Towards Integrated Planning: A Case Study of Coordination Challenges and S&OP Implementation in the Marine Sector

Enhancing Cross-Functional Understanding Through a Demand Breakdown Tool

Master's thesis in Quality and Operations Management

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Summary

In today's dynamic business environment, effective coordination across organizational functions is critical for operational efficiency and strategic alignment. This thesis investigates coordination challenges from an S&OP perspective within the order-to-delivery process of a system-providing company in the marine sector. Through a qualitative single-case study approach, the research identifies key coordination barriers, including unclear responsibilities, misaligned forecasts, siloed communication, and conflicting performance goals. To address these challenges, an Excel-based tool was developed to translate high-level sales forecasts into actionable insights for operational functions, particularly Procurement. The study evaluates the tool's potential to enhance cross-functional understanding and support the implementation of a formal S&OP process. Findings suggest an S&OP process holds strong potential to improve cross-functional alignment and support proactive decision-making. Moreover, having a basic excel tool as a first step in an S&OP implementation can significantly improve planning maturity, transparency, and responsiveness. The research contributes to both theory and practice by highlighting the importance of contextual adaptation, trust in data, and behavioral alignment in successful S&OP implementation.

Keywords: Sales and Operations Planning (S&OP), Coordination Mechanisms, Order-to-delivery Process; Cross-Functional Collaboration, Forecast Alignment, Marine Sector, Integrated Planning, Operational Efficiency

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1

Introduction

The following chapter provides a background to the thesis. It describes the Case Company, its market, the problematization and research focus. Furthermore, it introduces the purpose and objectives of the study together with the research questions. The chapter ends by explaining the delimitations of the research.

1.1 Background

Coordination in organizations has long been recognized as essential for ensuring aligned action across individuals and departments. In today's fast-changing environment, a company needs to respond and adjust operations to fluctuating market conditions (Kristensen and Jonsson, 2017). The main goal of sales and operations planning, S&OP, is to balance customer demand with supply capabilities (Tuomikangas and Kaipia, 2014; Wallace and Stahl, 2008b). It does so by aligning strategic and operational plans across internal functions and supply chain partners, making it a suitable approach for many organizations aiming to improve coordination and responsiveness. A business can benefit from an S&OP process in several ways (Wallace and Stahl, 2008b). For instance, some objectives of implementing S&OP are improved customer service, decreased inventories, shortened customer lead times and improved collaboration among functions.

Mintzberg (1983) identified five foundational coordination mechanisms: mutual adjustments, direct supervision, standardization of work processes, outputs, and skills. These mechanisms are seen as fundamental in how organization's structure and integrate activities. In the context of S&OP, Tuomikangas and Kaipia (2014) offer an applied view of coordination, identifying six interconnected coordination mechanisms: S&OP organization, process, tools and data, performance management, strategic alignment, and culture and leadership. These mechanisms incorporate and extend Mintzberg's framework, thus offering a practical framework for understanding how coordination is achieved in the S&OP process (Mintzberg, 1983).

Currently, the Case Company is attempting to manage a fluctuating market context without an integrated S&OP process. According to Grimson and Pyke (2007) maturity model, the lack of an implemented S&OP process indicates potential challenges regarding coordination, including communication and collaboration in the organization. Therefore, there is a need to implement an S&OP process to make their current order-to-delivery process more resilient.

1.1.1 The Case Company

The Case Company is a global provider of customized safety systems across multiple market segments and is currently in a growth phase. It both produces products for the systems in-house and sources them from subsidiaries and external suppliers to assemble complete systems. Some components of the systems are standardized and used across various system configurations. As a result, the company maintains inventories of these standardized components, following a make-to-stock production strategy. However, certain components are tailored to specific customer orders, which requires a make-to-order approach. Once the necessary components, whether produced or sourced, are available, they are assembled into customized systems upon order delivery.

This report will only focus on the marine segment of the Case Company, where they sell systems to all types of vessels.

1.1.2 The Marine Market

The new building projects in the marine market are characterized by predictability due to long lead times on producing new vessels and full order books for several years ahead. In the marine market, shipyards are responsible for building the vessels. Once constructed, the shipowners get ownership of these vessels. They then hire management companies to operate and maneuver the vessels, including technical managers. Suppliers to shipyards are dependent on the shipyard's production precision because if they delay the building of one vessel, the suppliers also need to rearrange their processes. Furthermore, the system solution providing companies that are suppliers to the marine market can supply equipment for different types of sales. For the Case Company there are three types of sales that occur, namely New building orders, Retrofit orders, and sales of Spares.

New building: The new building orders occur when a new system is purchased for a vessel that is yet to be built. The owner of the vessel often hires a technical manager company, which then becomes the contact point for the sellers at the Case Company. This type of sale occurs sporadically and could involve multiple vessels requiring simultaneous delivery. The systems are customized for the vessel and designed together with the customer.

Retrofit: When parts of a system or a whole system need to be updated or changed for an already sailing vessel these orders are called retrofits. These orders are often placed on short notice as the vessel is planning to dry dock. Dry docking is a regular process used to complete a range of maritime maintenance services(Clarksons, nd). To avoid costly vessel downtime, all services must be completed within the scheduled period. Therefore, retrofit orders typically have short lead times, making it essential for the Case Company to meet the requested delivery dates.

Spares: This sale occurs when one or several components need to be changed. These are often more standardized components with short lead times.

1.1.3 Problematization and Research Focus

Coordination is an important factor to fully facilitate the benefits of an S&OP process (Tuomikangas and Kaipia, 2014). In the initial thesis brief, the Case Company pointed out an identified coordination issue between the Sales and Procurement functions. The problem stems from Sales' forecast being created on a high level and communicated in monetary terms, which makes it difficult for the Procurement function to interpret the forecast on an item level. Consequently, Procurement struggles to determine which items the forecast affects and how much. The misalignment in information played a key role in shaping the thesis focus, indicating the need to examine whether there are further coordination challenges within the organization. Furthermore, given that the Case Company currently lacks a formal S&OP process, it can be inferred that they are in the early stages of maturity according to Grimson and Pyke (2007) maturity model. However, as they are preparing to implement an S&OP process, it is important to identify the coordination challenges that may arise in this specific business context to ensure a successful transition.

The coordination issue between Sales and Procurement indicates a lack of capability in translating information insights across functions. As a response, the Case Company has proposed a potential solution in the form of a tool that translates Sales' insights into actionable outputs for Procurement. While literature (Grimson and Pyke, 2007; Wallace and Stahl, 2008b; Danese et al., 2017) argue that IT should not be the first step in an S&OP process implementation, introducing a basic fundamental tool could foster the initial understanding necessary to initiate the development of a formal S&OP process .

1.2 Aim and Research Questions

The aim of this study is to identify and analyze coordination challenges from an S&OP perspective within the Case Company's order-to-delivery process, prior to the implementation of a formal S&OP framework. Given that the company has not yet established and integrated S&OP process, the research will explore how coordination currently occurs between functions in this process.

Furthermore, the study aims to evaluate and analyze the coordination issue related to Sales' forecast between Sales and Procurement, as mentioned in section 1.1.3. Additionally, the study aims to develop a tool to enhance understanding between the Sales function, Project function and the operational functions, including the Planning, Procurement, and Production functions within the Case Company. The purpose of the tool is to disaggregate insights from Sales' forecasts on an object-level into understanding what it means on a purchase item level. Thus, making it understandable for the Procurement function. This Demand Breakdown Tool will be evaluated to determine how it can enhance the implementation of the S&OP process and how it can be used to mitigate the identified challenges and result in an integrated process. Furthermore, the study will explore how the implementation of an S&OP process will mitigate the identified challenges.

The purpose has been decomposed into three research questions:

RQ1: What main challenges is the Case Company facing related to coordination in its order-to-delivery process?

RQ2a: What potential does the implementation of an S&OP process hold in addressing the coordination challenges in the order-to-delivery process within a system providing company supplying vessels in the marine market?

RQ2b: How can a Demand Breakdown Tool contribute to mitigate the coordination challenges in the order-to-delivery process within a system providing company supplying vessels in the marine market?

1.3 Delimitations

The research was conducted over a period of approximately 18 weeks, which imposed a limited timeframe for data collection. The time constraint also restricted the research to focus solely on the Case Company. The Case Company currently operates in several business areas, however, this study is delimited to only the marine segment to maintain focus. Furthermore, the study is investigating challenges connected to coordination and information within the Case Company's order-to-delivery process, therefore, other challenges not related to this area will be excluded from the report. Additionally, the study concentrated on the following functions within the order-to-delivery process: Sales, Project, Planning, Procurement and Production.

Certain information was excluded from the report due to its confidential nature. This exclusion was necessary to protect sensitive data, but it may have impacted the transferability of the findings.

2

Literature Review & Theoretical Frameworks

The following section presents findings from the current literature to provide a sufficient understanding of S&OP and what factors need to be considered in relation to coordination. The first subsection presents a literature review, followed by two theoretical frameworks in subsections two and three, which are used to evaluate the Case Company. These frameworks include coordination mechanisms (see Subsection 2.2) and a maturity model (see Subsection 2.3).

2.1 Sales and Operations Planning

S&OP is defined by Wallace and Stahl (2008b) as a set of business processes that helps companies keep demand and supply in balance. In essence, it is used to link the company's strategic plans and business plans to its detailed processes (Dwyer, 2000). Slack and Lewis (2020) refer to the process as a formal aggregated process that looks over a period of 18 to 24 months ahead and that is not detailed but rather focuses on the overall volume of output. The main goal of S&OP is to balance customer demand with the ability to supply, ensuring that strategic and operational plans are in sync within the organization and across functions and supply chain partners (Tuomikangas and Kaipia, 2014; Wallace and Stahl, 2008b). Furthermore, the S&OP process is normally conducted with a monthly frequency and involves general management, sales, operations, finance, and product development, indicating cross-functional collaboration (Wallace and Stahl, 2008b). It provides the company's managers with a holistic view of the company and a foresight into the future. Further, Feigin (2011) argues that the role of S&OP is to take the unconstrained demand forecast and decide what service level to target for each product with the right level of supply required to meet that service level, taking demand variability, supply constraints, market objectives, and competitive assessments into account. Regularly updating the plans based on the current market can help the organization to avoid costly surprises, due to increased awareness (Dwyer, 2000).

2.1.1 Objectives of Sales and Operations Planning

The S&OP process can be viewed through two perspectives, either as a structured, data-driven process aimed at making optimal decisions under constraints or as a dynamic and cross-functional process (Tuomikangas and Kaipia, 2014).

The structured, data-driven process perspective applies a method-oriented perspective on planning using fact-based decision-making to maximize profits (Tuomikangas and Kaipia, 2014). Thomé et al. (2012b) state several drivers for an S&OP process. These could be reduced inventories, improved forecasts, balanced supply and demand, integrated plans, and improved results. Thus, viewing the S&OP process as a technical and quantitative planning tool. Furthermore, Lapide (2004) argues that the process can help meet customer demand at the highest service level while maintaining reduced inventories and minimizing supply chain costs. Hence, the results are aligned with the findings from Thomé et al. (2012b) that financial returns increase with the level of S&OP integration. Beyond formal procedures, schedules, data, and performance, S&OP in companies has a softer side, considering a common culture, commitment, trust, and collaboration (Tuomikangas and Kaipia, 2014). Hence, the second perspective which working towards constructive engagement, involving departments, and cross-functional alignment, is highlighted. Thus, the focus on leadership and corporate culture is identified. Moreover, the S&OP process can enhance cross-functional alignment, operational improvements, and trade-offs between cost and service, and thus improve firm performance. Additionally, the S&OP process is shown to increase awareness in the organization, leading to mitigation of negative consequences created by market uncertainties (Thomé et al., 2012b). Internal and external alignments can also be leveraged.

Different functions in an organization can have different perspectives affecting their view of the future demand, thus affecting the quality of the demand plan (Wallace and Stahl, 2008a). Supply chain performance can be linked to demand plan quality (Stadtler and Kilger, 2002). Thus, highlighting that collaboration between functions is crucial. This finding is further suggested by Chopra and Meindl (2016), who argue that it is common to divide tasks of supply and demand management into different functions. This indicates that a lack of coordination between supply and demand management can lead to poor supply chain performance. Furthermore, a higher level of cross-functional collaboration in the S&OP process indicates that an organization is more likely to be a top performer (Chopra and Meindl, 2016).

Lapide (2004) argues that a cross-functional process with multi-functional attendance and involvement in combination with active participation is crucial for a successful S&OP process, highlighting the importance of collaboration in the process. Tuomikangas and Kaipia (2014) further discuss the need for active participation among stakeholders. Furthermore, formal S&OP teams need to be defined (Thomé et al., 2012b). Thus, participants will be empowered, and participation from key stakeholders such as top management, key customers, and other suppliers from the beginning of the process can be guaranteed.

2.1.2 Sales and Operations Planning Process

In contrast to strategic planning with long planning horizons and operational plans with short planning horizons, S&OP can be seen as a tactical planning tool (Thomé et al., 2012a; Lapide, 2011). The process aims to match supply and demand plans

Figure 2.1: S&OP process steps (Wallace and Stahl, 2008b)

over a medium-term planning horizon and thus bridge business and strategic plans to operations. Moreover, the output from strategic planning guides the process and then drives the daily operations. Thomé et al. (2012a) highlight the importance of holding regular meetings and building structures that build trust and confidence within the team. Many companies have evolved into having a monthly meeting process (Lapide, 2004). The monthly S&OP process is described by Wallace and Stahl (2008b) and includes five steps: (I) Data gathering, (II) Demand planning, (III) Supply planning, (IV) Pre-meeting, and (V) Executive meeting (see Figure 2.1). During the first meeting, demand and supply data, inventory levels, backlogs, and statistical forecasts are collected and reviewed (Lapide, 2004; Thomé et al., 2012a). The second meeting focuses on reviewing the demand plan, while the third meeting is dedicated to evaluating and refining the supply plan. The fourth meeting is dedicated to preparing for the executive S&OP meeting that concludes the monthly cycle, during which decisions, recommendations, scenarios, and the proposed agenda are reviewed.

Data Gathering

Data gathering takes place at the end of the month, once the results are finalized and systems are filled with data from various functional business areas (Seeling et al., 2021; Wallace and Stahl, 2008b). This step involves updating files with data on actual sales, production, inventories, and more. It also includes generating information through, for instance, sales data analysis, and statistical forecast reports used to develop new forecasts, as well as communicating the information to relevant stakeholders (Wallace and Stahl, 2008b). Line management is responsible for ensuring the validity of the data.

