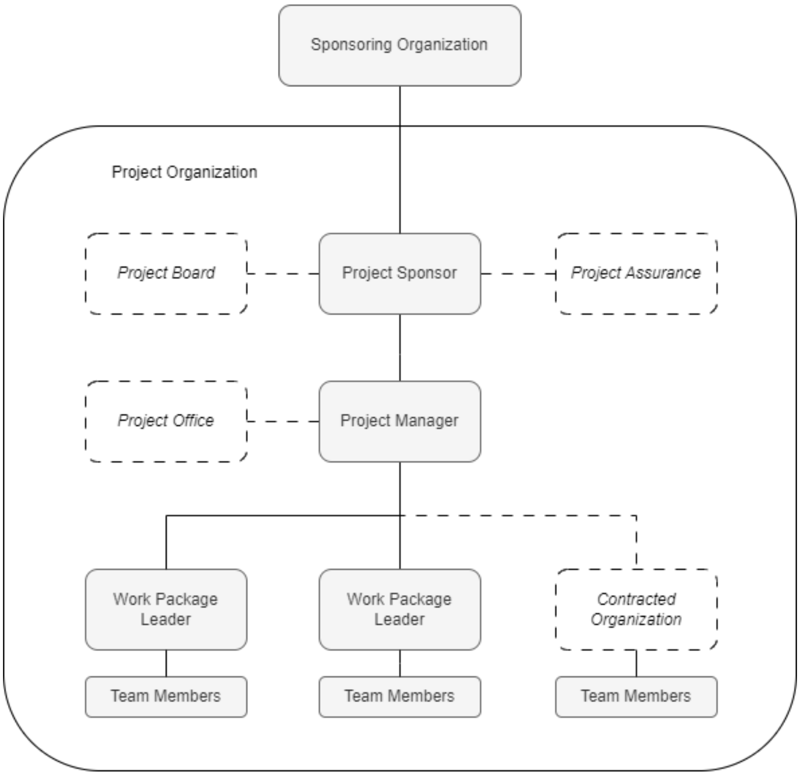

Figure 2.2: Example of a project organization structure, inspired by[1]

In a project organization, some individuals could have multiple roles, therefore, to avoid conflicts of interest, the project sponsor should not serve as the project manager, work package leader, or team member[1]. Customers, customer representatives, suppliers, or contractors could be part of a project organization. The organizational structure could change throughout the project, often between different phases or when adapting the required competencies needed for a specific work or process.

2.2.4 Key roles in projects

Effective project execution requires clearly defined roles and responsibilities[1][8]. In Table 2.1 the roles mentioned in Figure 2.2 are described.

Table 2.1: Description of roles in projects[1]

Role	Description
Sponsoring Organization	Operates as a higher-level authority, providing direction and resources to the project board or sponsor. Handles risks and decisions outside the board's authority.
Project Board	Provides guidance and direction to the project sponsor. Its level of authority relative to the sponsor depends on the organization and type of project.
Project Sponsor	Ensures project objectives are met, outputs and outcomes are delivered, and benefits are realized. Responsible for governance, including audits and assurance. Often part of the project board. The project sponsor may represent the sponsoring organization, but not hold its authority.
Project Assurance	Responsible for oversight and governance of the project sponsors' tasks. This can be delegated to an individual, independent of the project manager and team.
Project Manager	Reports to the sponsor or board. Responsible for delivering the project scope and leading the project team. May be supported by a project management team.
Project Office	Supports various project roles and activities. Has a defined role, responsibilities, and reporting structure. Provides functions like administration and coordination.
Work Package Leader	Reports to the project manager. Manages and delivers assigned outputs or outcomes within a specific work package or field.

2.2.5 Planning

Planning should be done to define requirements, outputs, constraints, and deliverables[1]. It is also a way to determine how the objectives can be achieved. The planning of a project should be a joint activity between the project manager and the project members to plan their work. The planning should include parts such as the scope, the resources needed in terms of people, material, and tools, a schedule with activities, costs, risks, and constraints.

The plan should be detailed and show the hierarchy of each project task with a corresponding person responsible for that project task's delivery[1]. The planning should be iterative, meaning it should progress during the project lifecycle. If changes are made to the scope, the project should revisit the plan and revise it accordingly. The plan should act as a baseline for the project progression. Regularly monitoring the progress of the project against the baseline is crucial, and it should be used as a tool for informed reporting. The plan should also be reviewed during gate passages to ensure that the estimated time of completion is correct.

2.2.6 Integrated project management practices

An integrated project management approach should be used throughout the project and applied to all its processes, from the beginning of a project when decisions are made until the project closure[1]. The practices of integrated management should ensure a structured approach for managing the different phases in a project, its activities, and overall project flow.

Selecting the project management practices, tailoring them, and integrating the activities into a structured approach is essential[1]. The purpose of these practices is to enable the project organization to achieve the objectives, define and manage the constraints within the scope, identify potential risks, and the resources needed. The integrated activities should also help the organization gain support from key stakeholders, including resource owners, funders, suppliers, customers, users, and other participants. The different project management practices that should be considered throughout a project and applied in the integrated project management framework described, are presented in Appendix A. The importance of specific concepts and practices depends on the project's context and the chosen approach.

A project should be managed using an integrated approach that takes into account different roles, competencies, and organizational and environmental factors that could impact the outcome of the project[1]. The approach should align and connect with other management frameworks, as shown in Figure 2.1. How project management practices are integrated including both pre- and post-project activities are shown in Figure 2.3.

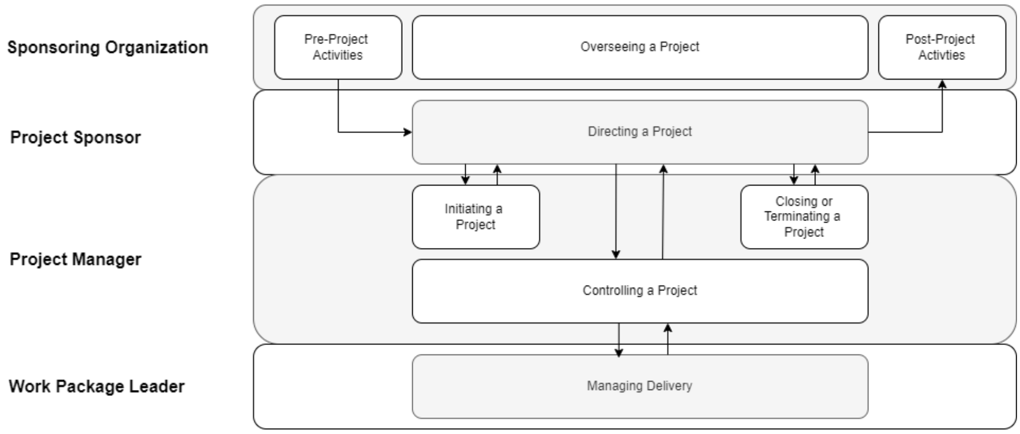

Figure 2.3: A view of integrated project management practices, relationships and associated roles, inspired by[1]

2.3 Guidance on governance

Governance defines the authority, direction, empowerment, oversight, and limitations of the environment in which management operates to achieve the organizational objectives[2]. Governance and management operate at different levels in an organization, where the governing framework is responsible for the overall performance of the organization. Since both have a big part in successfully achieving the organizational objectives, there needs to be a proactive relationship between them, see Figure 2.4.

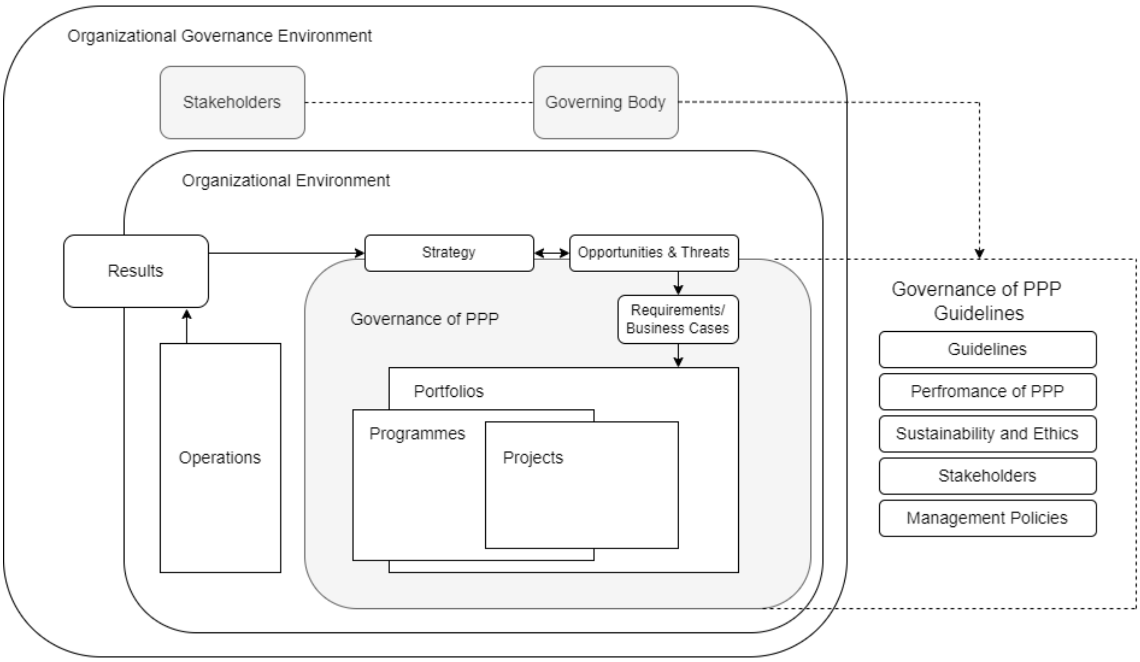

Figure 2.4: Example of governance framework for projects, programmes and portfolios, inspired by[2]

The overall governance framework consists of projects, programmes, and portfolios which all have their respective governance which should be integrated with the overall framework, see Figure 2.4[2]. The framework should ensure alignment between all initiatives and at the same time, if needed, incorporate the requirements of any internal or external participating organizations. An efficient governance framework should ensure that the management upholds the organizational values and principles. It will benefit from realizing the objectives within the constraints set by the governance, and at the same time, considering cultural and ethical norms.

2.3.1 Governance in projects

To meet the governance requirements, the governance of projects should be aligned with the organizational governance[2]. Suitable processes, procedures, and standards should be selected to support the governance of projects. In situations where several other organizations are involved, a separate governance framework might be needed, to be able to ensure that all participating organizations' governance is considered and aligned.

Governance of projects includes defining the authority and responsibilities of the governing body of the project, but also establishing and maintaining the governance framework[2]. The governing body of the participating organizations should establish and authorize a project governing body, such as a steering committee, executive leadership team, sponsor, or other solution for overseeing the project. The governance framework should provide guidance in project management by clearly defining the roles and responsibilities, including practices and polices such as risk management, decision gates, stakeholder engagement, audit, and assurance processes. Sustainability and legislation requirements, and reporting should also be considered.

The project management policy should clarify the purpose, roles, responsibilities, and authorities within the project governance[2]. Risk management should be aligned with the organization's policies and communicated to the stakeholders. In order to make decisions based on clear criteria throughout the project regarding continuing, adjusting, suspending, or discontinuing the project, decision gates should be incorporated between different phases or critical areas. Interests, expectations, and conflicts should be handled by stakeholder engagement. The sustainability and legislation requirements should consider questions regarding health, safety, security, regulatory, economic, environmental, and social factors. The reporting should contain things such as key decisions, ensuring transparency, and verification. The reporting of a project needs to be aligned with the guidelines set by the organizational governance in order to have a consistent format for all projects in the organization. The governance framework should regularly be documented, reviewed, updated, and archived, especially when circumstances change. An example of the governance framework for a project or multiple projects is shown in Figure 2.5.

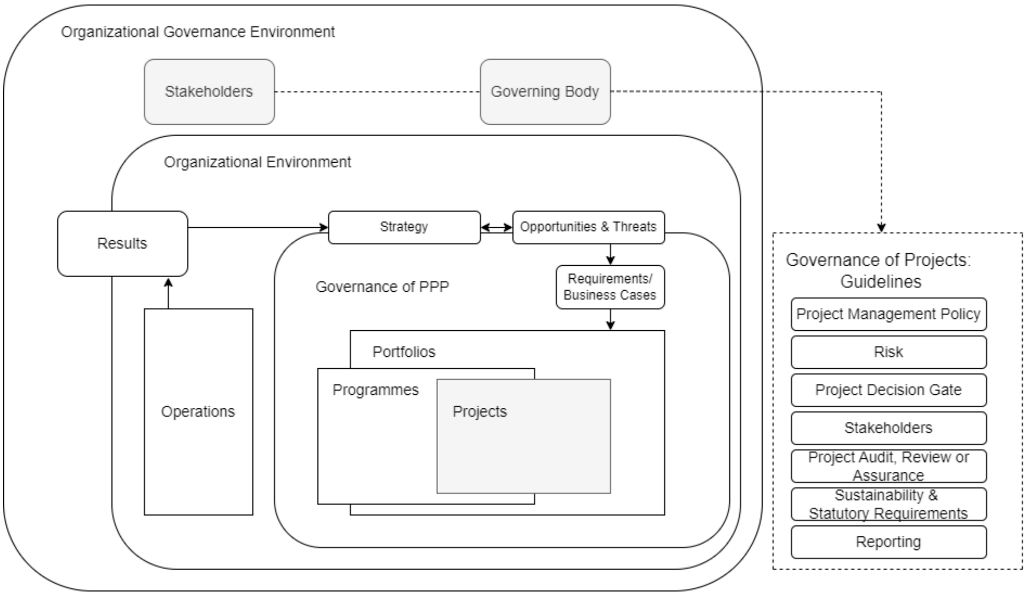

Figure 2.5: Example of governance framework for projects, inspired by[2]

2.4 Quality management in projects

Quality management principles should be used in all project management processes[9]. Quality management systems in projects are used both for the originating organization, which decides to initiate the project, and hand it over to the project organization, which will carry out the project. An originating organization can take on multiple projects at the same time and hand them out to different project organizations. The responsibility and authority between different parts should be clearly documented in order to avoid conflicts of interest or misunderstanding.

The quality plan for a project should contain documentation of the project quality management system, which is referred to and maintained during a project[9]. To attain high-quality objectives, the quality plan should define the activities and resources needed for the project. When developing the quality plan, both the originating and the project organization should use a risk-based approach for the quality management system, identifying potential risks and opportunities that could impact the objectives of the project. Considering risks should be done in both the planning and support processes. The quality plan should be mentioned or referred to in the project management plan.

