ASSESSING SKF'S S&OP PROCESS: A CROSS-CASE ANALYSIS

Master's thesis in Supply Chain Management

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Adrian Bergström
Hannes Gustafsson
Gothenburg, June 2024

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Abstract

The globalization of trade has significantly increased the complexity and vulnerability of supply chains. Major events like the COVID-19 pandemic, the Suez Canal blockage, and the Red Sea crisis have caused significant disruptions, highlighting the critical need for a robust Sales and Operations Planning (S&OP) process. To manage these risks effectively, companies must adopt a proactive approach to risk assessment and continuously evaluate and refine their S&OP process. This iterative approach ensures that the process remains effective and adaptable to changing conditions.

The aim of this master's thesis is to identify weaknesses and obstacles within SKF's S&OP process by evaluating it with a maturity model. The maturity model also evaluates the S&OP processes of other organizations similar to SKF. A quantitative study was conducted, incorporating interviews, documentation, and a workshop. A cross-case study was also conducted to compare other companies' S&OP processes and identify key similarities and differences with SKF's S&OP process. Interviews and documentation formed the basis of the cross-case analysis, which was followed by a workshop. In the workshop, companies such as Alfa Laval, Getinge, Husqvarna, and Sandvik participated in open discussions about S&OP.

In conclusion, SKF can improve their S&OP process by involving executive management and holding both pre-executive S&OP and executive S&OP meetings to assess and translate operational impacts into strategic actions. Appointing a process owner for coordination and implementing a planning hierarchy will ensure alignment between strategic goals and operational performance, fostering better company-wide coordination and decision-making.

Keywords: Sales and Operations Planning, cross-case analysis, strategic alignment, planning levels.

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1. Introduction

The introduction aims to provide the reader with fundamental information regarding the scope of the thesis project. Thus, the following section includes information concerning the background and aim of the project. Finally, the reader is also given an introduction of the case company, as well as information regarding conducted delimitations.

1.1 Background

According to Mentzer et al. (2001), a clear distinction can be made between the terms *supply chain* and *supply chain management*. While the former simply refers to the existence of a network of interconnected entities, the latter requires active effort from management of affiliated organizations in order to be effectively orchestrated. Furthermore, Van Weele and Rozemeijer (2022) describe supply chain management as the process of planning, designing, controlling, and optimizing the flow of goods, services, information, and finances across the entire supply chain, from suppliers of raw materials to end customers. This description supports the assertion by Mentzer et al. (2001) that without such management efforts, the coordination of supply chains would cease to function.

Regarding the main objectives supply chain management, Jonsson and Mattsson (2023) have identified a number of targets, such as reducing inefficiencies, minimizing costs, improving customer service, and creating competitive advantages. Furthermore, Jonsson and Mattsson (2023) also explain how companies, by effectively managing the supply chain, can ensure that the right products are available at the right time and in the correct quantities. According to Wagner et al. (2014), achieving this is of great importance for product-based firms; however, it requires continuous and balanced matching between product supply and demand. *Sales and operations planning*, hence referred to as S&OP, is a process that allows organizations to accomplish such a balance by linking strategic corporate plans to daily operational plans, thereby reaching a consensus and promoting cross-functionality instead of allowing separate business units to work in isolation (Grimson & Pyke, 2007). This view of S&OP is shared by, among others, Ross (2015) they describe the S&OP process as a tactical process with the primary objective of aligning various business functions such as sales, marketing, and finance to establish a coordinated plan that meets customer demand while optimizing resource usage and minimizing costs. Furthermore, the S&OP process is complex and, if designed appropriately, highly characterized, building upon several parameters and elements. Therefore, the configuration of S&OP processes among different companies seldom looks similar. According to Dittfeld et al. (2021), the customization of parameters such as planning horizon, frequency, and granularity is highly dependent on context and factors such as product complexity, supply uncertainty, and product portfolio stability. In other

words, as the contexts in which companies operate differ, it is reasonable that their business processes differ as well. As an example, Dittfeld et al. (2021) explain how, in times of volatility, the S&OP process can be adapted as a risk management tool by introducing what is referred to as the mini S&OP, among other strategies. This involves altering the S&OP process for a limited time to address specific issues, such as demand fluctuations. Similarities can be drawn between the mini S&OP process and the process of sales and operations execution, hence referred to as S&OE, which, according to Jonsson and Mattsson (2009), focuses on the short-term operational aspects of planning and execution, with a planning horizon ranging from a few weeks to a couple of months.