Demand Planning

During the demand planning step, personnel from sales and marketing functions review, analyze, and discuss the information gathered in the first step (Wallace and Stahl, 2008b). This data is then used to develop a revised management forecast covering the next 15 months and beyond.

Demand planning ensures that all decisions in the supply chain are based on fixed customer orders and planned sales or forecasts (Stadtler and Kilger, 2002). Furthermore, the purpose of demand planning is to improve decisions affecting demand accuracy and the calculation of buffer or safety stocks to reach a predefined service level. Wallace and Stahl (2008a) state that demand planning is considered the most important element in the S&OP process for financial and operational validity. The output of effective demand planning is a statement about future demand, typically in the form of weekly or monthly estimates by region or customer segment (Feigin, 2011). This should then be used to drive the operations-level plans defining the enterprise's medium-to-short-range inventory, production, supply chain, and logistics support strategies (Ross, 2015). Ross (2015) describes the process of constructing a demand plan in four phases: Planning demand, communicating demand, influencing demand, and prioritizing demand. The goal is to create a single, joint demand management plan that is feasible, supportive of overall enterprise goals, and in alignment with the objectives of all business functions.

In demand planning, the forecast structure varies depending on the desired outcome (Stadtler and Kilger, 2002). Additionally, each step of demand planning contains uncertainty to some extent. Further, he means that varying demand requires analysis of different scenarios, showcasing the consequences if different scenarios occur. To build the demand forecast, personnel from sales should gather in pre-meetings and generate a baseline demand forecast that captures what can be sold to customers (Grimson and Pyke, 2007). The forecast should then be adjusted based on marketing plans and include information about product introductions and product obsolescence. To get accountability and commitment from all employees involved in the S&OP process, the forecast needs to be aggregated and disaggregated to all levels and reviewed and revised by each one (Lapide, 2006). Due to the different ways of reviewing the forecast among different functions, the supply and demand views need to be consistent with each other and with the lowest and most detailed forecast. Moreover, the plans should use a common language, ensuring understanding among all participants (Dwyer, 2000).

Supply Planning
During Supply Planning, representatives from operations, including production, logistics and R&D, collaborate to evaluate the demand plan developed during Demand Planning (Seeling et al., 2021). This involves assessing capacity constraints and available inventory to ensure the plan is realistic and achievable.

In both the demand and supply planning steps, some companies hold formal meetings, while others find it more effective to work informally through one-on-one interactions (Wallace and Stahl, 2008b). Moreover, larger organizations typically follow a formalized process, whereas smaller enterprises tend to rely on less structured sessions.

Pre-Meeting
During the pre-meeting, cross-functional representatives discuss gaps in demand and supply capacity (Seeling et al., 2021). The team works to resolve conflicts, such as discrepancies between forecast and capacity, or customer demand exceeding available supply, and evaluates different scenarios (Wallace and Stahl, 2008b). Additionally, a financial review is conducted. Finally, a summary of key decisions, open issues, and proposed actions is prepared for the executive meeting.

Executive Meeting
During the final step of the monthly S&OP process, the executive meeting, senior management becomes actively involved (Seeling et al., 2021). The role of senior managers and executives include: (1) approving the proposed S&OP plan, (2) authorizing adjustments to production rates or supply costs that exceed the decision-making authority of the S&OP team, (3) evaluating the financial S&OP plan against the overall business plan and determining any necessary modifications, (4) resolving unresolved issues from the pre-meeting, (5) reviewing KPIs and monitoring the progress of ongoing projects to support strategic decision-making.

2.1.3 IT's Role in Sales & Operations Planning

Software and enabling technology could leverage the S&OP process (Lapide, 2004). However, initially in the process, simpler spreadsheets could be enough (Lapide, 2005; Grimson and Pyke, 2007). A well-understood S&OP process within the business should be of higher priority to later be able to leverage the benefits of advanced technology. Grimson and Pyke (2007) suggest that more advanced enabling technology should be introduced as the S&OP scope outgrows the spreadsheet approach. Thomé et al. (2012a), however, argue that information systems are viewed as essential to align strategies and operations, but that the level of investment needed in these types of systems varies. Thus, spreadsheets can be enough but more advanced systems could also benefit. Tuomikangas and Kaipia (2014) state that to optimize business performance more advanced systems are required as the organization increases in S&OP maturity. Additionally, as the S&OP process becomes more advanced, data quality becomes more important to ensure that users can trust the data and enable efficient decision-making.

Lapide (2004) presents three types of necessary systems to support an S&OP process; (1) Demand-side planning, (2) Supply-side planning, and (3) S&OP workbench. The software used as an S&OP workbench should align the demand and supply views and be used as a supporting tool during the meetings.

2.1.4 S&OP Process Implementation

An implementation of an S&OP process requires both a change in business process and company culture (Grimson and Pyke, 2007). Thus, it can become more difficult than anticipated. Due to the need to change fundamental incentive schemes to break down longstanding functional silos and to align goals among managers with different incentives, a change management effort is needed. Moreover, there is also a need to focus on the soft issues in S&OP to enhance performance (Stentoft et al., 2021, 2022).

Wallace and Stahl (2008b) present three phases when implementing a S&OP process. The first phase is to create a live pilot enabling executive management to understand how the process would work in their company . Secondly, the focus should be on expansion which cuts over the balance of the product families to executive S&OP, before lastly doing full financial integration. Additionally, Chopra and Meindl (2016) present steps for implementing a S&OP process in practice. The first step should address coordination across the supply chain, align incentives, and form joint teams to ensure that all actors work towards maximizing profitability. Secondly, the focus should consider taking predictable variability into account when making strategic decisions. Thirdly, the organization should ensure the involvement of senior management, and the ownership of the process should be with a senior leader. Lastly, the S&OP process needs to adjust plans based on the reality of forecast change. Moreover, Wallace and Stahl (2008b) argue that the main objective during implementation is to get the process working, rather than focusing on time.

Grimson and Pyke (2007) highlight the need for measurement within the process, both for implementation and continuous improvement. They argue that the measures should vary based on the industry context. Performance measurements can be seen through three perspectives: financial performance, operational performance, and process performance (Tuomikangas and Kaipia, 2014). Common KPIs for financial performance could be top-line sales growth, market share, forecast accuracy, and variance to baseline forecast (Grimson and Pyke, 2007; Tuomikangas and Kaipia, 2014). Operational performance can be measured in line fill, inventory on hand, obsolete inventory, expediting frequency, stockouts, variance to standard cost, quality, and capacity utilization (Grimson and Pyke, 2007; Tuomikangas and Kaipia, 2014). Process performance focuses on how effective the S&OP process is and considers improvements in decision support, planning efficiency, learning effects, process structure and maturity, and continuous improvements and process audits. Further, Tuomikangas and Kaipia (2014) highlight a lack of a unifying framework to measure performance management, the need for measures that handle conflicting interests, and the importance of multi-perspective measurements. Additionally, Stentoft et al. (2021) highlights the importance of setting up key behavioral indicators in addition to performance indicators to break down silo tendencies and enable a successful implementation.

The S&OP process should be tailored to an organization's specific environment, as a standard approach often fails to meet unique business needs (Kristensen and Jonsson, 2017). Tuomikangas and Kaipia (2014) present three different perspectives on S&OP in an organization. One of the perspectives argues that the S&OP organization is viewed in terms of four supply chain stages: procurement, production, distribution, and sales, which traditionally are decentralized. However, due to this approach limiting cost savings and profitability, a more centralized and integrated approach is recommended, with an integration level varying based on the business context. Organizational characteristics such as industry, supply chain structure, and internal complexity play a decisive role in shaping the design of an S&OP process. A context-based approach to S&OP emphasizes that the process should be adapted to the context of the organization (Kristensen and Jonsson, 2017). For instance, enterprises with more complex supply chains tend to require more coordination, which can improve S&OP outcomes. However, increased complexity demands greater advanced technologies and leads to higher implementation costs. Internal organizational culture can also be a barrier to successful S&OP implementation (Kristensen and Jonsson, 2017). Resistance to cross-functional collaboration, unclear roles, or a lack of trust among departments can undermine the effectiveness of the process. Coordination mechanisms are critical to overcoming these barriers (Tuomikangas and Kaipia, 2014). However, as stated, the need for coordination mechanisms will differ depending on the context.

Kristensen and Jonsson (2017) discuss how S&OP performance depends on the coordination quality with adjacent planning levels. A well-executed S&OP process will not be beneficial if lower-level systems are underperforming, and if there is no alignment with higher-level strategic business goals, the process may not support long-term strategic decision-making. Furthermore, complex and interconnected supply chain environments indicate the need for involvement of external factors such as customers, suppliers, and service providers in the S&OP framework (Jonsson et al., 2021). Additionally, many companies struggle to advance their S&OP maturity due to insufficient accounting of external factors and adjustments to volatile conditions. Thus, the need for a flexible and dynamic S&OP structure is highlighted in combination with external stakeholder integration to enable a more resilient process.

2.2 Coordination Mechanisms

Coordination mechanisms are essential in S&OP because they help align both business strategies with day-to-day operations and ensure collaboration between internal departments and external supply chain partners (Tuomikangas and Kaipia, 2014). Coordination refers to the way decisions are made, and information is shared among different people in teams working together to reach shared goals. In the paper A coordination framework for sales and operations planning (S&OP): Synthesis from the literature Tuomikangas and Kaipia (2014) presents a framework with six coordination mechanisms: S&OP organization; S&OP process; S&OP tools and data; performance management; strategic alignment; and S&OP culture and leadership (see Figure 2.2).

S&OP Organization
Tuomikangas and Kaipia (2014) present the first mechanism as the S&OP organization. The purpose of this mechanism is to understand what actors and functions are involved in S&OP. Furthermore, by identifying relevant organizations, organizational units, and actors it defines the formal structure including decision-making authorities, configuration for centralization/decentralization, and the definitions of roles and responsibilities as well as process activities. Danese et al. (2017) highlight that for a company to mature in the S&OP process, clearly defined roles and responsibilities, commitment from top management, and formalized cross-functional teams become more important in the people and organization dimension. Furthermore, cross-functional coordination and accountability can be seen as enablers of efficiency in S&OP, highlighting the need of structured roles and cultural readiness for integration (Stentoft et al., 2022).

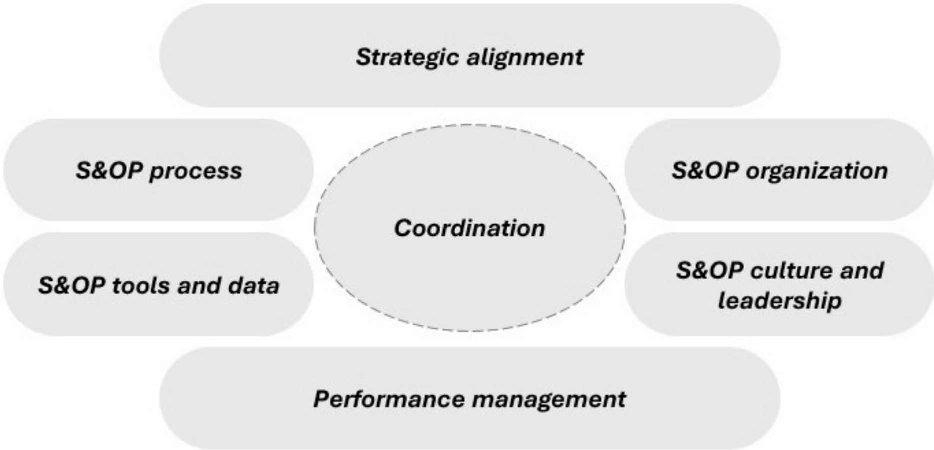

Figure 2.2: Coordination Mechanisms (Tuomikangas and Kaipia, 2014)

S&OP Process

The essence of the S&OP process mechanism is dynamic collaborative planning and decision-making between functions (Tuomikangas and Kaipia, 2014). It defines how different sub-plans are created and communicated. It understands the formal planning activities, decision-making processes, and collaborative activities. Oliva and Watson (2011) discuss that S&OP success is dependent on the procedural, informational, and alignment quality of the process and argues that a well-designed planning process can foster integration and executional coherence, despite misaligned incentives between functions. Moreover, a clearly structured process with routine meetings and defined agendas can enhance firm performance (Stentoft et al., 2022).

S&OP Tools and Data

S&OP tools and data aim at providing high-quality information and relevant IT tools to create operational plans (Tuomikangas and Kaipia, 2014). This mechanism includes alignment in a common set of data and common validation and interpretation of data, which is crucial for effective decision-making. The requirements for the data are defined by the need to be accurate, frequently updated, and appropriate in terms of content and form. Thus, participants can trust and use the data. As the organization evolves and becomes more mature, more advanced systems are required (Tuomikangas and Kaipia, 2014; Danese et al., 2017). Moreover, Stentoft et al. (2022) highlights that the tools also need to be appropriate in terms of behavioral alignment.

Performance Management

Performance management includes financial performance, operations performance, and process performance (Tuomikangas and Kaipia, 2014). To define what methods and activities are needed to reach the desired goals, including identifying targets and needed support, in these dimensions the performance management mechanism is used. Moreover, target setting and the follow-up process are included. Danese et al. (2017) presents performance measurement as a dimension of S&OP maturity, discussing that tracking performance and established KPIs should go from functionally specific to enterprise wide as the organization matures. Stentoft et al. (2022) present the use of key behavioral indicators to assess the soft side of performance, such as collaboration. Their findings confirm a positive relationship between process efficiency and financial, operational, and sales-based performance outcomes.

Strategic Alignment
The process of linking a company's strategic targets to the operational plan and strengthening the alignment to the business targets is included in the mechanism called strategic alignment (Tuomikangas and Kaipia, 2014). It links the high-level goals of the organization to tactical and operational activities and then provides feedback, ensuring that the strategic plan can be reached through S&OP measures. Moreover, it leverages S&OP to identify gaps between strategic targets and the S&OP plan, thus opportunities to create new value for customers can be found (Tuomikangas and Kaipia, 2014; Oliva and Watson, 2011). Furthermore, strategic alignment is reinforced through top management involvement and behavioral cohesion around common goals (Stentoft et al., 2022).