In order to develop and maintain an efficient quality management system, involvement from top management is crucial[9]. Top management of both the project and the originating organization should foster a culture of quality, contribute to strategic processes, and ensure continuous improvement through lessons learned from current and prior projects. The responsibility lay with the top management of the originating organization since project organizations are often dissolved after a project is completed.

2.4.1 Strategic process

Understanding customer needs, both current and future, alongside meeting requirements and striving to exceed customer expectations, is essential for organizations[10]. Satisfaction from customers and stakeholders calls for requirements to be clearly stated to be able to align project processes efficiently and meet the requirements[9]. The objectives of the project should contain both expectations and requirements from customers. The objectives might change throughout the project and should therefore be documented and specified in the project management plan. When making different actions impacting the outcome of the project, evaluating the importance of meeting the requirements is essential. Therefore, an ongoing dialogue with stakeholders is important to be able to exchange information and resolve conflicts. If conflicts arise, customer requirements are often prioritized, unless other documentation or legislation states otherwise. If any resolutions are made, they should be documented, and if other parties join the project or changes are made to requirements, they should also be considered.

All personnel in a project organization should have a clearly defined and documented role, where authorities and responsibilities in the project should be stated[9]. The authority should align with the assigned responsibilities, and a competent individual who matches the role should be appointed. Appropriate tools, techniques, and methods should be assigned to the personnel, enabling monitoring, operating, controlling, and improving the project processes.

If activities are understood and managed as processes, it is more likely to achieve more consistent and predictable results[10]. The process of the project should be clearly stated and supported by documentation[9]. The project organization should establish a process suitable for the purpose, containing both new and already established processes. Lessons learned from earlier projects should be provided by the originating organization. A process approach helps ensure coordination and alignment within the organization and the planned activities by identifying key processes and their inputs, outputs, and objectives. Assigning ownership and responsibilities over the processes, and designing the processes within the project lifecycle should be identified. Establishing correlations between processes and identifying potential risks and opportunities is also essential. The effectiveness and efficiency of these processes should be reviewed both internally and externally to evaluate the performance of the processes.

2.4.2 Continuous improvement

The originating and project organizations should both strive to continuously improve by enhancing the efficiency and effectiveness of their processes[9]. Learning from previous projects should be an included activity in all projects. Analyzing gathered information from the project, including self-assessments, internal and external audits, helps identify opportunities for improvement.

To ensure ongoing sustainability, adequacy, effectiveness, and efficiency during the project, the project manager and the project organization should go through and review the quality management system at planned intervals[9]. To assess how well the objectives are being achieved, all processes within the project need to be evaluated. A progress evaluation provides a structured way of reviewing the processes and their alignment with the objectives, providing information about the project's productivity. The evaluation should assess if the project management plan is still adequate for the objectives, ensure that the processes are coordinated, identify risks and opportunities, facilitate communication, gather information about the remaining parts, and ensure continuous improvement.

2.4.3 Personnel management in projects

The quality of a project is dependent on the engagement and competence of the people involved in it[9]. A project environment where people can operate efficiently is, therefore, important and impacts the outcome. The originating organizations set the policies and requirements. The organizational structure of a project should therefore align its structure to those and the specific requirements of the project. The project manager and originating organization should ensure that the structure facilitates good communication channels, collaboration, and coordination between team members and stakeholders. The structure should also take into account the authorities and responsibilities of different stakeholders, alongside a clearly defined relationship between the project organization, the originating organization, customers, and other relevant stakeholders. Roles, responsibilities, and reporting ways should all be documented. The functions that are implementing and maintaining the quality management system of the project must be defined, as well as the interaction between other project functions and other stakeholders.

A defined approach for personnel management should be implemented to ensure that team members can work efficiently[11]. The selection of personnel should be based on clearly defined competencies and attributes, including education, training, or necessary project-specific skills, but also references from previous experience. When selecting a project manager, leadership skills should be a priority. For essential positions in the project organization, the project manager should be involved. It is also the responsibility of the manager to select a team member who is responsible for implementing and maintaining the project quality management system. The assigned role or job should be understood and accepted by the person assigned. The roles in a project organization should be documented and shared with all concerned stakeholders. Personnel should be trained on and informed about the importance and relevance of their activities in achieving the project and quality objectives.

2.4.4 Communication management

The purpose of managing communication is to facilitate the interactions between stakeholders effectively, alongside contributing to successful delivery outcomes and benefits of the project[1]. The communication methods should be planned, documented, and adjusted for the needs of the stakeholders. An effective way of communicating is essential for reaching success in a project and should therefore be monitored to ensure its effectiveness. The communication activities should focus on supporting the key objectives in order to improve the understanding and cooperation between and among stakeholders. Communication management provides accurate data in time with unbiased inputs and minimizes risk by having a proper communication plan designed for the purpose.

Both the project and the originating organization should have an established way of communicating to ensure quality communication[9]. The communication plan should address the needs of all stakeholders by defining which information to be communicated, in which channels, and with what frequency. The communication plan should also describe the purpose, frequency, timing, and documentation of meetings. It should also specify the format, language, and structure of project documentation and the information management system, including security processes, and the format for progress evaluation reports to be able to highlight eventual deviations from the project management plan.

2.4.5 Information and documentation management

The purpose of information and documentation management is to ensure that relevant and accurate information and documentation are available for those working and making decisions in projects and organizations[1]. This should include secure and timely collection of, storage, analysis, distribution, and maintenance of accurate information necessary for activities such as planning, undertaking, and auditing work, and supporting lessons learned and knowledge management. The information and documentation should be accessible in the future, either as a reference for new projects or for the necessity of historical documentation. An information and documentation management system should ensure the secure storage and maintenance of information, ensuring that only authorized individuals have access to it.

The project organization should identify which information and documentation are necessary and establish a management system that incorporates both internal and external sources[9]. The information and documentation management system should address the needs of both the project and the originating organization. The activities and processes related to preparation, identification, classification, updates, distribution, filing, storage, retrieval, retention, and disposition of information should be defined alongside security measures. The information should be documented in a clear and structured way. Agreements that influence the project outcomes and performance should be documented, alongside meeting rules and guidelines. The agendas for meetings should be handed out in advance and should be documented, containing agreed-upon relevant issues, decisions, and actions together with due dates and the personnel assigned to do them.

2.4.6 Lessons learned

To avoid repeating mistakes, benefits from previous experience should be drawn from prior and ongoing projects[1]. Lessons could come from previous mistakes being made, issues and their resolution, reviews, audits, or risks that have been managed. The lessons learned should be integrated into the organization and used for improving project performance and laying the foundation for future decisions. If a specified project management process or structure is used, the process owner should be informed to learn and improve the processes accordingly.

To identify and collect relevant information for improving the project management processes, the originating organization should design an information management system, ensuring that data is relevant and that the information is used by other projects that it originates [9]. The originating organization should conduct reviews regarding project performance to highlight experiences gained to improve future and other ongoing projects. The reviews should be made with different stakeholders, be documented, and the project management plan should be used as the foundation for the reviews.

2.5 Asset management

Asset management is a structured way for organizations to manage assets over time[12]. It is a management practice to increase performance and maximize the value of assets throughout the entire lifecycle. Asset management includes various activities that are aimed at optimizing asset performance, managing risks, ensuring efficient utilization, and controlling costs associated with assets within the organization.

To ensure effective management over time, asset management includes a long-term approach from procurement to disposal of assets, covering the entire asset lifecycle[12][13]. Continuous monitoring and improvement of asset performance is a crucial part of the asset management process. Continuous monitoring includes data utilization for visualization and analyzing processes to ensure informed decisions on asset optimization[14].

Asset management is defined as the coordinated activities within an organization that are aimed at drawing value from its assets, according to the international standard for asset management[15]. Increase in output, increase in efficiency, and enhanced operational effectiveness are some of the benefits that can be achieved with effective asset management strategies[15]. Asset management is a way to ensure optimal asset performance, which can enable organizations to regularly meet or exceed customer and stakeholder expectations[15]. It is in the organization's interest to constantly refine processes, procedures, and asset performance because it is a way to enhance the overall efficiency and effectiveness of the organization[15].

ISO 55000 defines the core principles of asset management as value, alignment, leadership, and assurance. The focus is not only on the asset itself, but instead on the value it provides to the organization[15]. Activities in asset management should align with the overall strategic objectives of the organization. Leadership commitment is also crucial to ensure a successful implementation of asset management practices. Establishing processes that include continuous monitoring and improvement will help organizations to ensure the intended purpose of their assets[15].

2.5.1 Data management in asset management

Well-structured and accurate data is crucial for asset management success[16]. Data management includes all the processes related to handling financial and non-financial data within an organization. Non-financial data can include operational data such as maintenance records and production metrics, but also project documentation and data generated by projects. Documenting this data will help ensure that relevant data is available for the organization when needed. A key part is that each user or group within an organization must understand and trust the data that they work with. Standardized data classification plays an important role in aligning information with the asset management strategy and ensuring the easy finding of relevant information.

2.5.2 Maintenance engineering

The purpose of maintenance engineering is to apply competencies, methods, techniques, and tools to develop maintenance plans and strategies to ensure the function of an item over its entire lifecycle[17]. Benefits of maintenance engineering include risk analysis, lifetime extension of equipment, and improved competitiveness. Maintenance engineering has the highest impact when applied early in the process, during the conceptual and design phase. Activities within maintenance engineering are focused on making sure that items can fulfill their function, which should be achieved safely and cost-effectively. Maintenance engineering should be applied in every stage of an item's lifecycle, from the conceptual phase to the disposal of the item. An overview of maintenance engineering activities during the different project phases will be presented below.

In the conceptual phase, maintenance engineering aims to provide information and contribute to the initial definition based on the maintenance requirements[17]. Activities include evaluation of the maintenance requirements as well as assessment of the maintainability of different options presented. Help in meeting stakeholder goals by assessing the reliability, sustainability, and safety level of the options. Maintenance engineering should also make sure that the options comply with regulations.

Maintenance engineering should be applied to oversee the whole asset solution, contributing to dependability assessment by looking at maintainability aspects[17].

They should be applied to support the design in achieving reliability and maintainability. Early developments should be made on maintenance processes, instructions, and the opportunities within maintenance technologies should be identified. The development of maintenance plans and task descriptions should also be started. Maintenance engineering in the design phase is all about making sure that maintenance requirements are met early in the development of a project.

Maintenance engineering should assist in and participate in functional testing and inspection of the equipment, updating the maintenance plans according to the development of the equipment[17]. The aim is to implement the maintenance decisions that were made in the conceptual and design phases. During the commissioning, maintenance engineering should identify and implement the resources and competence needed for the maintenance of the equipment. Plans should be implemented, including inspections, operator maintenance, and condition monitoring plans. Maintenance procedures should be validated, and maintenance engineering should contribute to acceptance tests and commissioning.

2.6 Relation between project and asset management

Close alignment with project management in the early stages, from specification of requirements to project planning, execution, and commissioning of an asset's lifecycle is crucial for asset management to be effective[12][18]. This early alignment can help ensure that facilities, systems, and assemblies are designed, constructed, and implemented in a way that ensures the performance of the asset from the start.

Both asset management and project management contribute to the competitive advantage of an organization. By leveraging the entire asset lifecycle thinking, organizations can ensure that their assets, both tangible and intangible, are valuable, rare, difficult to replicate, and well supported within the organization[19][20]. Intangible project management assets such as knowledge, expertise, and structured processes are crucial to enhance the overall performance of project outcomes[21].

Integrating project management with asset management strengthens key operational activities such as maintenance and procurement by addressing issues together early in the process. This approach enables organizations to plan, procure, install, and dispose of assets in a way that maximizes their value throughout their entire lifecycle[22]. There is a connection between project management and asset management. Project management provides a structured approach to start, execute, and complete projects, which results in the creation of assets. Asset management focuses on optimizing these assets and extending their lifecycle. This is done by integrating asset management practices early in the project, such as during the concept and design phase.

Strategically integrating asset management and project management can lead to a competitive advantage by leveraging intangible project management assets such as strong and committed leadership, effective communication, and strategic planning, and by ensuring the value of equipment with asset management strategies[19][21][23]. A strong integration between the two disciplines can also enhance the overall efficiency of the organization, lower risks, and account for long-term sustainability[22]. Alignment can help organizations achieve cost-effective and efficient assets.

An asset lifecycle management model integrates project and asset management to enhance the asset lifecycle considerations[24]. The framework optimizes the maintenance prevention process during the acquisition phase, which results in reduced maintenance costs during the utilization phase. A comprehensive lifecycle management approach can ensure project consistency and effective information sharing and coordination. From a cost perspective, the requirements for system effectiveness in terms of reliability, availability, and maintainability should be of equal importance as the functional requirements of, for example, throughput and quality. The first-mentioned requirements should be defined early in the conceptual phase to prevent missing important parts.

2.6.1 Integration of asset management in projects

A significant gap still exists in effectively integrating project management and asset management[25]. OM is often considered as a part of asset management, and is often insufficiently integrated within the planning, design, and construction phases in projects. These are essential for sustainable, efficient, and comprehensive lifecycle management. These challenges can be traced back to organizational structures, where project management and asset management are located in different categories. This separation hinders the seamless transition of information and responsibilities. Unreliable handovers can cause value leakage[26]. Preventing this includes proper and early planning, as well as integrating asset management principles in the project management practices to prevent stakeholder expectations from not being met.

2.7 Project handover

Organizations often implement project management methodologies (PMM) to structure workflows, improve coordination, and ensure project success. Research suggests that many PMMs lack empirical validation and do not always deliver the intended efficiency gains[27]. Since PMMs provide structured frameworks for planning and execution, their effectiveness depends on how well they align and integrate with the specific needs of a project. Traditional PMMs often emphasize certain structures, which may not fit the complexities of real-world project handovers[27]. Studies indicate that almost half of project practitioners see little benefit from using PMMs, highlighting the need for tailored, adaptive approaches[28].

Recent research has emphasized the value of integrating both hard and soft skills, such as technical expertise and effective communication, which has been identified as a factor in improving project handovers and ensuring long-term operational success[29]. A better understanding of current structures can help identify inefficiencies in the workflows and provide insights into how other project management approaches can contribute to more effective transitions from project development to production.

3

Methods

This chapter explains which methods were used to arrive at the result. The thesis was conducted through mainly three parts, a literature study, a case study, and a process study, see in Figure 3.1.