In recent times, largely due to the globalization of trade, supply chains have become increasingly difficult to manage due to their broadening scope and increasing vulnerability to disruptions (Lara & Wassick, 2023). Events such as the COVID-19 pandemic, the blockage of the Suez Canal, as well as the more recent Red Sea crisis, have caused major disruptions, thereby reinforcing the importance of having an S&OP process in place. Furthermore, as discussed later in the report, Dittfeld et al. (2021) highlight that more recent management-oriented maturity models advocate for a proactive approach to risk assessment, rather than a reactive one. With recent disruptions in mind, as well as the market fluctuations they have caused, organizations should revise their current S&OP processes to ascertain their functionality. Risk mitigation, however, is only one reason why it is important for companies to reassess their S&OP processes. Grimson and Pyke (2007) describe how, when implementing an S&OP process, one important step is to measure the results and the effectiveness of the S&OP process. The S&OP process is iterative and recurring, highlighting the importance of evaluating its results and adapting it in any way deemed necessary. Thus, it is always important for organizations to reevaluate their S&OP processes, aiming to bridge any potential gaps or simply strengthen their performance.

Subsequently, the purpose of this master's thesis, conducted in collaboration with a case company, is to provide the company with information on how to improve its current S&OP process.

1.2 Case Company

Aktiebolaget Svenska Kullagerfabriken, nowadays known as *SKF*, was founded on the 16th of February back in 1907 by its first Managing Director, Sven Wingquist. The founder was an inspiring inventor, and it was his invention of the double-row self-aligning ball bearing that signaled the beginning of what we know today as SKF, a world-leading manufacturer and distributor of innovative solutions.

SKF operates in multiple sectors such as automotive, industrial, and aerospace, contributing significantly to the development and efficiency of rotating equipment. Today, SKF is a world leader in the bearings market, competing alongside other major international suppliers such as Schaeffler Group, Timken, NSK, NTN, and

JTEKT. Together, these top six bearing manufacturers, including SKF, are estimated to account for approximately 55% of the total global market for rolling bearings. The company is present in 129 countries, has around 42,000 employees, serves approximately 40 industries, and has around 17,000 distributors worldwide (SKF Group, 2024).

The company's long-term goals for 2030 are centered around financial growth, operational efficiency, and environmental sustainability, aiming for a 14% operating margin and 5% revenue growth annually. SKF's financial strategy is to maintain a net debt-to-equity ratio below 40%, target a 16% return on employed capital, and commit to a 50% dividend payout. Demonstrating its commitment to environmental responsibility, SKF strives to achieve net-zero emissions, underscoring the importance of 'intelligent' and 'clean' operations. 'Intelligent' operations refer to providing customers with connected, customized solutions and leveraging technology to boost efficiency. 'Clean' signifies SKF's dedication to sustainable industry practices and transparent, responsible conduct. To leverage growth opportunities, SKF focuses on technology development, digitizing the value chain, investing in automation and regionalization, and enhancing its organizational structure and leadership. Furthermore, SKF targets segments with high-growth potential, updates its product portfolio, and develops offerings for emerging industries (SKF Group, 2024).

Over the years, SKF has established itself as a world- and market-leading company, operating in several markets including the aviation, food, and wind energy sectors, among others. As a result, SKF finds itself in several networks that have become increasingly complex over the years, thus requiring rigorous management. Finally, SKF currently employs two similar S&OP processes, divided based on business areas: one for *automotive, seals, and aerospace* and one for the *industrial market*. Since these two S&OP processes encompass the entirety of SKF's global footprint, the research will not be limited to SKF's operations in Sweden but rather will encompass SKF on a global level.

1.3 Aim and Research Questions

As mentioned briefly in the background, the aim of this master's thesis is to identify weaknesses and obstacles within SKF's S&OP process and, by evaluating the S&OP processes of other organizations similar to SKF, determine how SKF could proceed to bridge any potential gaps. To further and in greater detail, outline the scope of the master's thesis, the following research questions (RQs) are to be answered (see Table 1.1).

Table 1.1: List of research questions.

	Research questions
RQ1.	What are the primary weaknesses of SKF's S&OP process, and what are the key challenges hindering its enhancement?
RQ2.	What are the key similarities and differences between SKF's S&OP process and those of similar organizations?
RQ3.	How can SKF leverage these similarities and differences to enhance their S&OP process?

1.4 Delimitations

With regards to conducted delimitations, one major restriction imposed concerns the number of organizations whose S&OP processes are to be compared and evaluated. To formulate research-based resolutions, and ultimately provide SKF with a credible recommendation, it is important that the sample size of organizations is of sufficient magnitude. However, as it is presumably quite complicated and time-consuming to gain an understanding of a company's S&OP process at an advanced enough level for it to add value to the research, only a limited number of organizations can partake. Thus, the scope of the thesis is limited to five companies, including SKF, with similar characteristics. As SKF plays a central role in the design of this master's thesis, other firms should also be global actors active in the business-to-business (B2B) sector, and have a product complexity similar to that of SKF's.