S&OP Culture and Leadership
Development of the corporate culture through communication, training, and staff development, can enable several factors supporting a successful S&OP process (Tuomikangas and Kaipia, 2014; Danese et al., 2017). For instance, aligned goals and corporate norms, rewards and incentives, trust and commitment among employees, support by top management, empowerment, and constructive engagement within the organization can be created. The mechanism focusing on this is the S&OP culture and leadership. Stentoft et al. (2022) discuss that trust, empowerment, and constructive participation enhance S&OP efficiency and performance. Thus, accountability, engagement, and communication are drivers of the corporate culture.

All mechanisms are affected by each other, thus they are interconnected (see Figure 2.2) (Tuomikangas and Kaipia, 2014). To clarify, performance management can be seen as the foundation, while strategic alignment highlights vertical coordination. The process including tools and data and organization considering culture and leadership is needed for cross-functional coordination. Furthermore, Danese et al. (2017) presents that the dimensions of S&OP maturity are not developed in isolation but must be coordinated across sequences. Stentoft et al. (2022) further argue that technical, behavioral, and strategic dimensions interact dynamically to affect overall efficiency and performance.

2.3 Maturity Model

Even though S&OP offers several benefits for a company's performance, many companies are struggling to achieve those positive effects after implementing it (Hansali et al., 2021). To be able to evaluate the maturity of the S&OP process, maturity models were developed. These models serve as diagnostic tools that help organizations assess their current state, define their desired future state, and identify the necessary steps to progress (Lapide, 2005). A maturity model is a framework to understand how well the S&OP processes are performing and for managers to know how to progress to the next steps in the model (Grimson and Pyke, 2007). The goal of a maturity model is to optimize profit through S&OP plan integration.

The maturity model dimensions used for this study are from Grimson and Pyke's Maturity model which has a ranking from one to five (Grimson and Pyke, 2007). Companies with no S&OP practices are at Stage 1. Stage 2 is classified as reactive, Stage 3 as standard, Stage 4 as advanced and Stage 5 as proactive. The framework consists of five different dimensions. The dimensions are Meeting and Collaboration, Organization, Measurements, Information Technology, and S&OP plan integration.

Meeting and Collaboration

The meeting and collaboration dimension evaluates the effectiveness of humans (Grimson and Pyke, 2007). If there are no meetings for planning and collaboration between sales and operations functions, a company is classified as in Stage 1. At this stage, the sales function only communicates with operations when the customers complain, and operations use the forecast information to try to meet demand. Danese et al. (2017) describes a company in Stage 1 as limited communication and information sharing between functions and a poorly defined demand plan. Companies are using planning tools inefficiently with many manual steps involved in the process. Furthermore, Grimson and Pyke (2007) explain the sales function often inflates demand forecasts to compensate for late deliveries from operations. The operations function then adjusts these forecasts downwards, knowing they are exaggerated. Furthermore, Danese et al. (2017) describes a company in Stage 1 as limited communication and information sharing between functions and a poorly defined demand plan. Additionally, the finance department sets goals based on these adjusted numbers without understanding market conditions or production capacity. This leads to numbers that are often inaccurate and not trusted by anyone. In this stage there are frequent re-planning activities and a focus on revenue (Danese et al., 2017).

In Stage 2, meetings regarding sales and operations occur at the senior management level where the purpose often is regarding financials Grimson and Pyke (2007). In Stage 3, pre-meetings are held within the sales and operations functions. There is a formal S&OP meeting where the functions can inform the other functions about their separate plans and the focus of this meeting is on integration. Stage 4 builds on Stage 3, with the addition of top customers and suppliers participating in the meetings. In Stage 5 there are also meetings in between the scheduled formal S&OP meetings if there are some critical events such as a shortage of an important component. There is a focus on long-term strategic plans to support the growth plan (Danese et al., 2017).

Table 2.1: The Meeting and Collaboration dimension (Grimson and Pyke, 2007; Danese et al., 2017)

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
Silo Culture No meetings No collaboration Frequent re-planning and revenue focus	Discussed at top level management meetings Focus on financial goals	Staff Pre-Meetings Executive S&OP Meetings Some supplier / customer data	Supplier & customer data incorporated Suppliers & customers participate in parts of meetings	Event driven meetings supersede scheduled meetings Real-time access to external data

Organization
The focus in the organization dimension is on the corporate S&OP structure (Grimson and Pyke, 2007). When there is no S&OP function in a company, a company is in Stage 1. In Stage 2 there is still no formal S&OP function but there is a role where someone is performing tasks such as aligning sales and operations plans with financial objectives in mind (Grimson and Pyke, 2007), but the demand and supply plan are developed independently (Danese et al., 2017). In Stage 3 there might still be a lack of a S&OP team but there is a role that is responsible for the S&OP function (Grimson and Pyke, 2007). In contrast, there is a formal S&OP team in Stage 4 where each team member has their own responsibilities and there is executive-level participation. Stage 5 is as Stage 4, but S&OP is understood by the whole company.

Table 2.2: The Organization dimension (Grimson and Pyke, 2007; Danese et al., 2017)

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
No S&OP organization	No formal S&OP function Components of S&OP are in other positions No definition of responsibilities	S&OP function is part of other position: Product Manager, Supply Chain Manager Clear roles and responsibilities	Formal S&OP team Executive participation Supplier	Throughout the organization, S&OP is understood as a tool for optimizing company profit

Measurements
The measurement dimension includes both company performance and the effectiveness of the S&OP process (Grimson and Pyke, 2007). In Stage 1 there are almost no other measures than financial measures. Stage 2 includes a monthly or quarterly review of the operations department's performance in meeting the sales plan. Here the sales managers do not feel responsible for their plans. Additionally, Danese

et al. (2017) explain measurements are functionally specific. In Stage 3, in addition to Stage 2, the sales function gets measured on how accurate the forecast is, which makes the sales managers more responsible for the forecast (Grimson and Pyke, 2007). Furthermore, the metrics are integrated across the functions to manage trade-offs between them (Danese et al., 2017).

In Stage 4, two metrics are introduced: New product introduction and S&OP effectiveness (Grimson and Pyke, 2007). When introducing new products, it is challenging since there is no demand history so at Stage 4 companies measure the effectiveness and efficiency in the development, such as development cost and time to market. S&OP effectiveness measures include feedback from all other team members. Additionally, suppliers and customers should be engaged to provide feedback on the process. Danese et al. (2017) explain the metrics should have a focus on customer service and on S&OP effectiveness. In Stage 5, profitability is added as a measure (Grimson and Pyke, 2007). Furthermore, Danese et al. (2017) explain the metrics should be aligned across the whole organization and it also includes the measurement of impact on the ecosystem, for example the social and environmental impact.

Table 2.3: The Measurement dimension (Grimson and Pyke, 2007; Danese et al., 2017)

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
No/ Basic measurements	Measure how well Operations meets the sales plan Functionally specific metrics	Stage 2 plus: Sales measured on forecast accuracy Integrated internal supply chain metrics to manage trade-offs	Stage 3 plus: New Product Introduction S&OP effectiveness External supply chain metrics to support decision-making at the supply network level	Stage 4 plus: Company profitability Measurement of the impact on the ecosystem (e.g. social impact, global environmental impact, etc.)

Information Technology

The focus in the Information Technology dimension is more on the information process than the business process (Grimson and Pyke, 2007). For a company in Stage 1, managers have spreadsheets that are not shared with others and the information is not consolidated. In Stage 2, some manual consolidation is performed but the spreadsheets are still owned and updated by the manager who owns the file. A company in Stage 3 has a more automated way of consolidating and updating information. There is software for revenue or operations planning. Additionally, there are IT tools for supporting the internal supply chain processes but also integrated platforms that support the alignment of demand and supply (Danese et al., 2017).

In Stage 4 companies have both revenue and operations planning software, though they optimize plans independently rather than together (Grimson and Pyke, 2007). In addition, companies also have an S&OP workbench to share information with the whole organization.

The tools help companies to share information and communicate better with trading partners to improve collaboration, create scenario analysis and manage supply and demand (Danese et al., 2017). Stage 5 is about having real-time information to optimize sales decisions together with operations decisions (Grimson and Pyke, 2007). In this stage, companies will optimize profit and be able to react to market changes quickly.

Table 2.4: The Information Technology dimension (Grimson and Pyke, 2007; Danese et al., 2017)

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
Individual managers keep own spreadsheets No consolidation of information	Many spreadsheets Some consolidation, but done manually Functional solutions	Centralized information Revenue or operations planning software Integrated demand and supply planning software	Batch process Revenue & operations optimization software – link to ERP but not jointly optimized S&OP workbench Technology to access external partner data and share information with them	Integrated S&OP optimization software Full interface with ERP, accounting, forecasting Real-time solve

S&OP Plan Integration

The S&OP plan integration dimension evaluates how well a company develops and aligns its sales and operations plans (Grimson & Pyke, 2007). This integration is the goal of the other four dimensions in the maturity model.

In Stage 1, companies have no S&OP planning and operations try to meet demand with no input from the sales forecast (Grimson and Pyke, 2007). In Stage 2, operations are driven by the sales forecast, but it does not consider capacity utilization, and operations information does not affect or adjust the sales plan. Furthermore, the plans are created in a top-down process. A company in Stage 3 is still mainly focused on the sales plan to drive operations plans, but in contrast to Stage 2, some information from operations can be used to adjust the sales plan. Additionally, the forecast is usually developed with a bottom-up approach. According to Danese et al. (2017) the S&OP is structured where the demand, supply and inventory plans are balanced, generally through monthly meetings. In Stage 4, operations and sales plans are created together instead of sales-driving operations and the planning process is concurrent instead of sequential (Grimson and Pyke, 2007). In addition to Stage 4, Stage 5 is characterized by an optimized planning process with a focus on revenue, efficiency, and profitability.

Table 2.5: The S&OP Plan Integration dimension (Grimson and Pyke, 2007; Danese et al., 2017)

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**
No formal planning Operations attempts to meet incoming orders	Sales plan drives Operations Top-down process Capacity utilization dynamics ignored	Some plan integration Sequential process in one direction only Bottom-up plans - tempered by business goals	Plans highly integrated Concurrent & collaborative process Constraints applied in both directions	Seamless integration of plans Process focuses on profit optimization for whole company

3 Methods

This chapter outlines the methodology used in the study. It begins with presenting the research approach, followed by a description of the method used to answer the first research question. Next, the process of developing the Demand Breakdown Tool is explained, and subsequently, the methods used to answer part a and b of the second research question are described. Finally, the chapter describes the data analysis process and discusses the ethical considerations relevant to the study.

3.1 Research Approach

The study was conducted as a qualitative study with inductive reasoning. A qualitative method with an inductive approach was deemed suitable because it is a case study and not a well-known and researched area (Bell et al., 2019). The research process has been iterative, with continuous movement between data collection, observations/findings, and generating theory, then at last generalizing a conclusion, which aligns with an inductive approach.

The research design of this study is a single case study. Some of the benefits of a single case study are that it allows for an in-depth analysis of the specific case, providing rich and detailed information (Gustafsson, 2017), which is the purpose of this study. However, single case studies can be questioned for their generalizability. While the purpose is to generate deep insights into one case, the findings may not apply to other cases. To make the findings of the results more generalizable and transferable, a study provides a detailed description of the case and the context to allow the readers to determine the applicability of the findings to their situation (Kennedy, 1979). Therefore, this study provides the readers with a detailed description of the characteristics of the Case Company, its market, and its context. A single case study is deemed to be the most suitable research design due to the prioritization of depth instead of breadth and time limitations. Figure 3.1 illustrates the method used for this study.

3.2 Understanding the Case Company and its Challenges

To be able to answer the first research question, "What main challenges is the Case Company facing related to coordination in its order-to-delivery process?", a

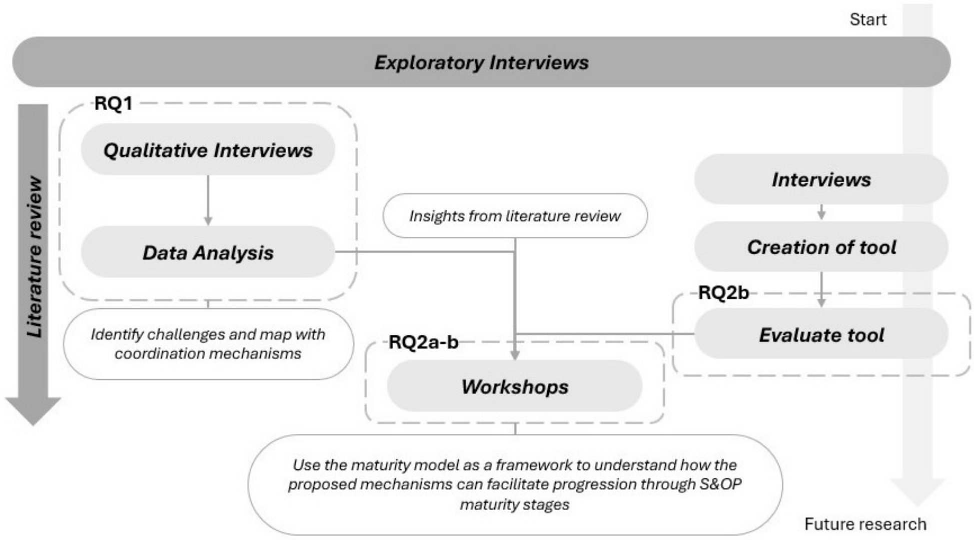

Figure 3.1: Overview of methodology

combination of methods was used. Since the researchers lacked prior insights into the Case Company, interviews were conducted to gain an understanding of the company's processes, context, and challenges. A literature review was performed to understand what literature that already exists on the subject. Additionally, a literature review in combination with exploratory interviews was conducted in the beginning to get sufficient understanding to be able to construct the interview guide. By combining these methods, the main challenges were identified.

3.2.1 Qualitative Interviews

Qualitative interviews were selected due to their greater flexibility in gathering in-depth data compared to more rigid methods such as structured interviews (Bell et al., 2022). Interviews were conducted after the purpose and background were finished because otherwise there was a risk of collecting unnecessary data that could not be used (Lantz, 2007).