The main part of the thesis was a case study. The case study contained a qualitative study with an analysis of the documented processes and structures, alongside interviews and an analysis of them to gain insights into how the processes and structures work in practice and if they are followed. The quantitative study contains a review of the documents to gain numerical data on how many projects are documented and if the projects contained all the necessary documentation when archived. The process study was conducted through a qualitative study, and aims to support the findings in the case study, validating, verifying, and comparing another way of working with similar projects. This was made by following an ongoing project, and information was gathered through a documentation analysis of the project's processes, structures, and resources, along with observations and attending project meetings to gain insights into the progress.

Through the case and the process study, strengths, weaknesses, inefficiencies, and the way of working in projects were identified by analyzing the internal documentation, conducting interviews regarding past projects, and gathering information about the ongoing project. A current state analysis was performed to present and explain how the projects are being performed, why certain complications arise, and what it might depend on. An analysis was conducted to demonstrate the strengths, weaknesses, opportunities, and threats (SWOT) of the current structure. These analyses led to the identification of several potential improvements.

A literature study was conducted throughout the thesis, in the beginning with the purpose of understanding the research field and the potential gaps, while in the later parts of the thesis, validating and identifying recommendations for the problems and inefficiencies identified in the other two studies.

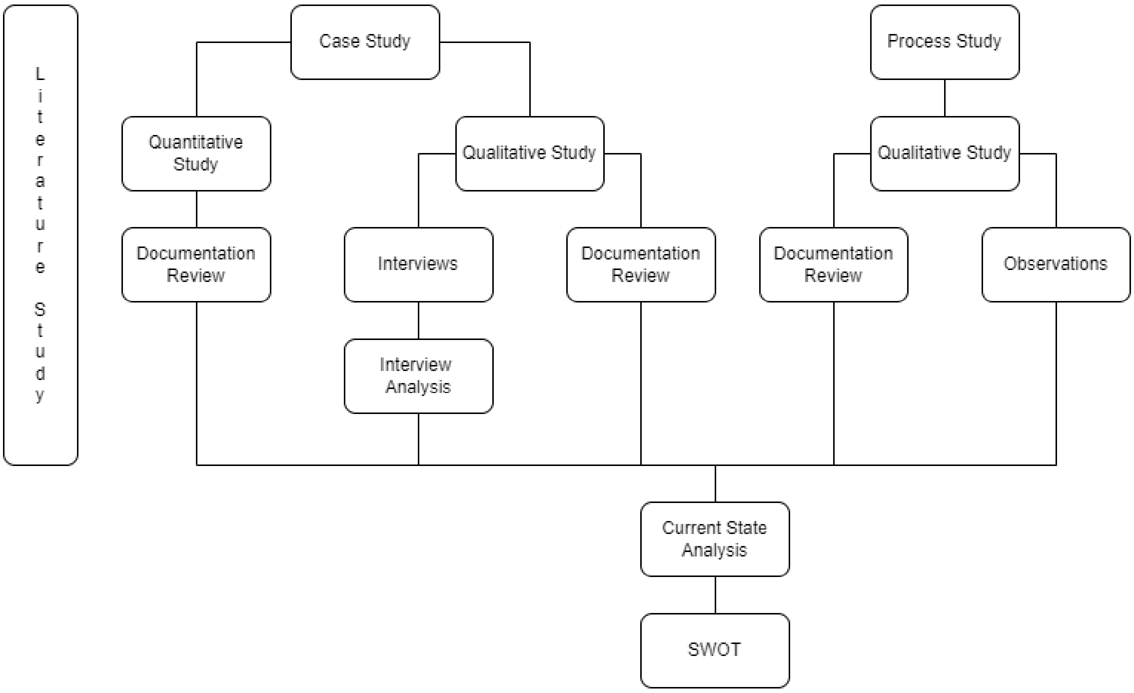

Figure 3.1: Thesis methodology

3.1 Literature study

The purpose of conducting the literature study was to examine the current research field. Knowledge of relevant literature helped in understanding how to tackle the problem, as well as indicating where further research is necessary. The literature study was an ongoing process throughout the whole thesis.

A literature study reviews the literature in a specific subject area[30]. A literature review can be a summary of sources that touch on the subject, more commonly, it is a way to summarize the information available on the subject and reorganize that information between different sources. The main idea of a literature study is to gather available information and summarize it without adding new contributions.

Scholarly databases were used for information gathering. These include Scopus, Web of Science, and the Swedish Institute for Standards. A search method approach, including keywords and boolean variables such as AND, OR, and NOT, was utilized. Scopus AI was used to streamline the literature search process. It is a search tool powered by generative AI [31]. It uses natural language processing, meaning that it converts regular questions into search strings with boolean variables[31]. It ensures that unfamiliar users capture as many useful sources as possible. Scopus AI generates responses from the metadata of articles, books, conference papers, reports, reviews, and data papers[31]. Scopus AI was leveraged by asking questions, gaining a response, and utilizing the sources that the AI used to write that response. This generated relevant sources in a short period. The relevant sources also contributed with more relevant sources in their respective reference lists.

3.2 Case study

The majority of the thesis was conducted through a case study. A qualitative study containing a documentation analysis of all documentation describing the project working procedures, processes, standards, and established frameworks. The documentation analysis also included all technical projects archived, except facility projects, since they are made differently. The qualitative part in the case study also contained interviews of personnel involved in or impacted by the projects. A thematic analysis of the interviews was later conducted to find interesting patterns and subjects. The quantitative part of the case study contains a review of all archived technical projects.

3.2.1 Qualitative study

A qualitative approach was used in the initial phase to map the processes within a project, understanding and gaining information about the frameworks and working procedures. This part of the case study also explored why there are problems in the processes and identified the current way of working by conducting interviews and analyzing the documentation.

The qualitative research revolves around the non-statistical data, which was collected through interviews and a documentation analysis[32]. The method was iterative, meaning that the research design was flexible and emergent, and to ensure that the data reflected the participants' real-life experiences[33]. While the quantitative part focused on measuring quantifiable data, the qualitative methods emphasized the understanding quality of human experiences[33][34]. To obtain valuable information reflecting the actual way of working around the structure, it was crucial to let the involved personnel explain how they are working with it and their own experiences using it or not.

3.2.1.1 Documentation analysis

To gain insight into how a technical project should be performed, a thorough analysis of the documentation describing the project process was conducted. It included documentation regarding all phases in a project from the definition to the project closure, including which roles and responsibilities all involved participant has, when, how, and by whom decisions are made, which processes should be involved, and how they should be performed.

An analysis of archived projects was also performed. The analysis contains past projects and the workflows and processes involved, existing documentation and data, inefficiencies and patterns, implementation of technical solutions, and lessons learned from past projects[35]. When the documentation analysis was conducted, a standardized approach was used and reflected on the approach to ensure a comprehensive and effective way of analyzing the documentation. By including a reflective analysis of archived projects and the standard, insights were gained on how different process enablers interacted and contributed to the project outcome[36].

3.2.1.2 Interviews

When interviewing staff, it was important to let them speak out and not prompt participants into answering what they think the interviewer wants to hear. Therefore, structured interviews were not preferred in this thesis work. Instead, semi-structured interviews were conducted. It is a qualitative method characterized by a flexible interview guide that includes both close- and open-ended questions[37]. It allows participants to feel more engaged and comfortable and often leads to more honest and detailed responses[38].

The documentation analysis served as a foundation for understanding the current project structures and uncertainties related to it. Based on the research questions and the literature reviewed, a set of questions was developed for use during the interviews. The questions were designed to be as open-ended as possible, allowing free responses from the interviewees. Additionally, prompts were used to guide the interview in the right direction. The questionnaire can be found in Appendix B.

During the thesis, there were a total of 17 interviews. The interviewees were selected based on the extent of their involvement in technical projects, from top management personnel to electricians to project managers. The interviews took between 30 minutes and one hour. To promote reflections before the interviews, the questionnaire was sent in advance to the interviewee. This mitigated the risk that an interviewee would not answer the questions thoroughly.

3.2.1.3 Interview analysis

A thematic analysis was conducted to analyze the content of the interviews. It provided a systematic approach to theme information between different respondents and served as a tool to find patterns and pinpoint problems within the handover process that were revealed during the interviews.

Thematic analysis is a qualitative research method that is used to identify, analyze, and find patterns or themes within data that comes from interview transcripts. Thematic analysis begins with familiarization with the collected data, reading to become familiar with the content[39]. Initial codes are generated by systematically coding interesting data features that are relevant to the research questions. Coded material is sorted into potential themes, which are then reviewed and refined by merging, splitting, and discarding themes. The themes are named, and an explanation for the correlation with the research questions is provided. The last step is to write the analysis that should provide detailed explanations of the themes and how they are related to the research questions and the literature.

Using built-in features in Teams, the interviews were automatically transcribed. The automatic transcription varied in quality, and therefore, each interview was manually revised with the help of the audio file. This procedure also served as a familiarization with the content. Each transcribed file was revisited to pick out interesting quotes that were put into an Excel sheet with a label describing the context of the quote. Initial codes were created by systematically reviewing all the listed quotes, which were later combined into themes. The themes were reviewed and refined by merging and discarding themes.

3.2.2 Quantitative study

The quantitative study included a review of the document to obtain numerical data on the number of documented projects and whether they contained all the important documents related to the project when archived. By systematically analyzing the data from the projects, it helped identify patterns and correlations that gave insights into the underlying factors and outcomes in the handover phase[40]. By reviewing documentation from past projects, such as reports, timelines, and project definitions, common challenges and misses that occurred during projects was identified. The documentation review also served as a validation tool, providing context and supporting the quantitative findings[41][42].

3.2.2.1 Documentation review

Based on the documentation analysis, the most critical documents could be identified in a project related to and impacting the handover phase between the project management and the receiving organization. The most critical project documents were later checked to see if they existed, were properly made, and uploaded to the project archive. All archived technical projects, which were not facility projects, were reviewed, and all critical documents were either noted as existing or not existing. The documentation review provided us with a comprehensive understanding of the documentation status and demonstrated the existence of the critical documents.

3.3 Process study

The last main part of the methodology for this thesis is the process study which was conducted through following an ongoing project. Information and insights were gained through a documentation analysis and observations. The process study project used another type of project structure, with more allocated resources and personnel working mainly with the project. The process study served as a comparison to the projects in the case study, allowing us to directly observe an ongoing project.

3.3.1 Qualitative study

As in the case study, a qualitative approach was used to obtain information and insights of the ongoing project through observing the project process by attending meetings and analyzing the documentation of the processes. This qualitative study aimed to observe how the team works on a current project with a different structure and other resources, providing a comparative perspective to the projects in the case study.

3.3.1.1 Documentation analysis

To understand the structure and how the process study project should be performed, a thorough analysis of the documentation describing the project process was conducted. This analysis detailed the structures, roles and responsibilities of all participants, the timing and methods of decision-making, the processes involved and their execution.

Compared to the documentation analysis in the case study, another analysis was conducted with the purpose of understanding and obtaining information about how different the project structure was and how it operates. This study focused on identifying key characteristics, resource allocation, and organizational structure. Similar to the case study, it involved analyzing the documentation of all frameworks, timelines, and other relevant materials to gain a comprehensive understanding of the project structure.

3.3.1.2 Observations

During the meetings, direct observations were conducted without interacting or interfering with the proceedings. After the meetings, discussions took place and conversations were held with the project members.

The objective of this qualitative study was to understand the structure of the work and the structure of the project through observations made during project meetings. Observations are a key qualitative data collection tool that allowed to gather first-hand information by observing people and phenomena in this specific situation and helping in understanding the structures presented in the documentation analysis by setting them into context[43][44].

3.4 Current state analysis

The current state analysis was based on the process study and the case study. It served as a method to combine the data from the interviews, interview analysis, observations, documentation review, and documentation analysis to conclude how the current project structure looks and to what extent it is followed in the daily work. Analyzing the current state from multiple perspectives helps identify areas for improvement and implement changes that optimize overall system performance [45].The current state analysis created a thorough understanding of the problems by identifying current workflows. Identified areas of improvements served as starting point for the SWOT analysis.

3.4.1 SWOT analysis

SWOT analysis is a strategic planning tool that is used for evaluating strengths, weaknesses, opportunities, and threats involved in a process. This methodology helps assess the internal and external factors to develop an effective strategy and ensure a holistic view of the project environment[46]. SWOT provides a clear framework for identifying key factors that influence the process outcome, which simplifies organizing and prioritizing information[47]. Highlighting the strengths in a process could leverage the organization's ability to maximize its projects and mitigate risks associated with weaknesses and threats[48].

SWOT analysis in this thesis was used as a tool to summarize and visualize the strengths, weaknesses, opportunities and threats of the project processes in a structured way. It was developed by discussing and analyzing the results of the thematic analysis, the documentation analysis and the documentation review.

4
Results

In this chapter, the result of the thesis is presented, including a presentation of the current project structure and its compliance with it. The process study and the SWOT analysis results are also presented.

4.1 Project structure

In this chapter, the current project management structure for technical projects is presented. This section is based on the documentation analysis of the internal documents, describing how a technical project should be performed, documented, and what should be included. The documentation analyzed contains project processes, role allocation, and responsibilities.

The overall structure and the different phases of a project are presented. All phases and the activities during each phase, based on the company's directives and documentation, are described. In chapter 4.1.2, the key roles in technical projects and their main responsibilities in a project are described. Additionally, a subsection describing how the management of spare parts should be made in a project is presented.

4.1.1 Overall project structure

The overall project structure for technical projects contains five phases: the pre-study, project definition, project development, project implementation, and project closure, see Figure 4.1. The purpose of the project structure is to ensure that there is a standardized way of working in technical projects. The project structure contains decision gates between all phases, at the beginning of the project life cycle, and the end. To initiate the project or proceed to a gate, certain demands need to be fulfilled.

Figure 4.1: Overall project structure

In Gate 0, based on the project idea, the factory management decides whether the project should be initiated or not, depending on factors such as priority, savings, risks, time, investment cost, or available resources. Whether a pre-study is necessary or if the project can proceed directly to Gate 1 is also decided by the factory management. The decisions made are then documented in a decision log. If the project is initiated, then a project manager is appointed.

If a pre-study has been conducted, a decision is then made by the factory management whether to close the study or proceed to the project definition phase. The decision is based on the updated project proposal and is documented in the decision log by the factory management. If decisions are made that are not aligned with the process structure in either Gate 0 or Gate 1, then they must be documented in connection with the gate passage. Potential risks and consequences must also be highlighted.

In Gate 2, decisions are made based on the agreed handover terms, project goals, along ensuring that the scope of the project is aligned with the needs and long-term objectives of the organization. The investment strategy is also reviewed in this gate. The decisions made in Gate 3 are based on the final solution for technical implementation, alongside a go or no-go decision for project procurement. Whether the project is accepted within the economic framework is decided by the investment committee.