The main objective of the interviews was to understand the responsibilities of different functions within the Case Company, the communication flows between functions, and identify challenges with the current process. Several employees within each function were interviewed to minimize the risk of bias, see Table 3.1 for the list of interviewees. Semi-structured interviews were used because the study aims to gather information about a specific topic (Bryman, 2018). During the interviews, both researchers participated where one researcher led the questioning, and the other was responsible for taking extensive notes. Questions were primarily more open-ended and general to give the employees a chance to freely express their thoughts to get a more comprehensive understanding of the topic (Bell et al., 2019). Furthermore, if it is relevant, follow-up questions were asked to get an even deeper understanding. Interviews were recorded with the respondent's consent, to allow for accurate transcription, correct citations, and deeper analysis. All interviews were held in Swedish but translated into English, which can violate source evaluation criteria: meaning (Bell et al., 2019). The information from the interviews has been translated into English, and the text has been checked with the Case Company so there is no translation bias. Furthermore, the information from the interview has been interpreted by the authors of this study.

Table 3.1: List of Respondents

Function	Medium	Duration	Date
Operations	On-Site	60 min	2025-03-05
Project	Teams	60 min	2025-03-06
Sales	Teams	60 min	2025-03-06
Production	On-Site	60 min	2025-03-11
Planning	Teams	60 min	2025-03-11
Procurement	Teams	60 min	2025-03-11
Planning	Teams	50 min	2025-03-12
Procurement	Teams	40 min	2025-03-12
Commerical	Teams	60 min	2025-03-17

3.2.2 Literature Review

A literature review was conducted to understand and explain S&OP, the objectives and the process. Furthermore, to understand concepts and what the literature describes about coordination and integration of different plans, within the order-to-delivery process, and sales and operations planning process. The search portals that have been used are Google Scholar, Scopus and Chalmers Library. Furthermore, some articles used were recommended by our supervisor who has written several research papers within the same research area. A snowballing method was used to find other relevant articles which is a method for finding other articles by looking into the references of an article (Bell et al., 2019).

3.3 Data Analysis

A thematic analysis was conducted to identify patterns in the data collected in the qualitative interviews. This approach was chosen due to its usefulness when generating new insights (Bell et al., 2019). The researchers started to familiarize themselves with the data through transcribing, reading, and re-reading the interview transcripts while making notes on emerging thoughts and potential patterns. To complement the thematic analysis and to be able to handle the collected data from the qualitative interviews, a KJ analysis was used. A KJ analysis is a method to structure and handle a large amount of data (Bligård, 2015). The method uses a bottom-up approach where it starts with the details and then works toward a full picture. Relevant information and citations from the interviews were written on post-it notes. These notes were then grouped and categorized to identify patterns. The analysis was performed in an online post-it-note program to facilitate the work process, see Figure 6. Once the challenges were identified from the KJ-analysis, the challenges were organized into the six different Coordination mechanisms; S&OP organization; S&OP process; S&OP tools and data; performance management; strategic alignment; and S&OP culture and leadership (Tuomikangas and Kaipia, 2014).

3.4 Demand Breakdown Tool

As mentioned in the introduction, the Case Company informed us about a communication problem between Sales and Procurement. The qualitative interviews confirmed the existence of a problem that led to the development of a Demand Breakdown Tool. The purpose of this tool is to use the Sales' forecast as input and generate a list of item numbers along with the required quantities as output. The tool was developed to see if it could improve the current order-to-delivery process and a potential enhancement of the S&OP process implementation. An overview of the logic behind the tool can be found in Appendix A.1

3.4.1 Interviews

The first step in the creation process involved conducting interviews with employees at the Case Company with knowledge about the potential data needed in the tool, in order to gain a better understanding of the data. The main objectives were to understand what data is important to include, what the data means and how the tool is planned to be used. Unstructured interviews were conducted because they are helpful when the purpose is to generate detailed and rich data on a specific case (Bell et al., 2019).

3.4.2 Creation of Tool in Excel

The Demand Breakdown Tool was created in Microsoft Excel, as requested by the Case Company.

To facilitate the creation of the tool a data request was made. The data was received via Teams and email and discussed in meetings to ensure a sufficient understanding. The data request included order specific information from 2024 and item specific information (see Table 3.2). The data request was sent out to different employees who had access to the requested data and an understanding of our project. Vessels will further be called objects.

Table 3.2: Data Request

Order specific information	**Item specific information**
Type of System	Quantity
Type of Sale (New Build, Retrofit, Spare)	Item description
Object Type	Item category
Object Weight	
Item number	

As mentioned, the tool was built using Microsoft Excel and all data from the data request was gathered in one table. The data were matched together with linking information from the different raw data files, such as order number, item number and object number. When the needed data was collected and understood, the second step was to create system packages per object type, which means to find which items and their quantity typically are needed for specific object types together with their characteristics such as weight. This analysis was performed in different sheets for every specific object type, in this way the organization gets an understanding of what items are usually included in a system for that type of object and type of sale.

The model allows users to easily input future sales data. The input needed is object type, weight if applicable otherwise it uses an average for the specific object type, system type, type of sale and delivery date (See Figure 3.2)

INPUT				
Boat type	**System Type**	**Weight**	**Quantity**	**Delivery Date**
Anchor Handling Tug Supply	New build System	1-4,999 GT	2	2025-07-01
Chemical Products Tanker	Retrofit System	10-29,999 GT	1	2025-08-01
Crude Oil Tanker	Retrofit System	50-99,999 GT	1	2025-10-01

Figure 3.2: Input

Once the input is added to the tool, it calculates and gives an output as a list of expected items and the corresponding quantity, total time needed in production, which production flow and total engineering hours (See Figure 3.3). This information can then be used to evaluate the current planning for the operational departments and to flag for fluctuations that need to be adjusted for. The model can also be used to understand different kinds of scenarios, as it is easy to test different amounts of sales to understand how it would affect the company.

Production Items	
Quantity	40
Production time (h)	58
PM (h)	2
PE (h)	10
Pool 1	39%
Pool 2	54%
Pool 3	0%
Pool 4	7%

High level category	Item number	Total QUANTITY	Production time (h)	Pool
A	123	2	5,97	2
C	231	2	1,50	1
A	132	4	15,50	1
A	331	4	19,33	2
B	111	2	N/A	
A	333	7	N/A	
C	221	28	1,48	4

Figure 3.3: Output

3.4.3 Evaluate Tool

Once the tool was developed as a first draft, the tool was presented to several employees at the Case Company to evaluate how it can further be developed. The discussion focused on the layout and possible additional features. After the workshop, a data request was sent out to be able to incorporate the suggested improvements into the tool. When the model was fully developed, its accuracy was tested by comparing the model's output to Procurement's forecast and comparing the quantity for items.

Before the last workshop, data input for the tool was received, detailing which specific objects are currently in the pipeline. The model's output, along with the current orderbook and spares data was reviewed and discussed during the S&OP forum. This workshop gave insights into how the tool can be used.

3.5 Identify How to Mitigate the Challenges

To understand how the identified challenges can be mitigated, the findings from the first research question were analyzed in conjunction with the tool. Workshops were conducted with employees at the Case Company to understand how the Demand Breakdown Tool can mitigate the challenges identified. Furthermore, the literature review presented in Section 3.2.2, along with other relevant sources, interview insights, and findings from additional workshops, was used to discuss the potential impact of implementing an S&OP process in addressing the identified challenges.

3.5.1 Workshops

Workshops together with employees from different functions connected to the order-to-delivery process, were conducted to understand which challenges this tool can solve and discuss the potential of implementing an S&OP process.

3.5.2 Final Evaluation

At the end of the project, the final findings were presented and discussed with several employees and stakeholders at the Case Company. This provided an opportunity for participants to reflect on the identified challenges, discuss potential root causes, and validate or correct any misunderstandings or malpresentations. Furthermore, the session also provided an opportunity for employees to discuss the potential benefits of an S&OP process and the Demand Breakdown Tool, thereby enabling organizational learning and facilitating knowledge retention.

3.6 Reliability and Validity

To ensure the data collection generates source critical and accurate information, it was important to systematically validate all sources of data (Bell et al., 2019). Throughout the data collection all data were checked for reliability, validity and credibility. Triangulation was used to check these aspects, which means cross-checking information by using different methods and sources (Simister and Garbutt, 2017). For example, interviews were conducted with several employees within each function, and theories were gathered from different sources to cross-check that they are describing the same concepts in the same way.

The triangulated approach helped reduce the risk of bias and increased the trustworthiness of the findings. Moreover, feedback sessions with stakeholders at the Case Company provided a form of respondent validation, where findings were discussed and confirmed or challenges by the employees. This approach contributed to a more nuanced understanding of the collected data and supported the overall credibility of the study.

3.7 Ethical Aspects

Most of the ethical aspects that were considered in this study are related to the people who were interviewed and how their personal information was handled. During all interviews, good research practice was used. All personal information was treated according to GDPR (General Data Protection Regulation). GDPR is about safeguarding personal information, ensuring it is not improperly shared or disseminated (European Commission, nd). It establishes strict guidelines for data handling and privacy protection across the European Union.

The study follows the "The European Code of Conduct for Research Integrity" of (All European Academies, 2023). The Code of Conduct explains that good research practices are based on four fundamental principles, Reliability, Honesty, Respect, and Accountability. It means careful design and methodology, transparent and unbiased reporting, respecting and treating all participants and subjects with care and taking responsibility for the entire research process. All information will be handled with integrity, and results will be transparent and honest (All European Academies, 2023).

Before all interviews, the interviewees were informed about the purpose of the research and the interview. All interviewees got this information via mail together with the questions. The interviewees were asked for their permission if the interview could be recorded to be able to re-listen and cite the interviewees correctly. The files of recordings were deleted directly after the research was completed so they cannot be used in any other way. In the report, the interviewees are anonymous and are referred to either their title or function instead of names to give the readers a better understanding.

4

Order-to-Delivery Process at the Case Company

The following section describes the current order-to-delivery process at one of the sites of the Case Company. The findings are a result of interviews with employees with different types of roles in the organization. First, an overview of the process across the different functions is provided. Moreover, to fully understand the process some sub-process and additional information affecting the process is described. In Figure 4.1 the identified information flows and material flows between the functions are visualized.

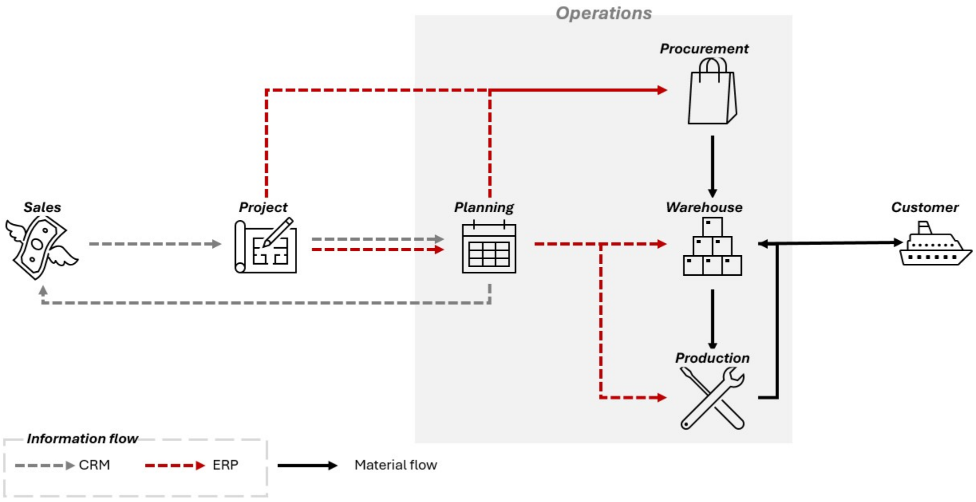

Figure 4.1: Order-To-Delivery Process, simplified information flow

4.1 Sales Function

The Case Company has several commercial entities which manage the sales to the end customer. Since a won quotation triggers the order-to-delivery process, this is explained even though it is outside of the investigated order-to-delivery process.

4.1.1 The Quotation Process

The quotation process begins when the Sales team receives a request for a quotation, RFQ, from a customer or when the sellers contact a customer with a proposed quotation. In the quotation, the seller adds information regarding the type of sales and resources needed. This information is added without communication with the supply chain at the Case Company. Moreover, the seller often lacks knowledge of lead times and if there are any problems connected to one or several of the items included in the quotation, therefore the lead times promised to the customer are often based on subjective judgement and experience.

Before a quotation is won, the seller adds a subjective grading of the probability of winning the quotation in the quotation system. Once the quotation is stated as won it is added to the customer relationship management, CRM, system and handed over to the Project function.

4.1.2 Setting Targets

A three-year business plan is developed based on market forecasts. Using this plan, an annual analysis is conducted to estimate potential sales, considering planned builds of vessels, vessels requiring system updates, the sales pipeline, and customer relationships. This analysis is then used to set annual sales targets at the product group level for each seller, with monthly breakdowns. These targets are then established into a forecast and communicated across the organization in financial terms.

4.2 Project Function

The Project function consists of project leaders and engineers responsible for system design and installation.

4.2.1 From Won Quotation to Established Order

Once the quotation is won, it is handed over to the Project function in the CRM system. The first thing they do is to assign a project leader responsible for the project. They then identify and define the deliverables and activities needed for the project. Furthermore, they want to trigger the supply chain process as soon as possible by registering a bill of materials and system configurations in the enterprise resource planning, ERP, system. Thus, the order is visible for the supply chain functions. All project-specific information and statuses are updated in the CRM system, hence the two systems need to be updated and synced. Some updates occur automatically, while others must be added manually.

Depending on the size of the project, engineering documentation is required, including the technical details and setting the design together with the customer. At this stage, the final design must be agreed upon to ensure the requested delivery date is met. The ambition is to set the design eight weeks before the scheduled delivery.

4.2.2 Status in the CRM System

In the CRM system, each order has a status. The status determines whether it is ready for delivery or not and it can be set to Delivery OK, Partial Delivery OK, or Not OK. The status indicates if the order is prepared for handover to the supply chain and further processing.

4.3 Planning Function

Once the order is added by Project in the ERP system, the order is visible for Planning. However, they mainly start to work with orders when the status is set to OK in the CRM system. Thus, the design of the system is set. The Planning function starts to allocate the orders to ensure that the requested delivery date can be met.

4.3.1 Signaling to Operational Functions

Based on the requested delivery date and specifications for an order, Planning initiates the activities needed in the supply chain process. Their role is to plan the daily activities in Operations, including Procurement, Production and Warehouse, to meet the requested delivery date for each customer order.

4.4 Operational Departments

The functions included in operations are Procurement, Warehouse and Production.

4.4.1 Procurement Function

In the Procurement function, each buyer is responsible for a group of suppliers and items. They monitor the ERP system to understand what purchases they need to make. The ERP system provides an overview of what material, the quantity, from what supplier, and when the sourcing needs to be done. The overview is done by set parameters which are based on a forecast, a customer need, safety stock and service levels, and communicated directives. Moreover, every twelve hours the ERP system goes through a material requirement planning process to ensure the latest updated needs are shown in the purchase order proposals.

Every buyer is responsible for ensuring all the components arrive when they are needed. If there are problems, it should be mentioned as soon as possible to enable the organization to solve and prepare for possible problems.

Forecast: The ERP system proposes a forecast based on historical order data. A side system to the ERP looks at consumed products and then calculates a forecasted quantity for each item that needs to be purchased. The calculated quantity is then adjusted based on safety stock parameters, the set service level and customer requirements. Then it is added to the ERP system. Thus, the buyer can see the need and can act on it.

Some of the components have a two-year lead time, indicating that a forecast is needed to be sent from the Case Company to the suppliers where they estimate the future need in a long period ahead of delivery.

The ordered volumes can sometimes be manually adjusted based on communicated goals of increased sales targets. For example, if the management team inform an increased sales goal of 10%, the buyers will adjust their purchases by a 10% increase for all items.

4.4.2 Warehouse

The Warehouse function receives information from Planning on what materials are needed for each customer order and materials needed for production. Due to the need for flexibility, Planning reserves goods for each order as late as possible. They let the Warehouse know what materials to get in a five-day horizon and are releasing orders to ensure a stable flow of utilization. Once the information is handed over to the Warehouse, the order is considered released. The warehouse personnel collect the materials needed for production one day ahead of production so they can start early in the morning. Once the production of a component is completed it is placed in the warehouse before it is added to the shipment of an order.

Most of the components in an order are purchased and stored in the warehouse before being delivered in one batch to the customer, along with a few products manufactured in-house.

4.4.3 Production Function

Twice a day the ERP system performs a material requirement planning, ensuring the right demand is reflected in the ERP system. Based on these requirements and order information, Planning releases what components should be built in production. It is the responsibility of the Planning function to ensure that the correct orders are released at the right time in production. The system gives a suggestion, but this is also done manually to ensure all resources are utilized due to more important orders.

Planning converts the production proposal to a production order, when this is done the system allocates resources and materials to the order. In this step the component in the order is allocated to a flow based on the characteristics of the item. The production has three different flows based on the type of component, where different competence is needed for each flow due to different complexity in the products.

Production can build components for specific customer orders or to build up the safety stock. The production is planned on a five-day horizon, but sometimes prioritized orders can be pushed in, hence stopping the production of other components.

Resource Allocation: The resource allocation needs to be planned due to the complexity of the produced items. Therefore, Planning needs to consider what components to be produced ahead of time to ensure that there is a stable flow of released orders, so the utilization level is steady. They need to consider if increased production is just a happening or if it is a trend that implies that Production needs to hire and educate more personnel or not and vice versa.

Product Preparation: Every produced item is prepared in a process where the items' bill of materials and production route are defined. This process needs to be done for a new item before it is added to the system.

4.5 S&OP Forum

During the spring the Case Company started to implement an S&OP process by having a monthly meeting called S&OP Forum. The agenda of the meetings follows an S&OP process where during the first meeting they discussed demand planning, during the second meeting the focus was on supply planning, the third meeting will be a pre-S&OP meeting and finally the fourth meeting will be an executive meeting. Thus, the plan is to follow the meeting structure presented by Wallace and Stahl (2008b). This cycle of meetings is supposed to occur every week instead of every month, making the current implementation process prolonged. The implementation process is mainly led by the Vice President of Operations at the Case Company. During discussions, the Vice President stated that if the organization achieves benefits from the meetings, it will be implemented in a monthly cycle.

One employee states that the meetings are going to be used to understand potential issues on the operations side, but also a possibility for sales to highlight their challenges. It will also be used to build future expectations and evaluate how the volumes will fluctuate, a kind of quantitative analysis to understand how the company should allocate and potentially reallocate the resources. Another employee highlights the importance of having this kind of process in a growing company:

> "In a growing business, it becomes difficult if we from the operations side do not understand where sales want to go, what they actually want us to produce, and what they are actually selling to customers."

Several employees from different functions highlight the importance of consensus between the functions and that this type of process could enable that. Furthermore, it is seen to improve the organization's way of working and therefore receive more satisfied customers. Thus, it is a positive attitude towards this implementation.

4.6 How the Context Affects the Order-to-Delivery Process

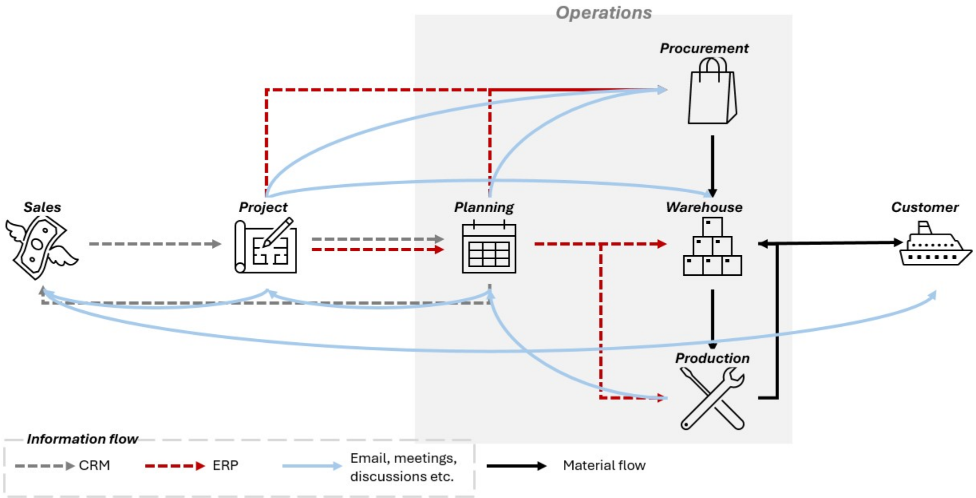

Figure 4.2: Order-To-Delivery Process

Although there is an established way to communicate information through systems like the CRM and ERP systems between the functions, several meetings, emails and direct discussions take place (see Figure 8). Due to the highly flexible nature of customer offerings and the risk of information loss, a discussion about what order needs to be prioritized happens. The discussion often occurs when retrofit and spare sales are added with short notice, leading to material shortages for already planned orders. Materials planned for other orders can be moved resulting in longer lead times for lower prioritized orders.

There is a weekly meeting where Planning discusses the orders together with the supply chain managers. However, sometimes the discussion needs to be escalated, in these situations, there is a decision ladder. The first step is to contact the project leader to understand the situation, the next step is to take it to the mangers in Project and Sales, who discuss and prioritize the orders based on order value, the importance of the customer, and what effort is needed to prioritize one order instead of another. Sometimes, the Commercial Entities are also included to understand the importance of the affected order. If this decision cannot be made, it is escalated to the management team and the Chief Operating Officer, COO. If there are short lead times on new orders, the Project function can communicate directly to Procurement and Production what articles to prioritize, before the order is registered in the ERP and thus handed over to Procurement.

As previously discussed, several additional information channels are added between functions through informal communication. This added complexity contributes to inefficiencies in the order-to-delivery process and is mainly driven by contextual factors. For instance, all sales types are handled within the same process flow, even though they differ in urgency and lead time. Retrofit and spare part orders are often urgent and can arise on short notice, making prioritization necessary. As a result, informal communication is frequently introduced at multiple stages of the process to manage these changes.

5
Challenges in Order-to-Delivery Process

To answer the first research question, interviews were conducted with several employees in different functions to fully identify what main challenges related to coordination the company faces in their order-to-delivery process. As presented, the Case Company does not have a formal S&OP process where they align all the functions involved and make decisions together. Thus, this can be seen as a main issue that potentially is interconnected to the identified challenges. The identified challenges are divided based on the six S&OP coordination mechanisms described by Tuomikangas and Kaipia (2014). The chapter presents seven different challenges and ends with a table summarizing all challenges ranging from C1 to C7.

5.1 S&OP Organization

Responsibilities and Decision-making
During the interviews, employees from different functions mentioned potential challenges in defining which function is responsible for what. One employee highlighted "Who does what, and who communicates what to whom? The area of responsibility can sometimes be a bit unclear.". An employee in the Production function noted that they sometimes discover information, which should have been handled and flagged by the Planning function, resulting in the information being communicated far too late. Thus, the unclear areas of responsibility causes information deficiencies within the organization. Furthermore, it was brought up that the way of working has silo tendencies, with Procurement's forecast highlighted as an example of this segregated working. Hence, this could potentially amplify the consequences of the ambiguity of responsibility areas and what information should be communicated by whom.

The organization faces significant challenges in coordination and communication due to unclear areas of responsibility, leading to information deficiencies and siloed working practices that hinder effective integration and collaboration.

C1: Lack of clarity in responsibilities and decision-making authorities

Priority Process
The appearance of retrofit orders with short lead times in combination with limited material availability is resulting in a need to discuss and determine which orders

should be prioritized to deliver. Regardless of that several employees state that the company has a standard priority process of how to work when this happens, but some challenges are still identified. One employee stated “Prioritization is one of those things, really. Who has the mandate to decide that we take this order before that one?”, another one said, "It would have been better to handle it without having to involve the management team.". Hence, this indicates that the decisions often are escalated higher up in the organization than needed. The problem with decisions being escalated too far in the organization is also stated by another employee when discussing the prioritization process “The problem is that he should not be involved in this process” referring to the COO. Thus, the comments suggest that the employees on lower levels are not able to make the needed decisions, due to a lack of necessary knowledge or a fear of making these decisions as highlighted by one of the interviewees "There is also a fear of making certain decisions at times, which causes issues to be escalated much higher up in the organization than they should be.".

The challenge lies in the inefficiency of the prioritization process when all orders cannot be fulfilled in time, as decisions frequently need to be escalated to higher management due to lower-level employees lacking the necessary knowledge about end-customers and the importance of the order.

C2: Inefficient prioritization process due to low information visibility among lower-level employees

5.2 S&OP Process

Way of Working
As described in the previous chapter, the characteristics of the sales differ between retrofit, new building and spares. Although these differ in lead times the company has the same standard flow for all types of sales even though retrofit and spares require a much faster process, "I think part of the problem is that we work with a standard flow throughout the entire chain, trying to fit all sales into it. This doesn’t work, especially for retrofits.". As indicated by the employee this standard flow in the process is resulting in challenges further down in the supply chain. It is also raised that the organizational departments are too far away from the end-customer to understand what problems that arise as changes are made in the process. Moreover, change management is brought up as a challenge where there is no good way of working with short-term changes.

Sales with Short Lead Times
The company often faces issues when it comes to orders with short lead times, "Another big challenge is when it comes to ’In for out’ orders, meaning when a customer calls and says, ’We need the system in two weeks.’". While the standardized process flow is well-planned for new building orders with long planning horizons, it becomes disrupted when sales with short lead times are placed, “Sometimes there is a retrofit that needs to be highly prioritized and must be planned immediately, which naturally creates problems in other parts of the process.". These short-notice sales

create challenges for planning, as they may require reallocating materials from existing planned orders, rescheduling production flows on short notice, and prompting procurement to secure additional materials. This results in an organization operating on a day-to-day basis, constantly addressing new challenges caused by the addition of short lead-time orders.

Moreover, another issue raised with short lead time sales is that orders are placed within the lead time of the required materials, suggesting that crucial information is bypassed, and therefore, an unrealistic delivery date is expected by the customer. The Procurement function stated, “The addition of customer orders within the lead time is currently our biggest challenge.". Thus, time is spent on trying to reduce the lead times from suppliers, creating a risk of affecting the relationship. This further highlights the importance of correct planning and forecasting to avoid these kinds of issues.

Flexibility

As mentioned in the process, flexibility for the customer is highly prioritized, both in terms of customized systems and the sales process. The issues raised are connected to the trade-off between flexibility and effectiveness, where for example the Procurement and Production function would like to have a greater focus on effectiveness but are forced to focus on short-term flexibility to be able to deliver on time. One employee highlight:

> “When the specifications change, it can be because the customer comes very late and says, ’Oh, we changed our mind, we want this instead of that.’ To maintain a good customer relationship, we often bend over backwards to solve it, which leads to a changed specification and a ripple effect.”

Moreover, there is an ongoing discussion of the trade-off between customization, short-term delivery, and working capital as one employee explains:

> “You have a control unit that is manufactured in the same way, so you might be able to stock certain parts to reduce lead time. However, this has other consequences elsewhere, such as becoming too standardized or being unable to provide certain solutions for specific customers.”

Fluctuating Order Stock

Sales with short lead times and the prioritization of flexibility can be identified as two of the factors affecting the fluctuating order stock. This results in difficulties planning for the operational departments, thus resulting in changing delivery dates and difficulties for the market entities communicating a final set delivery date to the end-customer. One employee stated:

> "Our goal is to look at this in the long term, but it is difficult because there is a lot of movement in the short term. It wouldn't surprise me if two projects came in today with deliveries next week that are quite extensive."

Planning Horizon
Another issue raised is the short planning horizon. One can assume that this issue is raised by the fluctuating order stock that is caused by short lead times and late changes in customer orders, caused by the offered flexibility. One employee highlighted here the short planning horizon creates challenges:

> "As it stands now, we are constantly behind; we want to release more material than we have planned for, or we have the wrong material on hand. This presents a significant challenge when we don't know what we will sell in the future."

Although theoretically there is a possibility to work more proactive and understand the future through the order stock and potential offers, the statuses are not updated and therefore not considered within the Planning function, "We only look at those with an 'OK' status and not at those marked as 'Not OK,' which is why it's crucial to have the correct status.". The overview on a longer horizon is highlighted as a potential solution to work more proactive and on a longer horizon "A better overview of the quote backlog is needed, and I believe all functions behind sales are asking for this. What is coming up, not just next week, but over the next six months?". Thus, enabling proactive planning for the operational departments.

The short planning horizon has resulted in the organization working on a day-to-day basis with "firefighting", one employee indicated that there is an operational focus on where the organization struggles with long-term planning, limiting its overall development:

> "What we excel at is perhaps when there is an urgent situation; we are very good at collaborating on the solution. This also indicates that our collaboration might not work as well when things are not out of the ordinary"

The challenge is the fluctuating order stock and short planning horizon caused by sales with short lead times and high flexibility demands, resulting in operational difficulties, changing delivery dates, and a reactive day-to-day approach that limits long-term planning and overall development. This is further exacerbated by poor coordination and communication, where departments fail to share critical information about order changes and priorities in a timely manner. As a result, teams are often unprepared for sudden shifts, leading to surprises and last-minute adjustments that disrupt workflows, hinder effective planning, and create a cascade of operational inefficiencies.