Based on a signed handover document, decisions are made in Gate 4. The handover document is signed by the project manager, the production manager, and the OM department. The decisions made are documented in the handover document. The last gate is passed when financial closure and the facility protocol are updated. The project ensures that both the project and technical documentation are archived accordingly. Technical documentation should be archived and available throughout the life cycle of the equipment, and project documentation should be archived and available for at least ten years.

4.1.2 Project roles and responsibilities

In this chapter, the respective descriptions for each role within a project are provided. This information is documented and available for the project manager, which can be used to clarify responsibilities and expectations within a project group.

4.1.2.1 Steering committee

The steering committee possesses expertise regarding specific technical, product, and market issues related to the project and has a comprehensive understanding of the business. A steering committee has the authority to make decisions within its respective areas of responsibility. They provide advice and support to the project manager and support the sponsor in monitoring and evaluating project execution and risks.

They help in continuously communicating project execution to relevant functions and facilitate the implementation of project results. Their responsibilities include providing advice and support to the sponsor during the project's execution. They also have the responsibility and authority to collaborate with the sponsor to develop and modify the original project definition and, if necessary, propose the termination of projects.

4.1.2.2 Project Sponsor

The sponsor of a project is responsible for defining the impact goals and evaluating them in relation to effort and risks before each gate. They are also responsible for ensuring that benefit-cost, return on investment, and net present value calculations are prepared to create conditions for the project to be profitable. The sponsor also agrees with the project manager on the project scope and makes sure that there are no external factors affecting the project. Anchoring the project with stakeholders, management, and resource managers is also the responsibility of the sponsor.

Additional tasks include managing conflicts of interest and ensuring that decisions are made, monitoring the project's results, timelines, and costs, providing feedback on these, supporting the project manager, and ensuring the conditions to achieve the impact goals are in place. Gate passage decisions and potential project termination are also authorities within the sponsor role.

4.1.2.3 Process development manager

The manager of process development has a specific role in a project, as it is also the manager of the project managers. The role entails a supportive role for the project managers, managing the overall project portfolio and requesting follow-ups on impact goals. Ensuring correct project orders from the originator that include clear impact goals and boundaries is also a task. Other tasks include recommendations for prioritization between different activities and projects in the factory, appointing project managers, production technicians, and designers, and prioritizing resources from the process development department for the different projects.

The manager for process development also manages conflicts of interest, ensuring that decisions are made, making sure that no external factors affect the project in collaboration with the sponsor, monitors that delivery to the originator occurs, and that handover to the receiver is completed. Additionally, the role is responsible for monitoring that experiences from projects are documented and that lessons learned are communicated.

4.1.2.4 Project manager

A project manager executes the project towards established goals regarding technology, quality, economy, and schedule according to the established project process, aiming to realize the factory's investment plans.

The role entails alignment and anchoring of project order with the originator, ensuring that status, current situation, and deviations are continuously presented to stakeholders, creating conditions for creative work environments among participants, and ensuring that project participants feel involved in the project.

Responsibilities include planning, leading, and managing the project to ensure its progress, and ensuring follow-up on project results regarding quality, time, and budget. Together with preparing material for decision-making and ensuring that the project is correctly documented. Initiation of risk analyses and communicating risks, managing procurements with a designated category buyer, maintaining contact with suppliers, driving installation and commissioning of machinery and equipment are also responsibilities of the project manager. Ensuring the handover of the project to the receiving organization is also the project manager's responsibility.

4.1.2.5 Project originator

The project originator is responsible for developing the project order in its entirety, including boundaries, defining project goals that match impact goals, monitoring that the project follows the schedule, and prioritizing between time, cost, and scope. The originator participates in the steering committee to provide clarity regarding what to expect from the project. Other tasks include ensuring that resources are allocated to projects and anchoring the project within the organization.

Responsibilities include ensuring impact goal achievement and that investments meet expected benefits, and creating a ramp-up plan for the impact goals. Authority to collaborate with the sponsor to develop or modify the original project definition and propose termination of projects, approve the handover, and ensure that there are receivers of the project, are also responsibilities of the project originator.

4.1.2.6 Project receiver

The receiver participates in the development of handover conditions and is responsible for continued operations after the handover of the project, such as operations and skill development. The role ensures that the results are managed properly after the project is concluded and ensures that the line organization actively participates in the project, such as during training or test runs.

Responsibilities for the receiver are to describe and communicate their requirements, wishes, and expectations at the start of the project. In addition, contribute with relevant baseline data for the project, inform the project if there are other surrounding factors that may affect, and support the project manager. Other responsibilities include maintaining a dialogue with the originator during the project and providing feedback, and monitoring that the project conducts necessary tests and reviews to ensure the possibility of impacting the goal achievement.

4.1.2.7 Operations & maintenance

OM is the department that ensures that the production equipment is maintained. Their assignment in projects is to ensure that applicable standards are followed and contribute with maintenance expertise that comply with the requirements set by the home department.

OM should also attend project meetings, concept evaluation, design evaluation, quotation evaluation, decisions on supplier selection, delivery inspections, including functional tests, failure mode and effects analysis (FMEA), and life cycle costing (LCC). Additional tasks include preparing handover of equipment to the end user, ongoing follow-up, and requirement setting from the home organization, and contributing with feedback from the home organization to the project.

The target areas for OM are to ensure that the equipment is quality assured according to the requirements of OM, that the equipment is cost-effective considering man-hours and spare parts, that the equipment complies with occupational health and safety regulations, and that the equipment is maintainable. OM should also specify necessary spare parts based on the supplier's recommended parts list, specify necessary training needs, ensure that preventive maintenance instructions meet requirements, ensure that documentation meets requirements, and ensure that risks are addressed.

OM are responsible for building equipment structures in the maintenance system, linking spare parts to equipment in the maintenance system, and linking preventive maintenance and instructions to equipment, including intervals for preventive maintenance. In the role document for OM, they also remark that it is always the project manager who is responsible, and that OM is a supporting organization in projects.

4.1.3 Project definition

The project definition phase is where a project is initiated and planned according to the objectives and limitations. The purpose is to plan the project in this phase to achieve efficient project execution. The input for this phase is that the project has received a formal decision on the continued definition of the project, and a draft of the assignment is formulated in a formal project order.

In the project definition, the project manager should anchor the project order with the originator to agree on expectations and goals. A communication plan should be arranged with contact information for suppliers and stakeholders within the project. This is to make sure that everyone in the project can contact the correct individual. A kickoff meeting should be arranged and held with agenda points such as project order, project role descriptions, responsibilities and expectations, and examination of lessons learned from prior projects.

A time plan should be arranged, indicating project milestones and delivery dates.

The project should identify what type of risk analysis is relevant for the project and apply that model or methodology. The project manager should discuss the handover requirements with the receiver of the project.

The handover document is used to create a basis for the agreed project requirements and goals, which are used later during the handover from the project to production and OM. The project requirements are specified by the project manager together with the originator, production, and OM. The document should cover all equipment handed over from the project to the receiving organization. The document is used for internal use only, not for suppliers or contractors. The document is signed in three different phases of the project lifecycle. Firstly, when agreeing and completing the requirements and goals in the definition phase. The document should later be signed at production start. Lastly, during the formal handover from the project to the receiving organization.

The project manager is responsible for all handover activities. In the project definition phase, the handover document should be prepared together with representatives from all parties. The purpose is to ensure that all parties understand and agree on the project requirements and goals. In this stage, a standard document is reviewed, marking all activities as either applicable or not applicable to the project.

If the receiving organization wants to start using the production equipment before the project is completed with all its commitments, it needs to be clearly written in the handover document, alongside having a written approval from the equipment supplier. Starting before the project is fully completed means that the equipment has been approved and the receiving organization, production, and OM are now responsible for the service and repairs of the equipment, regardless of its status. If there are any corrective actions made before the project has closed, they need to be communicated to the project manager, who should forward them to the equipment supplier.

The following terms should be considered during a handover:

- Risk analysis for CE marking conducted.
- Personnel have received the agreed training.
- There is documentation with a sufficient level of maturity, available to the production staff.
- Necessary spare parts are available.
- Electrical inspection must be conducted.
- Pre-energization check and emergency stop control are conducted.
- If there are lifting devices or pressure vessels, must inspections have been carried out and indicated as approved in the inspection reports.

The project manager should also discuss planned procurements with the purchase department to agree on procurement form, responsibility distribution, contract form, and supplier setups. The project should also review the process of phasing out equipment to identify activities that must be considered. Environment and occupational health assessment, and establishment of contact internally for product safety risk assessment, should be conducted. Media needs for the property should be investigated, and internal and external resource needs should be defined. A rough estimate of the project budget should also be made. The last thing in the project definition is that the basis for the Gate 2 decision should be anchored with the manager of process development.

4.1.4 Project development

During the project development phase, the project starts evolving; the activities identified in the definition phase should now be planned accordingly and developed into complete concepts for implementation. Technical descriptions and flowcharts with associated numbers are created. The documentation requirements are identified, and if it is a small project, a request to change the documentation is made. Applicable technical instructions are identified, and risk assessment on both the machine and the documentation should be initiated.

Layouts for the machine or production lines should be established or updated to ensure safe walkways in case of emergency and fire protection. Before the purchasing division sends out a formal request, it should be reviewed by the project to avoid misunderstandings. An evaluation of the bid is then made together with the purchasing division, where inputs from the project group and supplier strategies are considered. An updated project risk analysis should then be prepared and should include risk analyses for processes, equipment, and safety regarding machine usage. Then the investment documentation is summarized, including the investment proposal.

4.1.5 Project implementation

In the implementation phase, the project is realized. The work done in the previous phases should now be put into practice, and when in place, handed over to the intended organization, often the production and OM departments. The project and organization have agreed on an implementation plan and are actively involving it in the daily operations.

During the implementation phase, the procurement should be made, and a construction review with the project team and contractor should be conducted. An installation risk analysis should also be performed since employees could face significant risk when multiple companies work simultaneously during an installation or renovation phase. The contractor should aim to ensure a safe working environment and good work conditions, following schedules and informing employees about potential risks. The contractor should perform a risk analysis, identifying risks and preparing actionable measures.

A factory acceptance test (FAT), which is a delivery inspection test of the equipment, is performed before a delivery is made. The criteria being tested during FAT are communicated to the supplier during the design phase. The purpose of the tests is to ensure that the machine meets the requirements set by the project and outlined in the procurement documentation. All requirements that can be tested before the machine is delivered should be tested. The product quality is verified through specific tests during the FAT, alongside tests that ensure that the correct documentation is available and that prescribed standards are followed. When finished, a decision on the approval of FAT is made, notes are taken, a punchlist is created, and which personnel who participated in the tests are documented.

The logistics department is informed about the goods being delivered. Then the communication plan is reviewed, and the contact list is provided to the reception, and a start-up meeting with the contractors is conducted. The agenda for the startup meeting includes purpose, a brief project overview, and workplace information.

Before commissioning, a checklist is reviewed. The pre-commissioning inspection of the electrical installation includes visual inspection, testing, correct installation and materials, proper conductor colors, grounding, insulation resistance testing, and ensuring documentation and safety standards are met. A safety and emergency stop test is then conducted before the final machine safety inspection is made.

At the end of the implementation phase, the handover criteria should have been met. A successful site acceptance test (SAT) should have been conducted, and the supplier's self-inspection should have been completed. Additionally, functional testing of the subprocesses has been carried out, together with coordinated testing. Cleaning should have been performed, and quality acceptance test (QAT) and production acceptance test (PAT) should be completed. If there are any activities left to do in the project, a punchlist should be created with clear responsibilities and actions to complete these activities. Lessons learned should be conducted based on the experiences from the project. The handover of equipment has been completed, and the handover documentation has been reviewed and signed by all parties. The project manager should scan the signed original of the handover document and archive it together with other project documentation.

When all these activities have been completed, the documentation is anchored with the manager of process development to decide to proceed with the project to the next phase.

4.1.6 Project closure

In the project closure phase, the project documentation should be archived. The punchlist should be completed and assigned, alongside the final report. The final report should contain a description of the project, its sponsors, participants, steering group, goals, and purpose. The status check should be conducted and covering the overall status, cost, time, quality, and sustainability impact, alongside a description of the technical solutions used.

The objectives of the project should include quality regarding handover criteria, a time plan regarding installation, and economic and sustainability impact. The lessons learned should include recommendations and reflections regarding the interactions between different key roles within the project team. The methods, processes, suppliers, and contractors should also be covered in the lessons learned. The lessons should be communicated, together with comments from the project manager.

Before taking a decision whether to close the project, there are four gate criteria that are checked by the project manager. These include that the project objectives are achieved, that the project fulfills the checklists, that the handover is approved, and that lessons learned are documented. After the facility register is checked and should be updated by the financial department, the investment should be closed, and the facility form should be completed. When all this is done, the project is ready to be closed in Gate 5.

4.1.7 Spare part management

The project manager is responsible for the spare part management in the project. The project manager requests a recommended spare part list from the supplier and hands it over to the project member representing OM, who is responsible for reviewing whether there are any similar spare parts already in stock or if the component is already registered but with another name. If there are spare parts already in stock suitable for the project, the representative from OM should link the spare parts to the objects in the maintenance system and, if needed, change re-order points in the ERP system. If there are any spare parts in stock, the representative should decide with the help of the recommended spare part list, which parts and how many should be purchased. The warehouse department is responsible for extracting item numbers in the ERP system. In parallel, maintenance should link the parts with the object, and the warehouse should place the first order. The deliveries of spare parts should be monitored by both the warehouse and the project team.

4.2 Compliance with the project structure

In this section, the compliance with the project structure is presented. This chapter is based on the interviews conducted, thematic analysis and documentation from archived projects. The thematic analysis resulted in 341 quotes, which was initially spread among 30 codes. Refinements of the thematic analysis resulted in 5 themes, shown in Table 4.1.

Table 4.1: Thematic analysis

Theme	Codes
Roles and responsibility	Large area of responsibility, Personal responsibility, Unclear responsibilities for spare parts, Responsibility distribution, Unclear roles in projects, Additional tasks
Requirements and compliance	Start production before requirements are met, Results of unclear requirements, Unclear requirements, Lack of requirements for measuring points, Compliance with the project structure, Compliance issues regarding time, Changes
Project management and structure	Project order, Project structure, Project handover, Priorities, Lessons learned and follow-up, Communication and inclusion, Finding information, Training and education, Spare part management structure
Recourse allocation	Lack of personnel, Maintainability, Spare part problems, Competence, Role distribution
Improvements	Structural improvements, Role improvements

The phases, roles, responsibilities, and management of spare parts described in 4.1 are now described based on quotes from the interviewees, documentation review, and analysis of prior projects. A paragraph describing a scenario or practice is backed up and followed by one or several quotes or a reference to the data in the appendix. All quotes were in Swedish and were taken from the interviews and are translated into English in this section.