C3: Fluctuating order stock and weak cross-functional coordination hinder proactive planning

5.3 S&OP Tools and Data

Lack of Trust in Data
As mentioned, the Case Company is working in both a CRM and an ERP system. During the interviews, several interviewees expressed challenges regarding trust of the data in the systems. One of the issues mentioned was the synchronization between the two systems. The data from the CRM system needs to accurately be transferred into the ERP system, but also if there are status updates it needs to be updated in both systems. This can lead to information loss during the process and the employees don't know if the data in the system is correct or not. Furthermore, the trust of data in the system is dependent on the fact that all functions perform their tasks correctly and the system makes the calculations on, for example, safety stock level and order batch sizes correct. Currently, there are doubts about whether the data in the system is correct and if it is possible to base all the decisions on the data in the system. Therefore, there is a challenge for the employees to fully trust the data in the systems, and currently it leads to functions making their own fact sources that they trust. These sources are not integrated into the ERP system, meaning that everyone cannot access the information. One interviewee explained:

> "There must not be any other sources of facts besides the master, which should always reside in the ERP system and be visible to everyone simultaneously. If we can get everyone to understand and look there first and work based on that, I believe we will have come a long way in trusting what is in the system."

The consequence of employees not trusting the data in the systems is that decisions are based on different sets of data instead of everyone using the ERP-system as a master source for all decisions made.

Due to occasional inaccuracies in data, employees do not fully trust the information in the CRM and ERP systems. This lack of trust leads to reliance on disparate data sources and inconsistent decision-making. The issue is compounded by challenges such as system miscalculations and employees not consistently updating or accurately entering data.

C4: Lack of trust in data quality and system reliability

5.4 Performance Management

Trade-off Between Delivery Accuracy and Working Capital Binding
The Case Company has overarching goals for all functions within the order-to-delivery process. In addition to these goals, the functions are measured on different

criteria, which in some cases can be conflicting. One example that can be conflicting is that the Sales function is measured on delivery precision, while the operational departments are measured on minimizing working capital binding. One interviewee stated, "Sales want to be able to sell everything and have all the materials available." While the Sales function explains that one of the biggest challenges is getting the systems on time.

> "For example, if a customer is on their way to the port and their system has failed, they can't proceed until it's fixed. We then must either repair the system or provide a completely new one, which means having items on the shelf in the warehouse to deliver the systems."

On the other hand, the operational departments are pushed to minimize working capital binding, and they also mention, "We cannot order too much material because the warehouse would become completely full. We cannot have excessively large safety stocks because there isn't enough physical space.". These two measures create a trade-off and there is a challenge in finding the balance between them. "We need to maintain a balance there. It becomes a major challenge for us to keep inventory value low while always being prepared to deliver on short lead times.". Furthermore, the main goal is invoicing and following the business plan which can lead to taking orders that are very customized and complicated without considering the consequences it will have.

Functions are being measured on different criteria, in addition to misaligned interests. Thus, the organization has functions working towards conflicting milestones.

C5: Different functions within the company work towards conflicting goals

5.5 Strategic Alignment

Misalignment of Forecasts
As mentioned in Chapter 4, the Sales function does a forecast based on market insights and future data, while Procurement bases their purchasing on historical data, focusing on what has been sold during the last twelve months instead of looking into the order pipeline and getting insights from Sales. One employee explained:

> "The problem with the sales forecast is that it's very top-level and high-level. People talk about how many millions we want to sell in this segment, but it's not broken down enough to focus on what's more important further down the chain."

Sales forecasts and targets are always communicated in monetary terms, making it hard for the operational departments to understand what that means for them. During an interview, one employee from one of the operational departments described "We aim to increase sales by a certain percentage, but what exactly does that percentage consist of?". Another employee said:

> "If the sales department has set a target to sell X% more in one segment, we need to increase the Procurement of material by X%, we don't know what to buy more of and it is not that simple to buy X% more of everything."

This becomes a challenge because it creates a misalignment between the different functions. This discrepancy leads to several challenges and issues, such as overstocking or stockouts, and this becomes a significant challenge when introducing new products or phasing out old products. Additionally, relying on historical data for Procurement implies even further issues, especially since the Case Company is in a growth phase. As one interviewee noted, "Procurement primarily looks at historical data, and when a company is growing, this can lead to growing pains, resulting in insufficient safety stock and other issues." and another interviewee mentioned:

> "When looking at the purchasing forecast, the big problem I see with it is that it doesn't work in times when we have sharply increased sales in a certain segment. In those cases, historical data is quite useless, and this has been proven time and time again."

Furthermore, the misalignment creates an inability to align Procurement with Sales' targets and forecasts which can hinder the company's responsiveness to market trends and changes. Different languages are used to communicate between functions, leading poor understanding between the functions. Thus, challenges with coordination in planning create inefficiencies.

C6: Lack of coordination between Sales and Procurement forecasts

5.6 S&OP Culture and Leadership

Information Sharing and Knowledge Gaps
As mentioned before, the Case Company has silo tendencies, the data and information are usually always available, but it is not shared between the functions. This lack of information sharing leads to several events within the organization being perceived as surprises. However, they are not truly surprises because the information is available; it is just not accessible to all functions. One of the main challenges highlighted in several interviews is the need for better coordination between the functions to make better and more informed decisions.

One of the main challenges for the Sales function is the lack of communication from the operational departments. Currently, there is limited information sharing about lead times. Sales can get an approximate lead time for a standard system, but there are no real time updates and information about certain items. The Sales function expressed, "There is a bit more complexity to the standard lead times, and there is no real-time information on how it changes or how to respond to it". When Sales sell a system, there is limited knowledge about the lead time for the sold system or if some items in the sold system are problematic in terms of delivery or any other issues. This becomes a challenge because it is difficult for the Sales function to know when it is possible to promise delivery to the customers. As mentioned in Chapter 4, the Sales function uses a subjective approach in combination with the approximate standard lead times to estimate a delivery date. The lack of information sharing about lead times and problematic items can create false expectations for customers, as the delivery date estimated by the Sales team may not be feasible from the operations side. As one interviewee noted, “This often leads to discussions because a system is sold to the customer with a given lead time, and then, when the order is entered into the system, we are unable to meet what was promised.”.

Another example of an information sharing challenge is faced by the operational departments due to the lack of communication from the Sales function. As mentioned before, the lack of communication leads to misalignment in the forecasts. Sales do not share market insights and future data in a way that operations can use to make better and more informed decisions.

One of the challenges identified through several interviews is the presence of knowledge gaps which is a consequence of limited information. Concerns were raised that different functions within the process may lack understanding of each other’s work tasks, roles and priorities. For example, employees often work with item numbers without fully grasping the context or criticality of the items or understanding the impact of moving orders. As one interviewee noted, “There is very little understanding of this, and it creates a lot of communication issues. You don’t really know what you’re moving or its impact.” This lack of understanding can lead to significant issues and is a result of knowledge gaps between the functions. Moreover, this issue also indicates the fact that there is a lack of visibility into the same data across different units at the Case Company. Currently, there are many communication streams between the functions to access the needed information and data.

Poor information sharing among functions creates significant problems, such as knowledge gaps, misaligned forecasts, and inaccurate lead times. These issues lead to inefficiencies, hinder informed decision-making, and reduce the company’s ability to respond effectively to market changes.

C7: Insufficient information sharing between functions

The challenges are summarized in Table 5.1. Several of these challenges are interconnected, meaning that addressing one can help mitigate several others. Therefore, it is important to consider synergic effects when evaluating suitable mitigating actions. Moreover, during the final evaluation, employees reported that the identified challenges were anticipated and aligned with their prior experiences.

Table 5.1: Overview of Challenges

S&OP Coordination Mechanism	**Identified Challenge**
S&OP Organization	C1: Lack of clarity in responsibilities and decision-making authorities C2: Order prioritization process is unstructured and frequently escalated to the executive team
S&OP Process	C3: Fluctuating order stock and weak cross-functional coordination hinder proactive planning
S&OP Tools & Data	C4: Lack of trust in data quality and system reliability
S&OP Performance Management	C5: Different functions within the company work towards conflicting goals
S&OP Strategic Alignment	C6: Lack of coordination between Sales and Procurement forecasts
S&OP Culture and Leadership	C7: Insufficient information sharing between functions

6

Demand Breakdown Tool

As described in Chapter 5, it was expressed that the organization lacks information on future demand at a granular component level (see C6 in Table 5.1). Thus, Procurement and Production functions lack insights into future demand and are basing decisions on historical information. Hence, the need for a tool translating future sales insights to the operational departments on an item level, as described in the brief, is confirmed by several employees within the company.

The purpose of the Demand Breakdown Tool is to bridge the gap between the Sales and Operations functions, resulting in an item-level understanding of Sales forecast among the Procurement function. The tool can also be expected to kickstart the implementation of a formal S&OP process.

6.1 Evaluation of Output

After the initial draft of the Demand Breakdown Tool was created, a workshop involving key stakeholders was conducted to gather feedback on how to enhance the model. During the session, participants identified a shortcoming that the tool did not sufficiently break down information related to sales categorized as retrofit sales. To make the output more actionable, it was deemed essential to distinguish the type of system each sale referred to and whether the Case Company already had an existing system installed on the object in question.

Moreover, it was suggested that incorporating additional data from the Project and Production functions could expand the tool's usage, particularly by improving resource planning capabilities within these functions. The data mentioned was resource hours per full-time employee planning a system, time in production and details on production flow.

The workshop resulted in broader discussions on potential application areas for the tool. For instance, engage the Sales team in contributing data from the quotation pipeline , which could then be compared to the forecast generated by the Procurement team. This comparison could serve as a foundation for testing the tool during the upcoming S&OP forum. In this context, the tool would help identify gaps between demand and supply, thereby supporting the discussions in the pre-meeting in the monthly S&OP cycle.

6.2 Evaluation of Usage

During the third workshop, the practical usage of the Demand Breakdown Tool was evaluated. Participants emphasized that the tool would primarily serve as a means of comparing sales insights with actual sourcing and capacity planning. The discussion also highlighted the critical importance of high-quality input data. To trust the tool's output, and facilitating a correct demand plan, the organization must ensure the accuracy and reliability of the data being entered. However, it is important to consider that uncertainties in the demand plan persist due to the inherent unpredictability and external factors.

As part of the evaluation, the idea of establishing a recurring monthly meeting was proposed as an hour-long session dedicated to preparing inputs for the tool and developing the demand plan. This could formalize a monthly demand planning meeting within the S&OP cycle. The Demand Breakdown Tool was also viewed as a bridge between demand and supply planning. By using the tool, Project, Planning, Production and Procurement teams can gain a deeper understanding of the demand plan and its implications for their respective functions. However, it was mentioned that Procurement is stuck in their way of working, including the forecast based on historical data, but that manual adjustments based on the comparison can be made.

Additionally, it was noted that to fully realize the benefits of the tool, all business segments in which the Case Company operates must be included. A complete and holistic view of demand is essential to maximize the tool's effectiveness.

7

Discussion

In this section RQ2a and RQ2b will be addressed. In the first part, the effect of implementing an S&OP process and using the Demand Breakdown Tool are discussed in relation to the challenges. The second part addresses the Case Company's current maturity stage and how the identified mitigating actions in Section 7.1 can help them progress to the next maturity stage.

7.1 Mitigating Actions

Challenge 1: Lack of clarity in responsibilities and decision-making authorities

The S&OP organization acts as a critical coordination mechanism for ensuring a successful S&OP process (Tuomikangas and Kaipia, 2014). It is essential for overcoming barriers created by unclear roles and internal organizational culture, both of which hinder effective communication, integration, and collaboration. At the Case Company, areas for responsibility and decision-making authority within the order-to-delivery process are currently perceived as undefined and unclear. This lack of clarity has contributed to information deficiencies and siloed working practices, making cross-functional coordination difficult. This aligns with findings by Danese et al. (2017), who emphasize that low S&OP maturity is often characterized by informal structures and undefined roles, which hinder cross-functional collaboration. Therefore, a key step in the S&OP process implementation is the establishment of a formal S&OP structure with clearly defined roles and responsibilities. A clear definition of S&OP teams and authority areas can enhance the participation of key stakeholders, create common expectations, and enable more straightforward and faster decision-making, ultimately supporting better integration and collaboration across functions.

Regular meetings, which will naturally be established through the monthly S&OP cycle defined by Wallace and Stahl (2008b), also play an important role in addressing these issues. Regular interaction builds trust and fosters confidence among team members, which is critical given that interviews revealed that employees can hesitate to make decisions. This fear can be mitigated through structured monthly meetings, empowering decision-making at lower levels of the organization, and reducing bottlenecks caused by indecision. Furthermore, by systematically discussing gaps between demand and supply during the pre-meeting and specifying which issues require escalation to the executive meeting, a transparent decision making structure is established. This clarity ensures that information flows efficiently across levels, next steps are well defined, and responsibilities are clearly assigned.

However, although an S&OP process can help mitigate challenges, addressing the underlying organizational barriers ahead of an implementation could be crucial for a successful outcome (Grimson and Pyke, 2007). In particular, the cultural changes needed require strong leadership and a formal definition of responsibility areas and decision-making authorities. These efforts are critical to supporting the necessary change management initiatives and fostering the integration and collaboration essential for an effective S&OP process.

Several employees mentioned that the organization is generally open to change but also highlighted the unclear responsibilities. Thus, indicating an awareness of these challenges. This reflects a gap between theoretical best practices and organizational readiness in practice. While the need for an S&OP process may be acknowledged, cultural and structural inertia can hinder this implementation. Additionally, this indicates that reluctance to take ownership of decisions and siloed thinking can be seen as early-stage barriers for an S&OP implementation.

Challenge 2: Order prioritization process is unstructured and frequently escalated to the executive team

The escalation of the prioritization process can be directly linked to the uncertainties of decision-making authorities discussed in challenge 1. Thus, mitigating effects on challenge 1 could have a synergic effect on challenge 2. Furthermore, the establishment of an S&OP process could facilitate a discussion around fluctuations, thereby encouraging more consistent information and knowledge sharing among employees. During the pre-meeting and executive meeting stages, various demand and supply scenarios will be presented and discussed, enabling employees in each function to better understand market shifts and identify which orders should be prioritized. This shared understanding is expected to reduce the need for escalation to senior management.

While the process initially supports short-term order prioritization by improving information flow, the long-term objective is to eliminate the need for prioritization. By aligning demand and supply planning and integrating strategic and operational goals, the S&OP process aims to establish a more proactive and balanced planning environment, ultimately phasing out the prioritization process.

However, it is essential to consider the business context and how the different types of sales influence the occurrence of prioritization. For example, retrofit sales often arise with short lead times, impacting the order-to-delivery process and highlighting the need to plan for such cases to avoid material shortages and situations that would otherwise necessitate prioritization. One of the identified possibilities of the Demand Breakdown Tool is its potential to enable a more proactive planning approach. By improving understanding of the required resources, both in terms of material items and capacity, the tool supports forward-looking planning. It enables operational departments and project teams to anticipate changes in orders, fostering greater preparedness and reducing the likelihood of last-minute prioritization. As a result, the need for a reactive prioritization process may diminish over time.

The increased transparency and cross-functional alignment created by the S&OP process and Demand Breakdown Tool can equip lower-level employees with the needed information to make more informed prioritization decisions.

Challenge 3: Fluctuating order stock and weak cross-functional coordination hinder proactive planning
The challenge of a fluctuating order stock, driven by the retrofit sales with short lead times and the flexibility offered in all types of sales, results in a short planning horizon for the Case Company. Hence, they are facing significant operational inefficiencies, which are shown in last-minute delivery changes, a reactive work approach, and poor preparedness for order shifts. This reactive way of working is further intensified by weak cross-functional coordination, where critical information related to order priorities and changes is not shared in time. This results in unexpected disruptions and fragmented workflows. Moreover, during the interviews, it was mentioned that all types of sales go through the same process flow in the order-to-delivery process, despite significantly different lead times. Hence, one could speculate if the operational inefficiencies could decrease with two different process flows, focusing on the different types of sales, and thus making the incoming orders easier to plan for. In this way, the discussed contextual challenges could be planned for, and challenge 3 could be mitigated.

While the literature often presents S&OP as a structured, medium-term planning process designed to balance supply and demand (Wallace and Stahl, 2008b; Thomé et al., 2012a), it does not fully address markets with high variability and short lead-times. Indicating that there are potential limitations of a one-size-fits-all S&OP model and support the argument by Kristensen and Jonsson (2017) that S&OP processes should be tailored to the specific business environment. Implementing a tailored S&OP process for the Case Company could present a structured mechanism to mitigate these issues. Since a one-size-fits-all S&OP process is insufficient in dynamic and complex environments, a context-specific approach is required. The Case Company context, with fluctuating demand and high supply chain complexity, requires a more integrated, centralized, and dynamic S&OP structure to support frequent information exchange and alignment across functions. Moreover, regular meetings, such as the pre-meeting and the executive meeting, enable collaboration between functions. By institutionalizing the S&OP process in the day-to-day work, the organization can shift from reactive firefighting to more proactive and coordinated planning. Thus, the workflow stability can increase while reducing operational inefficiencies caused by constant last-minute adjustments.

The Demand Breakdown Tool can be used to create an insight into future demand on an item level and resource level in terms of quantity, production line, and hours needed. Thus, increasing the transparency for the operational functions and planning. Through item-level and resource-capacity visibility, the tool enables operational teams to understand which products and resources will be affected by incoming orders. This visibility is critical for planning and allows teams to prepare for high-flexibility, short-lead-time sales before they impact production. Moreover, if the organization can distinguish between the retrofit sales, newbuild sales, and sales of spares, it can allocate resources accordingly. Thus, preventing bottlenecks and reducing the need for urgent reprioritization. The shared visibility reduces surprises and enables smoother handovers between departments. By focusing on creating transparency and collaboration through an S&OP process, the organization can shift from reactive to proactive operations, thus improving resilience and mitigating the challenge.

Challenge 4: Lack of trust in data quality and system reliability
Currently, the Case Company is basing some decisions on different data sets due to a lack of trust in the data, resulting in inconsistent decision making. By implementing an S&OP process, the monthly cycle, including all five steps of the process, the Case Company will be able to coordinate the data from all functions into one joint plan. For the Case Company to make efficient and correct decisions, the data needs to be updated frequently, and by implementing this S&OP process, the data will be updated at least once a month.

The different functions in the order-to-delivery process at the Case Company need to be coordinated and use a unified approach to handle data to create greater trust. During the pre-meeting, cross-functional decisions will be made based on the data inputs from different functions. These decisions will then be used to update the joint plan accordingly and everyone is aware of the plans. Furthermore, this approach aligns with the S&OP tools and data coordination mechanisms, ensuring that all functions are coordinated with a common set of data and a unified approach to data validation and interpretation.

Furthermore, the demand plan can be used as input to the Demand Breakdown Tool, and its output can be compared with the actual procurement forecast to identify and address potential gaps. This will increase the understanding of the demand plan across Project, Planning, Production and Procurement, clarifying its implications for each function. As a result, this can create better trust between functions through improved transparency and shared understanding. Additionally, it is important for the Case Company to establish a structured process for developing the demand plan; otherwise, the output of the model cannot be trusted. During a workshop, it was discussed that monthly meetings should be held to ensure the demand plan is of high quality. A high-quality demand plan will not only build greater trust in the plan itself but also in the model's output.

Implementing an S&OP process and using the Demand Breakdown Tool will mitigate the challenge by creating a more collaborative culture where knowledge and information is shared between functions. This leads to a better understanding of the existing data and no need for creating separate files to make decisions. Furthermore, it will work away from a silo culture with separate plans, towards a more collaborative culture with a shared plan, fostering bigger trust between the functions as they work more closely together. Even though an S&OP process can help mitigate this challenge, the data still needs to be accurate from the start in all functions for the S&OP process to be useful. If the data gathered from one function is not accurate and when the joint plan is created, wrong decisions are taken. And as more advanced the S&OP process becomes the more important in the data quality.

Additionally, there are some challenges with the calculations and reliability within the system and an S&OP process or parts of it will not be able to solve this issue since there are problems with the systems. Accurate systems are a prerequisite for getting the right and quality data, and as mentioned before the data input into the S&OP process is crucial for making it useful so the systems need to be correct to be able to make use of it in the S&OP process.

Although research shows that effective S&OP relies on high-quality, shared data, and that data systems can be reliable when inputs are accurate and consistent (Tuomikangas & Kaipia; Lapide, 2004). This study points to another potential issue: trust in data is shaped not just by technical factors, but also by behavior and culture. So, improving S&OP data quality means focusing not only on systems and accuracy, but also on governance and user trust.

Challenge 5: Different functions within the company work towards conflicting goals

A siloed mindset can lead to different initiatives among different functions, thus conflicting goals can arise. Conflicts can arise due to lack of coordination or insufficient understanding between functions. Although the Case Company has established strategic business objectives that are communicated across all functions and then translated into function-specific operational goals, there is still an identified conflicting goal. The conflicting goal is delivery accuracy versus working capital binding. This showcases a classic example of poor strategic alignment, a key coordination mechanism in S&OP (Tuomikangas and Kaipia, 2014). The literature emphasizes that effective S&OP should not only align strategic goals with operational plans but also promote shared accountability across functions (Oliva and Watson, 2011). However, this challenge shows that misaligned KPIs can persist even when strategic goals are communicated. This suggests that alignment requires more than just communication, it requires integrated planning and shared accountability.

An S&OP process can enhance the coordination between the functions by sharing information between the functions. For example, it is important for the Operational functions to understand which items must always be available on the shelves. At the same time, the Sales function needs to understand that rare products might have longer lead times, as it is not feasible to have everything on the shelves. These functions need to be coordinated and agree on certain things, for example Sales should inform Operations of what items might need an increase in inventory because of some market trends. Simultaneously, Operations should notify Sales of any delivery issues regarding specific items. This allows the Sales function to prepare and inform customers accurately about delivery dates from the start. An S&OP process can foster this understanding by sharing data and insights and all these types of conversations are relevant to include in the pre-meeting of the S&OP process. By increasing the transparency and understanding that comes from having cross-functional meetings as in an S&OP process the trade-off between delivery accuracy and working capital binding can be minimized.

Furthermore, the Demand Breakdown Tool can also play a role in mitigating this challenge by creating an understanding of future needs. It can prepare the Procurement on what items that will be needed, but also for Planning to understand the production capacity needed, and Project understand the engineering hours required to be able to plan if additional resources are needed. When this understanding is created, working capital binding might decrease since the right items are on the shelves at the right time, resulting in higher delivery accuracy.

Challenge 6: Lack of coordination between Sales and Procurement forecasts

Different functions can have different views on the forecast, thus using the same language is important, enabling all participants to understand and use the information. By involving all functions in the process, the Case Company can ensure that everyone is committed and understands their part in achieving the overall company goal. Moreover, using the Demand Breakdown Tool and having a collective view can improve the ability to meet customer demand, hence overall business performance can increase.

The Demand Breakdown Tool can contribute to overcoming the identified coordination barrier by centralizing demand information in a format that is accessible and interpretable across functions. Furthermore, the tool is designed to address the misalignment between Sales and Procurement forecasts. By using the Sales' forecast as input, the tool generates the material demand required by Procurement. This approach bridges the gap between the two functions, ensuring that they work with the same data and towards the same goals. However, this requires the demand plan to be aligned with item lead time to ensure Procurement can purchase items on time.

There is potential for improving the Case Company's current procurement forecasting method, which is currently based on historical data. Given that the Case Company is in a growth phase, relying solely on historical data can hinder scalability and may also lead to miscalculations due to changing market trends and the phasing in and out of products. Instead, using future insights from Sales and leveraging the Demand Breakdown Tool to determine material needs could provide a more accurate and effective way of understanding Procurement requirements.

Additionally, several employees identified the lack of coordination in the forecasts as a major barrier to implementing an S&OP process. This suggests that misalignment in language and terminology is a critical issue that must be addressed early on. As identified and tested within the Case Company, this research finds that it is necessary to focus on creating an understanding with a fundamental excel based solution and put greater emphasis on IT support in the initial phases of S&OP. Thus, being contradictory to the suggestions in the current literature.

Challenge 7: Insufficient information sharing between functions
The issue of insufficient information sharing and knowledge gaps is a recurring theme that has been addressed through several of the initiatives discussed in Challenges 1 through 6. As discussed earlier, implementing an S&OP process can be helpful in mitigating the challenge of insufficient information sharing and knowledge gaps. The S&OP process enhances communication and collaboration across all functions, ensuring information sharing. An S&OP process involves regular meetings where representatives from Sales, Operations, Finance, and other departments gather to review and discuss, for example, forecasts, lead times, potential shortages, and market insights. These regular meetings foster a culture of transparency and ensure that all functions are aligned with the latest information. By having these cross-functional meetings, the organization can ensure that Sales teams are aware of real-time updates on lead times and any potential issues with specific items, reducing the likelihood of promising the customers something that is impossible to achieve.

Furthermore, an S&OP process also has the potential to help employees better understand the importance and context of the items and orders they are handling, as discussion during the meetings can effectively bridge the existing knowledge gaps. In addition to meetings, information can be shared through the ERP system. For instance, delivery precision is especially critical for retrofit orders, as the system must be delivered within a specific timeframe. By adding an indication in the system that a particular order is a retrofit with a specific delivery window, other functions can better understand which orders can be moved and which cannot. This type of visibility can also create synergies with challenge 2 by making it easier to prioritize orders, clearly highlighting which orders are critical due to the dry dock scheduling.

The findings of the mitigating mechanisms for each challenge are summarized in Table 7.1.

Table 7.1: Mitigating Mechanisms

Challenges	Identified mechanisms
C1: Lack of clarity in responsibilities and decision-making authorities	Establish a formal S&OP structure with clearly defined roles and responsibilities Regular monthly meetings to build trust and empower lower-level decision-making Monthly cycle of S&OP meetings to enable a transparent decision making structure Executive participation
C2: Order prioritization process is unstructured and frequently escalated to the executive team	Use regular S&OP meetings to discuss demand/supply scenarios Foster shared understanding to reduce need for escalation Demand Breakdown Tool to support forward planning and reduce last-minute prioritization
C3: Fluctuating order stock and weak cross-functional coordination hinder proactive planning	Tailored S&OP process adapted to context complexity Regular S&OP meetings for scenario planning and structured communication Demand Breakdown Tool for item- and resource-level demand visibility Segmentation of sales types to improve planning accuracy
C4: Lack of trust in data quality and system reliability	S&OP process ensures data consolidation and updates via a unified plan Demand Breakdown Tool helps create data transparency and reduces siloed data use Accurate input data is required

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Challenges	Identified mechanisms
C5: Different functions within the company work towards conflicting goals	Cross-functional meetings enable discussions around trade-offs Improved understanding of mutual constraints Demand Breakdown Tool enables better planning and inventory optimization
C6: Lack of coordination between Sales and Procurement forecasts	Demand Breakdown Tool translates Sales forecasts into material demand for Procurement Ensure demand plan horizon matches lead times to improve procurement accuracy
C7: Insufficient information sharing between functions	Regular cross-functional S&OP meetings foster transparency Shared discussion on forecasts, lead times, shortages, and market insights S&OP process creates a platform for bridging knowledge gaps

7.2 Maturity Model

To understand how the identified mechanisms discussed in Chapter 7.1 can help the Case Company to become more mature and how to evolve in their S&OP implementation journey. Thus, improving their cross-functional coordination, a maturity model has been applied and discussed.

Meeting and Collaboration
Currently, the Case Company exhibits characteristics consistent with Stage 1 of the S&OP maturity model presented in Section 2.3, particularly, they showcase a siloed organizational culture with minimal cross-functional collaboration. The limited communication and collaboration between Sales and the Operations functions tends to occur reactively and is triggered by urgent planning needs. Frequent replanning activities and a strong focus on revenue or financial metrics further confirm Stage 1. However, the S&OP forum occurs monthly and involves senior management to some extent, suggesting some progress towards Stage 2.

By focusing on the mechanisms outlined in Section 7.1, the Case Company can progress towards Stage 3 maturity. Institutionalizing structured monthly S&OP meetings, with active cross-functional participation will foster proactive collaboration, scenario planning, and integrated decision making. Moreover, leveraging the Demand Breakdown Tool in combination with a fully implemented S&OP process can enhance transparency, facilitate joint planning, and support data-driven decisions. However, reaching this level of maturity will require significant resource commitment and a cultural shift toward collaborative planning.