4.2.1 Overall structure

The project structure described in 4.1 is generally used in projects at Swedish Match, primarily as a support to keep things structured and ensure that essential practices or processes are not missed. The structure is often used as a framework and a checklist, especially at the beginning of a project. A steering group is most often used, especially in large or complex projects with many stakeholders and different factors involved, while in some smaller projects, there is no steering group.

"We don't have a steering committee in all projects, but in some projects, especially complex projects with many variables."
"More based on experience. Then maybe the experience of the project structure is quite similar in that way, but I would say more experience."

The structure is not always strictly followed. Several respondents described the project process as often more based on previous experiences rather than following the documented project structure strictly and in the intended way. In some cases, the intended project processes are not fully suitable for the situation, leading to another way of working. Quick decisions, limited resources, and changing circumstances in a project require some flexibility in the processes at times, leading to deviations from the originating project structure.

"To succeed with the conditions we have been given, it sometimes requires taking a slightly different path than the process suggests."
"Mostly to ensure that nothing is missed, because it is a really good checklist to follow."

4.2.2 Project roles and responsibilities

Roles and responsibilities within the project group are often based on established ways of working rather than formal structures. Respondents express their own roles and responsibilities as clear, but it is built on personal experiences and habits rather than clearly understanding the defined guidelines and documented areas of responsibility. A recurring pattern is that the respondents expresses their own area of responsibility as clear based on prior experiences and individual work within other projects.

“I would probably say that it is clear because it is me as a person.”
“...as my responsibility is quite clear.”

Responsibility distribution in projects tends to be formed depending on the project members. When the same project members are active in multiple projects over time, areas of responsibility become well-established. The responsibilities are based on informal agreements rather than established structures.

“Many times, we work with the same people in different projects, and that naturally makes us well-integrated with them.”
“So, I have certain colleagues I've worked with in every project, and our roles are very well-established, making the division of responsibilities crystal clear.”
“Everyone has different competencies, so it almost naturally falls into place who does what.”

Another recurring theme is that people within the organization have different roles, often expressed as one normal task and additional project tasks on the side. This is because the organization is not big enough for dedicated project employees, as explained by multiple respondents.

“But it’s really about resource allocation, often, one person takes on multiple roles.”
“There are a few individuals juggling many tasks at once simply because the organization isn’t larger.”
“The project manager has many roles.”

Expectations on project participants are not always expressed; in some cases, there is a perception that expectations are obvious but not always shared among participants. The lack of instructions and clarifications of assignments and responsibilities can make it harder for new participants to take an active role within the project.

“I want those under me to be involved at an early stage, and what I think is lacking in this process is that they probably don’t fully understand the expectations when they join the project group. So, what is actually expected?”
“I believe people assume that everyone knows, and it feels obvious to oneself. But that’s not the case for everyone else, this is where I think things get overlooked.”

Respondents also express that they have not used or had a review of the intended documents to clarify roles and responsibilities in the projects.

“I don’t think we’ve actually done that, no.”
“Not explicitly, I don’t recognize that. People tend to expect things from the group, but I wouldn’t say that clarification has been a major focus.”
“We probably haven’t made use of the existing role description, but rather focused on how we think we should carry out the project to make it work.”

4.2.2.1 Operation and maintenance

During projects, the maintenance perspective is often something that is considered late in the process. Rather than starting with the maintenance perspective, the project starts by looking at their needs, what it is that the project needs to achieve its goals. It is not until the needs are in place that questions about maintainability and long-term functionality are addressed.

“We never really started with the maintenance aspect, but rather, we begin with considering what it is we need. And once we’ve reached the point where we’ve identified what we need, we then look at whether there’s anything that we feel like, ’No, we don’t need that,’ or ’This is going to be a problem’.”

Maintenance is reactive rather than proactive. There is a lack of distinct responsibilities regarding these questions, and in practice, the work is divided between the different technical areas, where each group is responsible for its own technical area, without anyone ensuring the overall perspective.

"There aren’t dedicated individuals in that sense, rather, on the electrical side of the project, it’s the electrical team that focuses on the electrical aspects, while the

mechanical team looks at the mechanical side."
"I imagine that one might not always have the overarching perspective and might not realize that it's oneself who should take those aspects into account."

The respondents express that there are expectations on some parties in the project to be responsible for maintenance-related questions in the design phase, but it also requires a mutual commitment. The correct competence has to be invited and given the chance to contribute in that field. The result varies with the coordination of different parties in the design phase.

"But it's also one of their areas of responsibility during the design phase. With their perspective, they can take a closer look at that, and depending on how successful they are and how many opportunities there are, they can achieve more or less quality from that work. And it doesn't just depend on what they do, it may also depend on how much I involve them, so it's a two-way street."
"No, I would probably say that it also depends on their experience. Many will look and say, like, no, this technical solution, we've tested it before, it doesn't work well or requires a lot of maintenance."

A recurring pattern is that questions related to maintenance are not brought up in time. What should have been addressed in the development or implementation phase, is later discovered when the equipment is delivered and in production. At that time, it is too late to change the design, resulting in adaptation according to the given conditions.

"Maintenance aspects aren't addressed in time, instead, we often have them dropped in our lap"
"It's easier when the machine is in place and you can see it, but by then, it's often too late, the machine has already been delivered."
"Things that ideally should or could be identified during the design phase aren't discovered then, but only when the machine is actually in place."

There is also a trend where the problems in absent maintenance work are repetitive because there is a feeling that there have not been any problems yet, so why should it be a problem this time, continuing the lack of maintenance work in the projects.

"Often I feel that we fall into the same trap, that yes, but it hasn't been a problem before. Why should it be a problem now."

Lack of time is a repetitive explanation as to why maintenance aspects are sometimes overlooked. Even if the competence might be there, the time is not there to use it.

"Either things have just happened too quickly and you've missed a lot because of that, or you don't have that knowledge."
"The competence, I think it absolutely exists, it's just that they have progressed too

quickly and have not had the time to identify maintenance problems."

Maintenance within the organization from a holistic and strategic perspective is often not considered. The originating project structure does not explicitly mention these activities, and therefore, aspects regarding maintenance, functional safety, and operational reliability are missing.

"Looking at the maintenance development and how functional reliability, maintainability, maintenance support and performance, how operational reliability is built up, I think we are weak there."

4.2.3 Project definition

To ensure a successful handover where the project originator is satisfied, respondents express the importance of a clearly defined project order and requirement specification. By being thorough in the formulation of the project order and requirement specification, it is perceived as easier to ensure that project goals and expectations are met in a handover.

"To ensure the requester is satisfied, the key is making a well-structured project order, that clearly describe its content and reasoning. When the project concludes, demonstrating that all points have been checked off reinforces its success."

When it comes to technical specifications and requirements, there is a need for clear definitions. It is important to create requirements that do not leave any space for different interpretations.

"There can be tough technical requirements, such as 99%. It is important to define what is meant by 99%. Does it involve avoiding downtime, material shortages or other issues?"

There is rarely any analysis on prior projects to gain insights from experiences. Reflecting on previous experiences is not a given in the initial phase of projects.

"When I've been involved, we haven't gone back and reviewed things that specifically."

Necessary training is defined during the procurement of new equipment and in dialogue with suppliers. It is usually stated in the request documentation how many occasions and how many hours the company requires from the supplier. Training is often defined mostly on recommendations from suppliers rather than analyses of internal needs.

"Usually, in a procurement process, we specify early on that a certain number of training hours must be included over a certain number of occasions"
"Often, the decision is based on what the supplier recommends regarding the type of training."

Training often takes place in close connection with commissioning, which is seen as positive since it allows staff to get started quickly. A common way to provide staff with training is to allow them to participate in functional testing.

“We are quite good at offering training directly in connection with the commissioning of a line or machine, ensuring that staff have the necessary conditions to operate it.”
“Line mechanics and operators received training down there for about two weeks and participated in the functional testing.”

There are also challenges related to training, where there is a perception that there are shortcomings in how knowledge is transferred within the organization after initial training is completed. Some people acquire the knowledge, but transferring that knowledge is lacking. There is also confusion regarding who is responsible for the continuing education.

“But it is also important that production and line mechanics take the initiative to pass on their knowledge to others. Sometimes, there can be gaps in this, and I get the feeling that some people have no idea how things actually work”
“The first step is for the project manager to ensure that training is provided. However, it is also the responsibility of production to further develop or continue educating its staff, and sometimes there are gaps in both aspects.”

4.2.3.1 Project order

There are several recurring patterns regarding the project order process. The initiative for new projects often comes from a higher organizational level, such as the top management, where they ask if there is capacity to take on new assignments.

“The initiative comes from the central level, do you, for example, have the capacity to start up a new line?”

Project orders are often written based on standardized templates, where parts are then adjusted to fit the specific project. Several respondents described reusing previous project orders and in some cases even through direct copying.

“It is written quite standard, to be honest. . . ”
“We copy-pasted a request from the Gothenburg factory which had purchased something similar to what we wanted”

The adjustments that are made mainly concern key metrics such as overall equipment effectiveness (OEE), waste, output, as well as the relevant production technology.

”. . . then we adjust the actual OEE figures, some waste figures, and whatever we want, output and such things, depending on the type of line”

There is a recurring description that the requirement specification is often insufficient or unclear. Several respondents expressed that the project originator does not always have the opportunity to formulate detailed requirements, either due to a lack of time or insufficient competence.

"The originators don't have the time, but also because they don't really have the competence to define it at the level required. . . "
"We are generally not good enough at specifying what we want out of the machine."

It is also described that the responsibility for concretizing the project order in practice often falls on the project manager. They often have to prepare a first version that is then confirmed by the project originator.

"We usually have to write the project order ourselves as project managers, and then we confirm it with the project originator, Is this what you had in mind?"

Several respondents also described that uncertainties in the requirement specification can have consequences later in the project. Important needs are sometimes discovered late in the project, which can lead to increased costs and the inability to meet the needs at all.

"We've experienced that toward the end of a project, we realize we're missing something because it wasn't specified in the requirements, and then it becomes a huge cost to address it, so the decision is made not to do it."
"Nowadays, if it's not a requirement, it doesn't exist."

Furthermore, the clarity of expectations varies between different project originators and projects. In some cases, it is perceived as unclear what is expected to be delivered, and sometimes it is unclear what the expectations are from the project originator. Another recurring aspect is that the scope of the project often changes during the project.

"Some are not quite as clear, and it's not always obvious what we can expect from the project."
"But often, it might feel like the expectations expressed by the project originator are not particularly clear"
"...the scope often changes as we progress."

4.2.4 Project development

In the project development phase, solutions and activities should be defined, and operational needs in a long-term perspective are often overlooked or not prioritized. Strategic planning on how equipment should be maintained and operated over time is often not in focus, instead often discussed in a later stage when the equipment is already up and running and problems have started appearing.

"There isn't much focus on how we're going to take care of it or run it in the long term."

Measuring points used for tracking machine and production performances are at times forgotten during these early project phases, resulting in measurement points being applied later, when the equipment has been put into practice. The pressure of getting the production line up and running is almost always the highest priority, leading to other activities being missed or prioritized less.

"Unfortunately that gets forgotten or lost along the way because of all the time pressure to get things up and running. But it's really just as important as everything else."

To save time and speed up the definition and development phase, projects are at times copied or replicated in some stages from previous projects. The existing lines, layouts, and project plans are reused and adjusted where needed.

"You start from previous lines and add whatever deviates."
"A lot of it is just copying a whole project and adapting it."

The procurement of machines and equipment sometimes face challenges. During the procurement process, required stakeholders should be involved to verify that the equipment being bought lives up to the technical standards. This is not always done, leading to missing reviews of equipment.

"Machines can be bought that don't follow our technical standards."
"Machines can be purchased blindly without us even getting to look at them."

The FMEA assessment is expected to be made during this early stage of the project to evaluate and mitigate risks related to equipment and evaluate its safety. These are sometimes delayed and conducted in a later stage, after the equipment is in place, which it should not be.

"It's actually the project that's supposed to do the FMEA early. That's when you're supposed to consider those things. But it doesn't happen very often."
"I think we should be clearer about FMEA, it should be done when you're introducing new equipment. We're too sloppy there."

4.2.5 Project implementation

During the implementation phase, when the project is realized and being handed over to production and OM, it is supposed to be a clear process with an implementation plan and set expectations that have been agreed on at the start of the project. In practice, the handover is often unclear and not always performed as intended. The requirements and boundaries for the project, if the project is still considered a project, or if the responsibility has been handed over to the operating organization, are often unclear.

"The biggest issues are with the handover itself. The boundaries. How long is it still considered a project, and when does it transition to operations?"

In some cases, the production equipment or machines are already up and running for years before it is officially written over to the receiving organization.

"It can take years before they are officially written over."

Projects are not always finished when handed over, it could depend on whether there is no money left in the project, or there is pressure to start producing. The OM might agree on taking over the project anyway, even if there are parts missing or a lack of documentation and education.

"*The project might not be fully completed, but it's still handed over and accepted."*

The handover document that is agreed upon in the project definition, showing that all requirements and practices are being met and made is not always used and in place. The document should work as framework in order to outline certain requirements and ensuring a reliable handover, but the document is not always used in all projects, which is seen in the documentation review of all archived projects, see Appendix C, where it is often missing and the interviewees highlighted that the document is not always used.

"There isn't always a handover document, which there really should be every time."

Often, when a project is at its end and is going to close, things that are not finished, which were agreed upon in the definition phase, cause uncertainty in the handover. When the outcomes of the project are handed over and the project is closed, then responsibility for unresolved issues is moved to the OMs budget. Therefore, the remaining issues should, in practice, be resolved by the project before the project is closed, but that is not always how it works.

"When the project is closed and there are still unresolved items, those end up on the receiving team's budget."

If the project is still open, it is expected that the project team will take care of the remaining activities unless anything else is agreed upon. The cost and responsibility move into the hands of production and OM when the projects are closed, but if it remains open, it is still on the project.

"If it's still within the project, then it's the project team that should handle it, if it's not closed."

The receiving part of the project is therefore not eager to push and take over a project if it is not fully finished, since it could come with new costs, responsibilities, activities, and resource needs which has not been planned for.