Organization
At the current state, the S&OP implementation at the Case Company is being driven by the Vice President of Operations, which shows progress toward establishing a clear ownership of the S&OP process and thus is an indication of Stage 3 maturity. However, due to the absence of clearly defined roles and responsibilities, and the fact that the demand and supply plans are still developed separately, the company currently aligns more closely with Stage 2.

By establishing a structured monthly S&OP meeting cycle, responsibilities can be clearly defined, and participants will be better prepared ahead of the executive meetings. This structure enables the formation of formal S&OP teams and ensures consistent executive involvement, both of which are key for progressing toward maturity stages 3 and 4. Additionally, the process promotes thorough preparation, leading to more effective meetings and stronger senior management engagement.

Measurements
The Case company has measures within different functions, and all interviewees highlighted invoicing as one of the key metrics, along with other function-specific measures. Due to limited integration between functions and the absence of a formal S&OP process, and thus no S&OP metrics, the Case Company is placed in Stage 1.

Since there is no formal S&OP process in place, the absence of S&OP measures have not been identified as a challenge in the current order-to-delivery process. Even after implementing the proposed mechanisms, the maturity level will remain at Stage 1 due to the lack of defined S&OP measures.

However, it is important when implementing the S&OP process, including all different mechanisms, to introduce key S&OP metrics such as how well operations meet the sales plan and how accurate sales are on forecast to assess performance. Measurements are needed both during the implementation phase and for continuous improvement. Furthermore, the metrics must be adapted to the specific context, to ensure they are relevant and unlock the potential of the S&OP process.

Information Technology
Currently, information and data are managed in multiple spreadsheets across the organization with limited consolidation. Some consolidation with insights from different functions has recently started for S&OP forum meetings, but the process is still very manual and not well coordinated. Therefore, the company is considered to be at Stage 1.

By implementing the previously presented mechanisms regarding information technology, the Case Company can reach a higher stage in maturity model. Although data is still spread across many spreadsheets, a formal S&OP process will enable spreadsheets to be shared between functions. The Demand Breakdown Tool can be used to bridge the gap between the demand and supply plan so the evaluation and comparison will be easier. However, since the consolidation will still be manual, the company will only have the potential to reach Stage 2 in maturity. The tool is a basic and fundamental Excel-based solution that supports the implementation of the S&OP process by helping establish a shared understanding across the organization, without the need for advanced software. To further advance in maturity, the company will need to adopt software that can integrate and centralize the various plans more effectively.

S&OP Plan Integration

Since Procurement currently bases its forecasts on historical data rather than the Sales forecast, and Operations primarily focus on fulfilling incoming orders, integration between functions is limited. The Case Company has initiated S&OP forum meetings, which indicates the beginning of some cross-functional integration. Despite these meetings, the process is still in the early stages of implementation, which places the company in Stage 1.

By implementing an S&OP process and using the Demand Breakdown Tool, the integration between functions will improve. The tool supports the alignment of functional plans by taking the Sales forecast as input and comparing it to the actual procurement plan and capacity planning in both Production and Projects. This allows the Sales forecast to influence operational planning, creating one-way integration from Sales to Operations. By analyzing the output of the tool against current procurement and capacity plans, the company can identify discrepancies and make necessary adjustments, leading to better cross-functional alignment.

The use of the Demand Breakdown Tool, particularly the ability to incorporate capacity utilization into the planning process, demonstrates that the Case Company has the potential to progress beyond Stage 2. Furthermore, the planning process does not appear to follow a strictly uniform approach, as input into the plans can come from multiple levels and functions. This indicates the Case Company can reach between Stage 2 and Stage 3 in the maturity model, with the potential to progress further as the S&OP process develops.

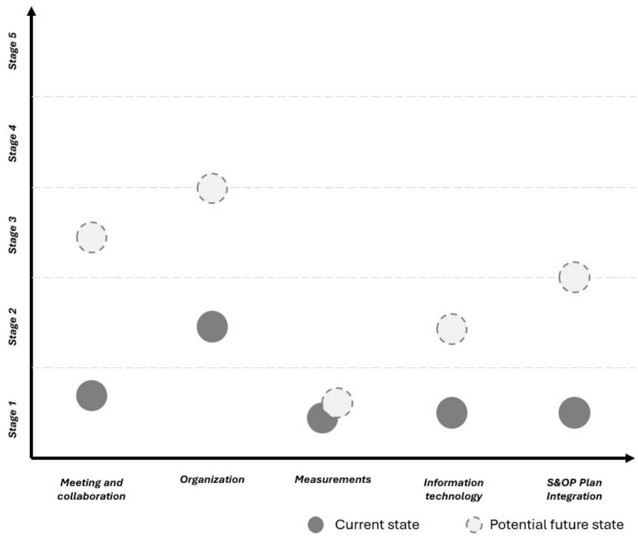

Figure 7.1: Current maturity stage and potential future state

Figure 7.1 illustrates the Case Company's current and potential future maturity levels across each dimension. The company currently demonstrates higher maturity in the organization dimension, mainly due to the establishment of the S&OP forum with an S&OP implementation leader. With the implementation of the mechanisms outlined in Section 7.1., the company is expected to advance to Stage 2 and potentially progress towards Stage 3 in all dimensions, except for the measurement dimension. Therefore, focused efforts on developing performance measurement practices will be essential for the Case Company to fully advance in its S&OP journey.

8
Conclusion

This report examined coordination challenges in the order-to-delivery process of a system providing company in the marine market. It evaluated how the implementation of an S&OP process, supported by a Demand Breakdown Tool, could address these challenges. The study provides insights into both organizational and technical barriers to successful S&OP adoption, as well as opportunities for tailored improvements.

The challenges identified are unclear responsibilities and decision-making authorities, frequent executive escalations for prioritization, limited collaboration in short-term market changes, lack of trust in data, conflicting goals, misalignment in forecasts, and insufficient information sharing between functions. These challenges were noted as expected and familiar by employees at the Case Company during a final evaluation. Some challenges are interrelated, so addressing one may create synergies that help mitigate others.

The findings suggest that the S&OP process holds strong potential to improve cross-functional alignment, support proactive decision-making, and increase transparency. Key enablers identified include establishing dedicated S&OP teams, the facilitation of regular cross-functional meetings with executive involvement, and the adaptation of the process to the organization's specific context. However, the study also reveals that cultural and structural inertia can hinder implementation, even in organizations that express openness to change. The Demand Breakdown Tool supports S&OP by translating high-level sales input into detailed operational data. It improves planning by visualizing demand, offering granular insights, serving as a shared reference across functions, and enhancing procurement timing. However, its effectiveness depends on the quality and consistency of input data, as well as users' trust in the information. When used effectively, the tool lays the foundation for a more mature and integrated S&OP process, helping the company better respond to complex customer demands.

Moreover, while the organization has taken promising initial steps, particularly through the establishment of S&OP forums and the development of the Demand Breakdown Tool, several dimensions remain in the early stages of maturity. The analysis shows that by implementing the mechanisms identified in this study, the Case Company can move toward a more integrated, collaborative, and data-driven planning process. However, more focus should be given to developing relevant S&OP metrics to close the gap in the measurement dimension. This will be crucial for driving continuous improvement and ensuring long-term success in the company's S&OP journey.

While the study is context-specific, many of the observed challenges, such as siloed communication, misaligned KPIs, and disconnected forecasts, can be assumed as common across industries. The Demand Breakdown Tool, though tailored to this company, offers a replicable approach for other organizations that need to align strategic sales forecasts with operational planning. By adjusting the tool to their specific data and planning needs, companies in similar environments may improve coordination, transparency, and responsiveness.

Implications for Theory and Practice
This study contributes to the S&OP literature by emphasizing the importance of cultural and behavioral factors, such as trust, ownership, and organizational inertia, in enabling effective planning. While existing research acknowledges the soft side of S&OP, this study further indicates the importance of focusing on a supportive organizational culture to enable change management efforts.

From a practical perspective, the study demonstrates that a simple Excel-based planning tool can be effective in the early stages of S&OP implementation. Moreover, inconsistent forecasts and terminology can be seen as barriers to S&OP implementation. Addressing these issues early can help build a stronger foundation for S&OP success. Ultimately, this study underscores that technical systems, cultural readiness, and collaborative mindsets must all work together to enable a successful and sustainable S&OP process.

Limitations and Future Research
This study was limited to a single company operating in the marine segment. While many findings provide valuable insights across various industries and organizational contexts, some may not be directly generalizable to all settings. Further research could explore S&OP implementation in other marine system providers or in companies with similar hybrid production environments to validate and expand on these findings. Additional research should also explore how to tailor S&OP processes for hybrid environments that combine long and short lead times and how to design S&OP processes that can effectively manage both stable and highly variable demand within the same organization. Comparative studies may help identify broader patterns and best practices.

To further improve the tool, continuous updates are needed to reflect changes in product configurations. Over time, migrating the tool to a more advanced platform such as Power BI could improve scalability, usability, and data visualization, supporting broader adoption and integration across the organization.

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A

Appendices

A.1 Overivew of Demand Breakdown Tool

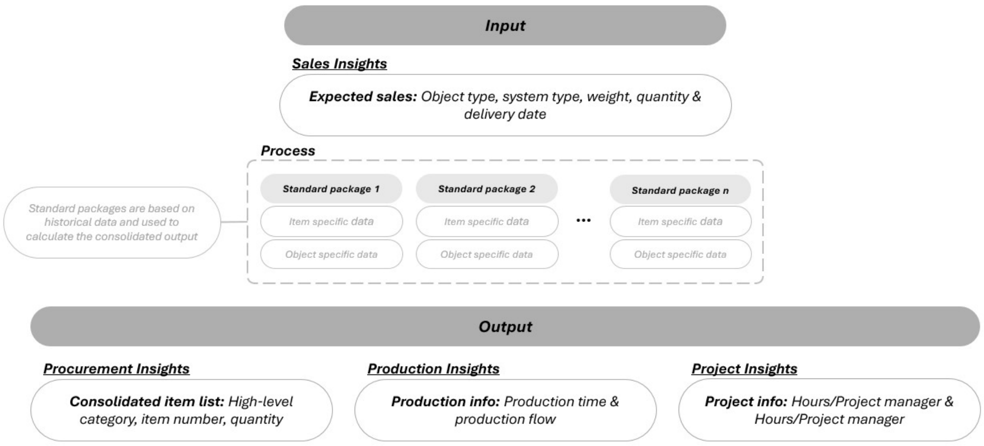

Figure A.1: Overview of Demand Breakdown Tool

A.2 Interview guide Operations

(Operations changed to the different functions)

Introduction

- Can you tell me about your role and background here at the Case Company?
- Where do you work within the order-to-delivery process?
- Who do you work with on a daily basis? (Who is part of your team?)

Order-to-Delivery Process

- How would you describe the order-to-delivery process from an operations perspective?
- Which systems are used?
- Which functions do you collaborate with the most in your work?
- How is communication conducted?
- How are your plans communicated, and how are they connected with other functions?

Goals

- What goals are you working toward, and how does your function contribute to reaching them?
- For example, during your weekly meetings, what indicators show that you have succeeded in reaching your goals?
- What shared goals are you working toward together with other functions in the process?
- Would you describe your function as more focused on long-term strategy or day-to-day operations? Why?
- Does your function prioritize efficiency (cost reduction, standardization, process optimization) or flexibility (adaptability, quick response, agility)? Why?

Challenges in the Process
General

- What are the biggest challenges in the order-to-delivery process from an operations perspective?
- Where do problems most often occur in the process? What causes these problems? How does your team handle unexpected changes in demand, delivery disruptions, or market shifts?

Collaboration and Communication

- How is the collaboration between your function and others?
- What kind of information from other functions would make your work easier? What other challenges do you see in collaboration and communication between different functions?

Forecast

- We understand that Sales creates one type of forecast to set their targets, while Procurement creates a forecast based on historical data. What challenges do you see related to this?

Decision-Making

- Are there situations where it's unclear who makes the decisions? What information is most important for making good decisions?

Improvement Opportunities and Future Needs

- Have any initiatives been implemented to improve the process in the past? Were they successful? Why or why not?
- What do you think is required for improvement initiatives to be successful? What changes would make the process more efficient?

S&OP Forum

- What is the purpose of the S&OP forum?
- What do you think Operations can gain from those meetings?

A.3 Interview guide Sales & Commercial

Introduction

- Can you tell me about your role and background here at the Case Company?
- Where do you work within the order-to-delivery process?
- Who do you work with on a daily basis? (Who is part of your team?)

Order-to-Delivery Process

- How would you describe the order-to-delivery process from a Sales/Commercial perspective?
- Which systems are used?
- Which functions do you collaborate with the most in your work?
- How is communication conducted?
- How are your plans communicated, and how are they connected with other functions?

Goals

- What goals are you working toward, and how does your function contribute to reaching them?
- For example, during your weekly meetings, what indicators show that you have succeeded in reaching your goals?
- What shared goals are you working toward together with other functions in the process?
- Would you describe your function as more focused on long-term strategy or day-to-day operations? Why?
- Does your function prioritize efficiency (cost reduction, standardization, process optimization) or flexibility (adaptability, quick response, agility)? Why?

Sales Forecast/Target

- Can you describe the process for creating your forecast that leads to your targets? / What factors do you base your forecast on?
- What is the time horizon for your forecast?
- How often are forecasts generated and updated?
- What tools do you use – spreadsheets or more advanced software? Do you involve your customers in the process?

Challenges in the Process

General

- What are the biggest challenges in the order-to-delivery process from a sales/-commercial perspective?
- Where do problems most often occur in the process? What causes these problems? How does your team handle unexpected changes in demand, delivery disruptions, or market shifts?

Collaboration and Communication

- How is the collaboration between your function and others?
- What kind of information from other functions would make your work easier? What other challenges do you see in collaboration and communication between different functions?

Forecast

- We understand that Sales creates one type of forecast to set their targets, while Procurement creates a forecast based on historical data. What challenges do you see related to this?

Decision-Making

- Are there situations where it's unclear who makes the decisions? What information is most important for making good decisions?

Improvement Opportunities and Future Needs

- Have any initiatives been implemented to improve the process in the past? Were they successful? Why or why not?
- What do you think is required for improvement initiatives to be successful? What changes would make the process more efficient?

S&OP Forum

- What is the purpose of the S&OP forum?
- What do you think sales/commercial can gain from those meetings?

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