“You don’t really have an interest in taking over a project until it’s finished. If things are dragging out, you’re not chasing the project team daily either. As long as it’s not closed, the project handles it.”

The handover should ideally be made when all goals and requirements are met. The reason why projects are closed before all activities agreed upon are complete depends on various reasons; in some cases, the budget is too narrow and there is no money left. In other cases, the time frame has been too short and the project has not had the time to deliver everything on time, or delays have appeared during the project, causing the necessity to take over and start using the equipment in advance.

“The problem is when you don’t agree, and there’s a problem that you have to close now. But we haven’t reached our goals yet. Then it’s hard to take over projects. Because then receiver is the one who has to deal with it afterwards.”

This puts the receiving part in a position where they are expected to accept and take over the responsibility for the project outcome, even though the project has not delivered the expectation, and needs to resolve the punchlist.

“Is the project finished? No, maybe I don’t think so, but there’s no money left in the project so then operation and maintenance have to take it. It doesn’t really feel like anything gets disapproved. But, we have to run this now so we launch it and write down the remaining issues, and take them as we go.”

The reason why projects are commissioned before supporting deliveries are complete is due to decisions being made to start the production as soon as possible, leaving activities unfinished or to be performed later. The activities and issues remaining are added to a list for later resolution.

“It feels like it has to go very fast. We can’t really afford to say that these things should be fixed before we launch, instead we go live and fix it over time. That’s just how it ends up.”

This results in production and OM receiving solutions that are not fully ready or do not meet the set requirements at the time of the handover. Instead, what was originally intended is eventually achieved over time, but at a cost both financially and in terms of responsibility from the receiving party.

“This is missing for us to be able to do maintenance so the project is finished. Yeah, but now the money is gone in the project and it’s up and running so we won’t take care of it now. Well, then maintenance has to handle it.”

The handover from project to operating organization often does not contain all the required material, spare parts, or education when the actual handover is made. Everything is rarely up and running right away, and it is often that the receiving organization must work with machines that do not contain everything needed to operate at full potential. The missing parts are often in place a few weeks after the handover.

"That's also the kind of thing we're maybe not so good at having up and running right away, it usually takes a week or so."

It is not only material that is delayed during the implementation phase and the handover, often documentation and administrative tasks tend to fall behind and made in a later stage or not at all. During an intense period of testing and installation, the project team often prioritizes getting the production equipment up and running, rather than focusing on supporting materials and documentation.

"...all the documentation and administrative stuff often takes a back seat during that intense installation and testing period, because the focus is on getting the line running and getting production started, that's kind of the mindset we've had, like 'production has to roll,' and we want to get going."

During the transition phase between the project and the operation, there is a lot of uncertainty about what applies in this stage. When the handover is performed, it is often unclear, and the responsibilities of certain procedures and parts are therefore questionable. Instead of having a clearly structured handover point, the transition tends to be an unstructured phase where several actors are still involved simultaneously in different parts, causing confusion regarding roles and ownership of the equipment and procedures.

"There is such a big uncertainty about what applies when the machine or equipment is put into use."

In the transition phase, both project members, suppliers, and personnel from receiving organizations are all working at the same time on the implementation and installation. This results in many people being involved at the same time, causing accountability and coordination to be more difficult.

"Then we have to go in and deal with suppliers and the others involved in the project. It becomes way too many cooks in the same place."

When the transition had been made, the project been handed over to the receiving party, and when the responsibilities have been transferred to the production and OM, it is often not effectively communicated to all the involved parties, creating confusion and unnecessary questioning.

"It never feels like you actually get told that now it's finished."

4.2.6 Project closure

The project closing phase often gets extended over a longer time. The final steps in the project closure, documentation, evaluation, and lessons learned are not always completed and made immediately after the commissioning. Instead, these tasks are made either in parallel with other work tasks or it is postponed for later.

"Many times, it's straight into the next project the very next day, and that's also why these final closing parts can take such a long time."

During a project, there are often things such as requirements or circumstances changing, resulting in a more complicated handover and project closure, especially if it is not communicated effectively. The changes often make the finalization of documentation and completion of the project handover slightly more complicated, since the scope and content sometimes shift during the project. The prolonged closing phase causes challenges. After implementation and project handover, the formal closing process contains final documentation, which takes time to complete. If the project is not closed, the project team is still responsible for the equipment and outcomes if nothing else is agreed upon.

"What makes the handover document difficult is partly that we have a tendency to start the project and then change it along the way, and that the closing phase of the project is so drawn out."

After a project is closed, finding the archived documentation is sometimes challenging. Even though all documentation regarding risk analysis or other important assessments is uploaded somewhere in the project folder, it is not always easy to find and retrieve it, unless you know where to look for it. If analysis has been made in a project, it is often hard to find the documentation afterwards, when the operational departments need it.

"When the project is closed, everything is in the project folder. That includes things like risk analyses and various assessments. It's all in that folder, but it's hard to find and hard to access if you don't know what to look for."

Previous projects are not often systematically evaluated or revisited before starting a project or compared with when closing a project. Instead of having structured reviews, all projects rely on individual experiences rather than a review of previous projects.

"I don't think I've ever actually looked at a completely different project that someone else has managed, but rather relied more on my own experience, like, what did I learn then?"

Even if there is documentation and reports from previous projects, they are not always used. There are sometimes certain issues recurring in projects by different team members, which could be identified and addressed if more time were spent on evaluating previous projects.

"If one had gone back to the white books, there are probably many common denominators that maybe should have been discussed earlier."

4.2.7 Spare part management

Spare part management is a central component in the procurement of equipment and maintenance practices. The interviews made it clear that spare part management is dealt with late in the project process. The primary focus is on commissioning, which often takes place before spare parts are ordered. This results in equipment being put into operation before necessary spare parts are available in case of equipment failures.

“Then there are occasions where a machine has been purchased, but not all spare parts have been acquired. However, they have made a strategic choice.”
“There are several projects we have put into operation, and then something has broken down, but we have no spare parts.”
“Then, it is often the case that we start up facilities without having spare parts on hand, which are often ordered several months after the recommended spare parts purchase from all suppliers.”

Late spare part management causes risks. The project is often pressured to get the equipment up and running, while production and OM are faced with the fact that there are no necessary spare parts. This means that the organization deliberately accepts the potential risk for operational downtime during the initial face after commissioning.

“At the same time, they are in a tricky situation when production says we have to run, even though we have no spare parts.”
“It is a conscious risk that we do not yet have this motor on hand.”
“It is often the case that projects are so focused on getting the machine up and running... and then, oh right, something can actually break as well.”

There are unclear responsibilities regarding spare part management. It is unclear who should be responsible for identifying which spare parts should be ordered; is it the project management, or is it OM? Budget responsibility is also unclear, as the purchase of spare parts is not included within the project budget.

“I don’t really feel that it’s my responsibility to compile the spare parts list, but if I hadn’t done it, it wouldn’t have happened.”
“Maintenance has all the spare parts. They are the ones who should be responsible for all spare parts.”

"The big question is who pays for this. I don't have any budget for spare parts, maintenance does."

An additional complication is that spare part lists arrive late in the process and are hard to interpret. Some cases suggest that the process of analyzing the spare part list is initiated very late in the project process, making planning even more challenging. Those who are at the receiving end of the spare part lists also sometimes lack sufficient technical knowledge to determine whether a spare part is relevant to keep in stock or not.

"Usually, all documentation arrives at the same time, and in the final phase when a machine is ordered. . . "
"This is the spare parts list with item numbers, but it's very difficult to determine what they are, whether they need to be kept in stock, or if they should be added to the inventory. . . "
"When you receive the spare parts list, who gets it varies, as does the level of knowledge required to interpret it."

There are also indications of structured ways of working with the spare part lists, where the project members jointly review them, deliberating what spare parts are crucial to have in stock. Reusing suppliers, standard components, and systems, the project aims to lower the amount of unique spare parts on the shelf.

"I usually gather my project team, and then we go through it row by row... making an assessment as we go."
"We try to stick to standard components and control systems to minimize the number of spare parts we need to keep in stock."
"Then we check and think, yes, but we could buy this from another supplier instead. . . "

It can be stated that spare part management often falls between the cracks within projects, but the awareness of the consequences has increased. There are responses indicating that there have been efforts to focus on the problems resulting from prior negative experiences.

"More and more, we have gained better focus on this, after a few major projects where spare parts are still arriving, even though the equipment has been in operation for two years."

4.3 Process study

The results from the process study are based on observations and internal documentation analysis. The process study aimed at understanding how Swedish Match worked with their new project structure called vertical start-up (VSU), which was implemented during the thesis period. Observations gave insights into project meetings, confirming the internal documentation on the structure. No interviews were conducted in the process study. The description of the VSU structure will not be as detailed as the regular structure in 4.1 due to confidentiality.

4.3.1 Vertical start-up

The VSU structure in Swedish Match was not fully operational when the observations were conducted; rather, the observations were made during a pilot project. The aim of the pilot project was to get everyone to learn and understand how to work with and operate the new structure. The aim and purpose of the new VSU structure is to maximize the performance of the project's outcome, usually new equipment, as soon as possible after commissioning, see Figure 4.2. This is achieved through dedicated project staff, a clear role definition, and extensive preparation before the installation phase. During a normal start up, there are an increase of problems appearing during the early implementation phase while in the vertical start up you identify and solve these before in order to have a smoother start-up.

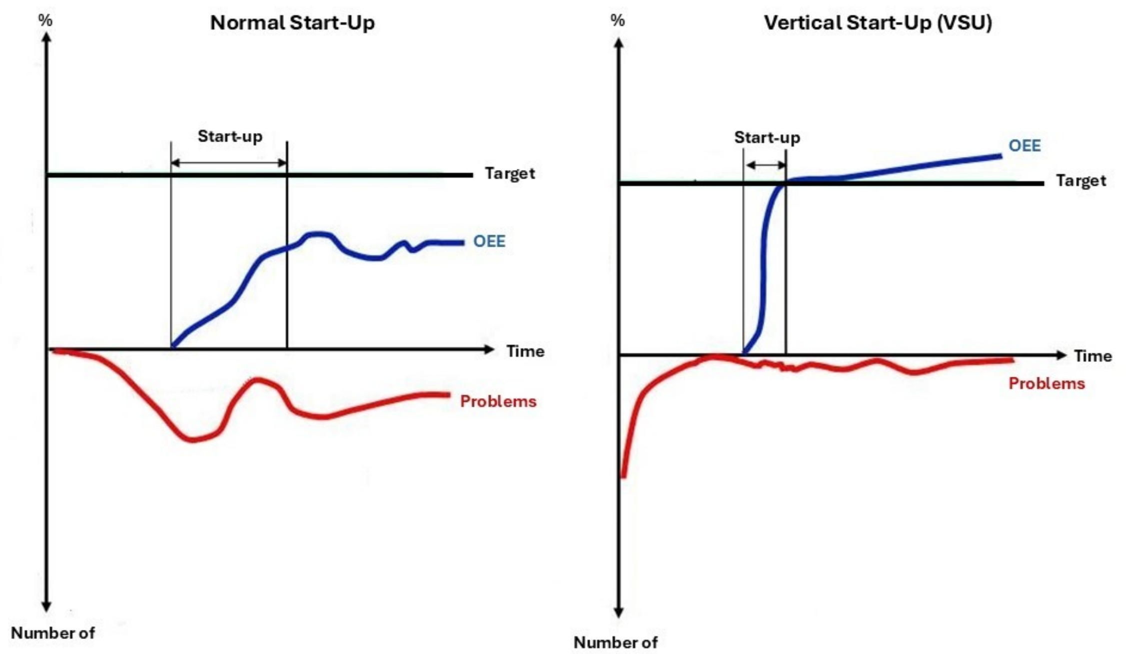

Figure 4.2: Comparison between normal start-up structure and vertical start-up, inspired by[3]

The project lifecycle is built on a pre-study, a definition phase, a design phase, an implementation planning phase, and an implementation phase containing similar activities as described in 4.1. Between each phase, there is a gate passage. A big focus within the project lifecycle is risk assessments, which are done in several stages within the project. The objective is to ensure that the VSU is reachable at every stage of the project. Risk assessments is a way to communicate and understand risks that can hinder an efficient commissioning. The structure aims to ensure resources early in the process, addressing problems early, for initiatives and to establish systems needed for long-term success in order to meet the targeted goals as soon as possible, see Figure 4.2.

The project organization is well defined with dedicated project staff and clear role descriptions. There is a project manager who oversees the project and project leaders who lead the project and facilitate the plan that the project manager has created. There is a person responsible for overseeing and ensuring that the structure is followed and acts as an expert. A person responsible for maintenance and a person responsible for the processes are also appointed to represent their respective department and to lead the work within the respective fields. There are several more roles that connect to the different departments, including people overseeing the work from their departments and people acting as experts from their departments. A steering committee is also in place to ensure the outcome of the project and take overarching decisions regarding the project.

A pillar in the structure is how meetings are conducted. There are daily meetings in place to review the previous day's work, plan, and set priorities for the day's activities. There are also weekly meetings with the project team to review the master plan, discuss last week's results, and review the project punchlist. Bi-weekly meetings are also in place to review the project milestones within the plan and compare them to the results achieved. This meeting is conducted by the project team and the steering committee.

Processes are in place to achieve and ensure knowledge transfer. Checklists are in place, which should be fully achieved before a handover can take place. This includes training and technical packages that are aimed at ensuring that documentation and training are in place before commissioning is started. A well-planned commissioning is a pillar in the structure, ensuring that everyone involved is on the same page. The structure involves processes for commissioning, quality inspections, and verifications.

4.4 SWOT analysis

The SWOT analysis can be viewed in Figure 4.3. It acts as a visualization tool to summarize the findings in the results. Strengths, weaknesses, opportunities, and threats that were found are displayed. The focus within the thesis has been to identify weaknesses that explain the discrepancy between the four categories.

Figure 4.3: SWOT analysis

5 Recommendations

In this chapter, a list of recommendations is presented, followed by a subsection for each recommendation that describes and discusses it.

5.1 List of recommendations

In this section, the list of recommendations is presented. The recommendations are based on the weaknesses identified in the SWOT analysis. Together with the opportunities found, each weakness was investigated, and a discussion regarding recommendations was made. The recommendations are based on this specific case to improve the current setup, but the recommendations are applicable in other companies facing similar issues as well. An overview of the recommendations can be seen in Table 5.1.

Table 5.1: List of recommendations

List of recommendations
Introduction meeting, discussing roles, responsibilities, and expectations
Roles and responsibilities document should be more detailed and clarified
Document a clearer division of work with structured tasks and time plan
The steering committee should enforce the compliance with the structure
Prioritization should be overseen by the steering committee and managers
Continuously review prior and ongoing projects
Detailed project orders with operations and maintenance involvement
Detailed handover requirements between all affected parties
Oversee maintenance questions on a strategic level in projects
Establish a standard for project documentation
Improved communication channels

5.1.1 Introduction meeting, discussing roles, responsibilities, and expectations

This recommendation is connected to several issues found in the results. Firstly, compliance with the project structure is not good enough. The structure clearly states that a kickoff meeting should be held, where one of the agenda points is to review the role description documents to discuss roles, expectations and responsibilities. This kind of review is most often not on the agenda, resulting in team members thinking that they know what their own and others' roles are within the project, but in reality, they are missing essential responsibilities. The work is therefore based on informal agreements rather than formal review of the role and responsibility documents.

It is therefore important to revise the checklist so that it states that the role document must be reviewed and discussed, instead of being a suggestion for an agenda point. The clarity that can be created through that meeting will lead to more reliable results, as the chance of something within the project being forgotten will be reduced. The fact that maintenance-related questions are not addressed in time can also connect back to this, as the role description clearly states that maintenance should oversee issues related to maintainability, for example. A clarification during the start of the project could improve the outcome of maintenance, because the responsibility could be assigned to a representative from that department.

Another issue with not clarifying roles, expectations, and responsibilities is that the project manager accumulates most of the work in projects. Clarification in the start-up meeting, describing who is responsible for what in the project, will evenly distribute the work across the entire project team. Less accumulated work on the project manager will also allow for more timely deliveries and deadlines being easier to meet. It is also important that everyone in the project has a clear vision and that everyone strives to achieve the same goals[1][11], which could be facilitated by the review of the documents.

The recommendation is that at the start of each new project, without exception, a kickoff meeting should be held where the entire project team reviews the roles and responsibilities documentation to sort out areas of responsibilities and discuss expectations, both with each other and on the project. It will make it easier to understand and deliver on the project originator's requirements, and it will ensure that all parts of the project are included[1][8].

5.1.2 Roles and responsibilities document should be more detailed and clarified

The role and responsibilities documents that are in place at the moment should be even more clarified. At the moment, the role documents describe the scope of the role, what the role should do in a project, and why it should be done. It also describes what areas of responsibility the role has. There is also a category of miscellaneous, explaining other areas that the role should cover. There is a need to revise these documents to differentiate between responsibilities and scope. For example, one of the points in the scope for the project originator is that they should develop the project order in its entirety, including limitations. This point should not be in the scope of the role, but rather a responsibility of that role. There are several other points in these documents that should be placed under responsibility rather than scope or miscellaneous.

Furthermore, the OM role description deviates from the standard that is held in the other role descriptions. Instead of having scope, responsibility, and miscellaneous as categories, the document is structured as general assignment, targeted assignment, and responsibilities. The way the document is written also gives a sense that it is a liability disclaimer. Instead of having clear responsibilities, it is written as an assignment to monitor different areas, for example, "monitor that the equipment is maintainable". As seen in the results, maintenance-related questions are not addressed early enough, and a simple explanation could be that no one feels the ownership and responsibility of these issues within projects. The problem falls through the cracks because no one is responsible for looking at them. OM are tasked with monitoring that the equipment is maintainable, but at the same time, no one is responsible for actually making the equipment maintainable.

5.1.3 Document a clearer division of work with structured tasks and time plan

The results have shown that the project manager has many roles within projects. They are often tasked with many different aspects of the project. This is partly due to the size of the organization, there are too few people to have one designated person responsible for every area of the project. The theory exemplifies structures where the project manager should be in charge of delivering project results and leading the project group[7]. In practice, the project manager is responsible for the majority of deliveries, with the help of different resources enabling these deliveries. The project organization structure described in the theory includes work package leaders[1], differentiating from the project organizational structure in the case study company. Instead of assigning work package leaders to oversee specific areas, the project manager at SM takes on all responsibilities typically handled by those leaders.

There is a need to distribute the work more evenly among everyone in the project. The recommendation is that a project time plan should be set early, including all activities within the project and marking the responsible person for the specific delivery[1]. This could be done by dividing the project into subtasks and deliverables in a detailed time plan. The planning should be done as a group activity, as explained in the theory[1]. The documentation review showed a lack of solid time plan for project activities. If a time plan existed among the archived projects, they were often only describing the time plan for functional testing and the commissioning phase. A more comprehensive time plan that can guide the project and act as a baseline is desirable.

In combination with the first and second recommendation, revising the role description documents and reviewing these in the beginning of each new project, this recommendation aims to relieve some workload from the project manager, evenly distribute the work between the responsible persons and guide the project to a timely project delivery.

5.1.4 The steering committee should enforce the compliance with the structure

A common problem identified is that compliance with the structure is varied. One of the reasons for this could be that there are few follow-ups and reviews to see if the project follows the set structure. Documentation in the closing phase of projects is rarely uploaded, which can be explained by a lack of structure enforcement by management. Theory states that the governing body should be involved in reporting, including key decisions, ensuring transparency and verification[1]. The case study company performs this by having regular gate passage meetings, taking decisions on continued projects or not; however, there is a lack of verification of the work procedure.

The governance should ensure transparency by asking and verifying the project's way of working, not only accepting and fully trusting what they are told. They should ask for documents indicating that the project is working according to the set structure, and also push the project to upload all the key project documentation before a gate passage. Final reports, for example, are one of the things that should be uploaded and checked before the final gate can be passed, where there has to be an approval by the governing body before the project can be closed.

The recommendation therefore consists of more engagement by the governing body, regular checkups, and ensuring the structure is followed, ensuring documentation is uploaded before gate passage or project closure to enable lessons learned in new projects.

5.1.5 Prioritization should be overseen by the steering committee and managers

There is a need for the governing body to discuss and prioritize decisions regarding its business. The results show a lack of spare part management, where spare parts are not on the shelf before the equipment is in production. At the same time, spare parts are not prioritized during projects, but instead are viewed as the next phase after commissioning. The decision to put equipment in production before relevant supporting deliveries, such as spare parts, should be overseen by the steering committee. Prioritization should be discussed; should spare parts be of higher priority within projects? Another prioritization is that new projects are initiated immediately after another one is finished with commissioning, not prioritizing the final stage of a project with documentation and project closure. Prioritization should be made regarding the final stages of projects. Is it more valuable to start new projects as fast as possible, or should time be given for the closure of a project? If time is given, it should result in more project closures and more final reports, which benefits lessons learned and outcomes in upcoming projects.

5.1.6 Continuously review prior and ongoing projects

The interviews and documentation reviews described and showed that previous projects were not often reviewed to gain information about previous findings and experiences, leading to knowledge within the organization not being used. Issues and mistakes being repeated could easily be fixed with awareness of previous experiences.

By having more continuous reviews of ongoing and prior projects, the organization could improve its project performance and its project management processes, adapting and avoiding mistakes from repeating it self [1][9]. Having more continuous reviews will also benefit the knowledge of the ongoing projects, allowing for putting more resources in place if needed, or ramping up the closing phase of a project.

5.1.7 Detailed project orders with operations and maintenance involvement

The case study showed that unclear expectations and a lack of detailed specifications regarding the project outcomes often appeared, leading to unreliable handovers, uncertainties in the project lifecycle, and unsatisfied recipients of the project. The project orders were not always made by the receiver of the equipment and were often based on previous project orders, causing a lacking feeling of ownership for the project outcome. Another thing acknowledged from the interviews and documentation analysis is that the OM department is not involved in project order, even though they are the recipients of equipment, and the project outcome is their responsibility to maintain when in production.

To ensure a successful project, it is important to have clearly defined goals, expectations, and measures to avoid any misalignment or unclearness[9][10]. The project orders should be described in more detail, specifying what is needed and clearly stating the expectations. The receivers of the project outcome should also be involved with the project order to avoid dissatisfaction and being able to impact the project deliveries and outcomes by bringing inputs and requirements early. This will create more satisfied receivers of the project outcome, it will simplify the handover process since all receiving parties are aware of the situation from the beginning. Expectations and requirements that are set from the start create awareness of which kind of equipment is being delivered by the project.

5.1.8 Detailed handover requirements between all affected parties

Just as in the project order, the interviews and document analysis showed that there is a need for clarification, more detailed goals, and requirements. To prevent uncertainties, production and OM should together with the project manager clearly define all the elements that each party requires from the project[9][10]. This includes maintenance plans, KPIs, preferred production equipment, and production systems. There should also be a defined plan for the ramp-up phase, including measures, requirements, and responsibilities for deviation from the requirements.

Another recommendation is that the level of acceptance should be agreed on and documented in advance, specifying the boundaries and which level of acceptance that the receiving parties are satisfied with. The responsibility for eventual deviation in performance between testing and actual production should also be described.

5.1.9 Oversee maintenance questions on a strategic level in projects

Maintenance-related questions are not addressed early enough in the current ways of working in projects. There is no one responsible for the holistic and strategic perspective related to the maintenance of the equipment procured. The maintenance engineering role is essential in projects to ensure asset performance over time. As described in the theory, early involvement of maintenance engineering in projects is of high value, as it should be able to ensure that maintenance requirements are achieved in the concept and design phase of a project[17]. Early involvement also allows maintenance plans and task descriptions to be in place at commissioning[17]. The recommendation is that there should be someone taking the maintenance engineering role in every project, who should be involved early in the project to ensure that the requirements from the OM department are met.

5.1.10 Establish a standard for project documentation

The interviews with personnel working in the organization, the documentation review, and analysis of archived projects all indicated that there is no structured or standardized way of archiving documents related to projects. This causes problems when trying to find documents. By having a structured way of archiving and naming documents, benefits will come when trying to find historical documents, allowing for searching for a specific document, instead of manually going through different folders[1]. A standardized way of documenting helps and benefits the closing phase. By having a list of all the necessary documentation, it will become easier to review and ensure that all documentation is in place, named, and archived accordingly.

By creating a standard way of archiving projects, including meetings and decision logs, backtracking and evaluation of historical projects will become easier, potentially leading to more effectively managed projects[9].

5.1.11 Improved communication channels

The interviews highlighted the lack of a structured way of communicating necessary information between stakeholders, leading to uncertainties and confusion. Things such as changes within the project, handover of equipment, or bypassing necessary actors are caused by an unstructured way of communicating.

By establishing communication channels with all necessary stakeholders, structuring how, when, and who should have the information, it will help obtain more transparency and better effectiveness in the operations and handover[1][9]. Communication should be established both within projects but also within the organization to ensure high-quality communication and address all stakeholder needs[1][9].

6
Discussion

This study aimed to investigate how the Swedish Match project structure corresponds to theoretical frameworks within project management and asset management, focusing on the handover between projects and receiving organizations. It also aimed to investigate and find key challenges in project and asset management integration that hinder a reliable handover.

6.1 Research questions

RQ 1: *What are the key challenges in the handover of production projects concerning the project management and asset management integration?*

The first research question identified several challenges that are related to the handover of technical projects, such as a lack of documentation and routines, uncertain roles and responsibilities, and late involvement of OM personnel. The findings were confirmed by both the documentation analysis and the thematic results from the interviews. The weaknesses in the SWOT analysis highlight the key challenges within the case company regarding RQ1.

There is a clear difference between documented routines and how the actual work is conducted. Several interviews pointed out that the project result is often dependent on individual experiences and initiatives rather than on the standardized work structure that is in place. The compliance with the structure is seen as one of the major challenges, where if the standardized structure is not followed, it is hard to validate and develop it for the better. The work becomes highly individualized, creating a large difference in project and handover success. A fundamental observation is that the described project structure is not consistently followed in practice. Several archived projects lacked crucial documentation, including the handover document, final reports, and project orders, see Appendix C. This shows that even if there is a documented structure, describing the ways of working, its application is varied. The inconsistency in applying the structure undermines the positives that a standardized method is supposed to create, such as gate passages, role descriptions, and documentation described by ISO 21502[1]. Lack of compliance with the structure can also be viewed as a prioritization by the organization, where the structure is not highly prioritized due to operational requirements, where the equipment has to be in production as fast as possible, or where personal experience is valued higher.

Another major challenge for succeeding in the project and with the handover is that people involved in projects are uncertain of their respective roles and what their responsibilities are within the project. This also creates unclear expectations within the project team and on the project itself. As described in ISO 21502 and ISO 10015, the importance of clear expectations, roles, and responsibilities, and working towards the same goal is crucial for project success[1][11]. Although there are role descriptions in place at the case company, the use of these is very limited. As a project group member, the opportunity to understand the role and responsibilities within a project is not given because there is no group review of these documents before a project starts. Rather, the roles and responsibilities are based on informal agreements that have been created over the years. Many of the respondents have worked on many projects and felt that their respective roles were clear and that they knew what they were supposed to deliver. This points towards a highly individualized project.

A crucial part of a successful handover in a project at the case company is the handover document. The idea of writing down requirements that have to be met before a handover can be achieved is good. Identifying requirements from each party, including OM, the project, and the project originator, can allow for clear expectations. It can act as a guarantee, and if defined well enough, the project can deliver what is asked for. In practice, the documentation review and the interviews showed that the handover document is rarely used. This again points towards the problem of complying with the structure, as the handover document is a crucial part of the structure at the case company. The handover document is seen as a strength in the SWOT analysis because the intended use of it comes with many positives, such as clear expectations and accountability.

RQ 2:*What solutions can be implemented to ensure an efficient and reliable handover between the project and receiving organization?*

The second research question has been answered through the recommendations presented in Chapter 5. The recommended measures, including clear standards for documentation and enhanced steering committee responsibility, aim to create a more reliable and effective handover process. The recommendations do not only apply to Swedish Match, but can also act as a guide for other companies with similar issues.

6.2 Project structure comparison

Comparing the project structure at Swedish Match with the theory described in Chapter 2 reveals many similarities. There are similarities in both project structure and organization. The theoretical model presents a project lifecycle including initiation, planning, execution, and closure phases. Emphasis is put on clear deliverables, defined milestones, and control mechanisms throughout the different phases. Swedish Match has a comparable phase-based structure with pre-study, definition, development, implementation, and closure phases.

Figure 2.2 presents an example of a project organization structure, highlighting a sponsoring organization, project sponsor, project manager, and work package leaders with team members. It also showcases alternative roles such as a project board, project assurance, and project office. Although Swedish Match overlaps with the theory to a degree, the size of the organization hinders a clearer difference in roles. Instead of having work package leaders, who typically would be in charge of areas such as maintenance or production within a project and report back to the project manager, Swedish Match uses an approach where group members from each department report back to the project manager. This makes it so that the project manager has many roles within a project and hinders cross-functional collaboration when information goes from one group member to the project manager and back to another group member.

The VSU structure showcases many similarities to the theoretical framework. There are more resources put towards the VSU structure, which results in a project organization that is more similar to the standards. When a responsible person from the maintenance department and one from the process department are appointed, they act as work package leaders. The work gets more evenly distributed, and by having responsibilities within different fields, a more thorough work can be completed in each respective field. The structure is also built around different phases and gate passages, showcasing similarities to both the ISO standards and the current SM structure. Problems created by the current SM structure, such as unclear roles, responsibilities, and expectations, are prevented within the VSU structure due to its organizational setup.

Standards advocate risk assessments throughout the project and asset lifecycle[1][17]. Although the current SM structure shows a certain degree of risk assessment, the VSU structure integrates risk assessment as a core principle throughout the project lifecycle. The VSU structure emphasizes daily, weekly, and biweekly meetings to review previous and upcoming activities and to follow up on goal achievement, adherence to the schedule, and compliance with the structure. This could be a way to address the challenges in communicating the status of the project shown by the results for the current SM structure.

Theoretical models advocate robust and relevant documentation for those who work and make decisions in projects and organizations[1]. Ensuring documentation is key for enabling future analyses and lessons learned within an organization[1]. The structure at Swedish Match also advocates documentation. Technical documentation should be stored in a specific location for the entire asset lifecycle. Before project closure, all relevant project documentation should also be stored to allow lessons learned and backtracking. However, the poor compliance and lack of involvement from the steering committee negatively impact the documentation process.

6.3 Theoretical and practical contributions

The thesis will help Swedish Match gain insight into their project structure and why certain practices are missed or overlooked. The results and recommendations can be used as a basis for future decisions and evaluation of the current structure, which must be taken into account during projects to get an outcome that people are satisfied with. Swedish Match is now in a phase where the organization and ways of working are adapted to the PMI structures, leading to structural changes in both organization and management. The thesis could be used as a basis, highlighting important factors and practices that should be considered in the management of new projects and structures.

Since many of the current structures in projects at Swedish Match are inspired by the ISO standards, the thesis could be used as a validation and show how the structures are working in practice with both intended and fewer resources. The study identified both the strengths of the structures and the difficulties of following a structure due to project complexity and resource limitations. From a practical perspective, the thesis identifies gaps between standardized expectations and operational reality. The study shows how resource limitations and project complexity can impact compliance with project structures, providing managers with insights for improving and tailoring them to their situation.

The findings of this thesis could be applied to other organizations that have the same problems or struggle with compliance to organizational structures. The study helps to gain insight and theoretical understanding of how project structures are operated in industries and how theoretical structures can and are adapted in operations. This thesis adds value to both industries and researchers by exploring organizational setups and their effectiveness in complex environments.

6.4 Limitations

The thesis examines the way of working in technical projects rather than improvement projects, and they have slightly different structures and resources since improvement projects work on improving already existing equipment and processes rather than bringing fully new concepts and machines. If the thesis had included these types of projects or only focused on them, the angle of incidence would have been completely different. The project scope was limited to only focusing on the last four phases and not including the pre-study phase due to various reasons. Pre-studies are often made for more complex projects, but the low number of pre-studies and lack of archived material led to decisions to exclude this phase from the thesis.

The responsibilities of different stakeholders were mainly investigated for those involved in the projects, especially those making decisions regarding OM, since the focus was to find improvements to ensure a reliable handover for production projects.

The scope of the thesis was to overview the different project phases rather than analyzing all steps in each phase in detail, focusing on project and asset management. For example, the thesis did not analyze the design of the equipment, which would have had more focus on design and mechanics instead of project and asset management. Facility projects were also excluded from the thesis since they did not fit the thesis scope.

The number of structural documents was enough to get a detailed understanding, which made the findings specific and not too general. The archived projects that were reviewed were from 2015 until today, which made the samples relevant, and a shift in individuals working on the projects could be viewed. To get a more solid quantitative analysis, a larger size of archived projects would have been preferable to get a more reliable and valid result. However, the number of interviews was more than sufficient, providing clear insights and including a wide range of perspectives from different individuals.

6.5 Ethics and sustainability

The thesis considered ethics while conducting and analyzing the interviews and contributed to sustainable development within the organization and the projects. This study highlights how project outcomes and structures could be improved, enabling an increase in performance of resources, generating both environmental, economic, and social benefits.

The semi-structured interview approach was important to be able to get an accurate view of the internal structures. All participating interviewees were informed about the circumstances and their possibility to withdraw any statements, thoughts, or choose not to answer a question. The participation in the study was fully voluntary, and to protect the identity and integrity, all answers were anonymized. This was chosen to avoid any personal consequences when the data is being shared and to let the participants feel free to express themselves. The interview question was designed to be open and inclusive, allowing all participants to be able to discuss and share their views on specific areas.

A more structured project management approach with more reliable handovers, integration of asset management principles, and a larger focus on the lifecycle of equipment can lead to more efficient use of resources, potentially increasing the lifespan and minimizing stops in production. More efficient implementation of projects, less rework and material waste, leading to better performance in both projects and organization, directly impacts economic and environmental sustainability by saving time, cost, and material.

Clearer roles, responsibilities, and expectations, and improved project structures could allow for better dynamics within the organization, reducing potential misunderstandings between individuals and simplifying the way of working. Gaining a better understanding of both own and others' roles and responsibilities will lead to fewer uncertainties, improve performance in projects, and increase satisfaction in projects, creating a more sustainable social situation within the organization. Lessons learned and evaluation of projects help prevent recurring mistakes by improving processes and sharing knowledge, which also helps foster organizational learning and a sense of progress.

6.6 Future research

This master thesis provides insight into the internal project structures and governance at Swedish Match, but there are still uninvestigated areas for future research. An interesting topic is to investigate the role of external suppliers and contractors in projects and how they impact and are impacted by the structures at Swedish Match. This would provide a broader perspective describing the collaboration and the influence external parties have on the project outcomes.

Another field for future research could focus on measuring the quality and performance of projects by using defined metrics and investigating project data, providing actual numbers and KPIs regarding the project performance. Using metrics such as time, cost, and level of satisfaction would provide another type of evaluation. Finally, it would be useful to investigate and validate our findings by implementing them in the actual setup or testing them in a similar situation. This would provide more reliable results and possibly identify areas for refinement.

7
Conclusion

Efficient management of resources, ensuring reliable operations, has become more important for Swedish Match. A critical aspect of achieving this is a reliable transition from project development to implementation in production. This master thesis has identified several weaknesses within the current project management practices at Swedish Match. The weaknesses relate to unclear roles, responsibilities, and expectations, insufficient planning, lack of documentation standards, and weak structure enforcement.

The recommendations presented address these issues through practical and structured improvements such as mandatory introduction meetings, more detailed project orders, clarified roles and responsibilities, detailed project planning, and stronger involvement of the steering committee and operations & maintenance. Implementing these recommendations can help the organization to enhance project clarity, ensure better alignment with the long-term operational needs, and increase the overall efficiency and effectiveness in the project execution. Despite this study being based on a specific case, the insights are applicable in similar organizations that want to improve project outcomes and their project and asset management integration.

Even with well defined structures and standards in place, their effectiveness ultimately depends on the consistency of the compliance. Nearly all identified weaknesses can to some extent be traced back to a lack of compliance with the structure, highlighting its importance.

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A

Description of project management practices

This appendix contains description of the different project management practices that should be considered throughout a project and applied in the integrated project management framework described in 2.2.5. The importance of specific concepts and practices depends on the project's context and the chosen approach. All described practices are based on[1].

Planning
Defining the requirements, deliverables, constraints, and strategies for achieving project objectives while considering different solutions, approaches and ways of implementation.

Benefit management
Ensuring that the project outcomes are aligned with the benefits described in the business case. It should involve identifying, prioritizing, documenting, and communicating benefits to the stakeholders.

Scope management
Focusing on defining and controlling project deliverables, ensuring that only approved work is incorporated. It also manages scope deviations and confirming a successful delivery.

Resource management
Determining and optimizing the allocated resources, including personnel, materials, and infrastructure. It involves planning, managing, and controlling resources but also identifying potential conflicts or shortages.

Schedule management
Ensuring that the activities are done in time by sequencing activities and estimating the duration of an activity. The project manager should monitor progress, manage changes, and identify critical ways of preventing potential delays.

Cost management
Establishing financial controls, estimating costs, and managing the budget ensuring that the project stays within approved limits.

Risk management
Identifying, assessing, and mitigating risks throughout the whole project, enhancing the likelihood of not facing disturbances impacting the objectives of the project.

Issue management
Identifying and resolving project issues to prevent negative impacts. A structured escalation process should ensure that unresolved issues are addressed at the appropriate management level.

Change Control
Controlling changes in the project scope and deliverables by assessing and implementing necessary modifications within the limits of its authority.

Quality management
Ensuring outputs meet the required standards by defining different quality criteria, verification methods, and control processes. Including quality planning and assurance.

Stakeholder engagement
Identifying and involving the stakeholders throughout the project to address their needs and concerns, ensuring alignment and effective communication.

Managing organizational and Societal Change
Enable the organization and personnel adopting to project outcomes. Involving preparation and support while adapting, innovating, or transforming changes.

Reporting
Providing stakeholders with the current project status, forecasts, and analyses. The reporting approach should be planned and established early in the project and adjusted if needed during the life cycle of the project.

Information and documentation management
Ensuring safe and efficient handling of project data, supporting planning and execution, while following the organizational policies.

Procurement
Managing the sourcing of goods and services, ensuring their quality, if it is value for money, and if it could be delivered in time and aligning it with the project's procurement strategy.

Lessons learned
Capturing the insights from members' and stakeholders' experiences to improve the performance of future projects. The lessons learned should be documented, analyzed, and shared throughout the project.

B
Interview questions

What is your name and title?

What is your role in technical projects and can you describe it in detail?
Can you exemplify which parts of the project you are involved in and how it usually work.

What are your opinions about the project structure, is the distribution of responsibilities in projects clear?
Is there consensus on who is responsible for the different parts in a project, especially regarding spare parts management and training?

Have you experienced that problem often arise in projects related to operations and maintenance?

How do projects ensure that measurement points are available for machines and equipment when they are in operation?
Is there a structure for planning and implementing KPIs, such as OEE,during the project phase?

How are the need for training and education identified within projects?
Who is responsible for ensuring that the right people get the training needed for operatating and maintaining the equipment?

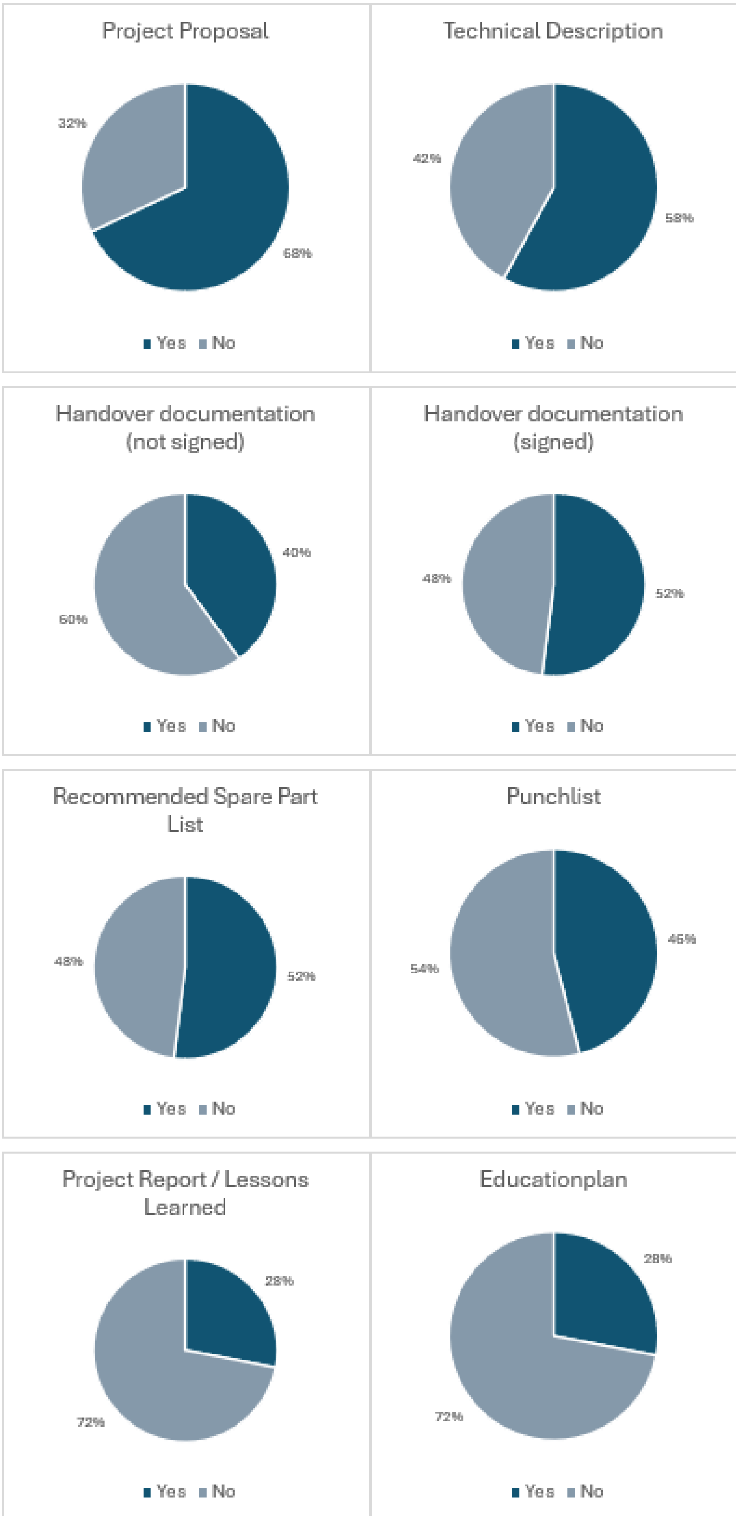
How does the project ensure that the expectations are met?
How are decisions documented during the definition phase apart from handover documents?

Do you have any other thoughts or suggestions on how the project structure could be improved?
Is there anything you think is important to consider that has not been mentioned yet?

Is there anything you want to bring up related to the topic and that we have not touched upon during this interview?

C

Statistics over archived projects



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