Furthermore, as mentioned previously, SKF currently operates two separate S&OP processes: one for the automotive, seals, and aerospace sector and one for the industrial market (IM). Although these processes are fairly similar, in order to narrow the scope of the project, this study will focus exclusively on the S&OP process pertaining to the IM. The rationale behind this decision is that the IM not only accounts for a larger portion of SKF's turnover but is also more complex, as SKF serves as a supplier to several customer groups across various industries and countries.

2. Methodology

The following chapter introduces the methodology used throughout the process of this master's thesis. As presented in the research framework, the project was divided into several sub-projects, such as research and cross-case analysis, each of which required a suitable approach. Furthermore, information about data gathering, including interviews, documentations, and a workshop, is provided. The process of comparison is also explained. Finally, the chapter contains information regarding research quality, focusing on the reliability and ethics of the project.

2.1 Research Framework

According to Turner (2009), project management involves turning a vision into reality, and, like many other endeavors in life, benefits can be derived from breaking down a project into smaller deliverables. Furthermore, Turner (2009) explains how using a product or work breakdown can help manage the scope of a project. While Turner primarily addresses larger projects, this concept is applicable even to smaller ones. Therefore, the process of this master's thesis was deconstructed into a research framework (see Figure 2.1) consisting of several smaller milestones which naturally aligned with the research questions presented in Table 1.1 and effectively described the path forward.

After this introduction, the descriptions of the four major milestones that served as stepping stones toward the final recommendation are provided. The descriptions also include the methods chosen to attain these milestones, as well as key decision areas.

Understanding SKF's S&OP Process

As the title suggests, the first step in this journey of a master's thesis was to establish an overall comprehension of SKF's current S&OP process. Similar to what former management consultant and author Peter Drucker said about managing what cannot be measured, one cannot effectively improve a business process without first understanding how it works, its strengths, and weaknesses. Therefore, the initial phase of this project was devoted to creating a fundamental but detailed comprehension of the topic and its characteristics. Furthermore, as displayed in Figure 2.1, the method employed to establish this understanding primarily involved internal interviews, specifically with internal business units, process owners, etc.

Gaps Between Theory and Practice

The second phase of the project was dedicated to gathering information to further strengthen existing perceptions of what an S&OP process truly entails or encom-

passes. To be more precise, one of the main objectives of this phase was to obtain an understanding of the structure of a best practice S&OP process. Although the S&OP process is highly subjective, characterized by its context-specific nature (Kristensen & Jonsson, 2018), it is deemed crucial to understand the theoretical ideal in order to make recommendations for improvement. Furthermore, by utilizing the clear understanding of SKF's S&OP process established in the previous phase, gaps - symbolizing areas with room for improvement - could be identified.

To gain a deeper understanding of the topic, a literature review was conducted, which, according to Knopf (2006), can be described as a summary and evaluation of existing writings on a specific topic. Furthermore, the writings examined mainly consisted of articles accessed through credible scholarly search tools such as Google Scholar, or they were forwarded by professors within the field. Finally, the findings from these two initial phases were crucial as they formed the foundation upon which the forthcoming recommendation would be based.

Cross-Case Analysis of Comparable Companies

After collecting relevant literature and assessing SKF's S&OP process, several weaknesses were identified. Collaboratively with supervisors from SKF, a focal area for discussion in this study was determined. To assess whether similar challenges had been encountered by companies akin to SKF, external interviews were conducted with willing participants. The selection of cross-case companies can be found in Section 2.2.1.

After the external interviews, supplementary attention was given to the differences present among the different S&OP processes, especially in those cases where one S&OP process had achieved what SKF was trying to accomplish. These differences were identified through the implementation of a cross-case analysis, which, in short, can be described as a systematic process used to compare organizational features. Further information regarding the cross-case analysis conducted in this project, such as information about the selection of companies to be analyzed as well as the overall process, can be found in Section 2.3.

Discussion of Workshop Findings

Collaborative learning, as described by Laal and Laal (2012), is an educational approach to teaching and learning in which a group of learners cooperate by working together to resolve an issue, create a new product, etc. Furthermore, Hmelo-Silver et al. (2013) highlights a significant cognitive benefit of collaborative learning: the generation of collective learning outcomes that cannot be solely attributed to individual learning efforts. Since the cross-case analysis was of a collaborative nature rather than a competitive one, the companies involved were given the opportunity to participate in a workshop toward the end of the project. During this workshop, general findings from the study were discussed, and company representatives were allowed to participate in an open discussion regarding

S&OP. The focus was on contextual features, challenges, and opportunities. Finally, although the workshop partly served as an incentive for other companies to participate in the analysis, as mentioned above, it was also seen as an opportunity for SKF to gain further understanding of how to proceed regarding the identified area of opportunity

Final Recommendation

Following the completion of all prior steps, it was finally time to provide SKF with a final recommendation. This recommendation was made with careful consideration of the findings from preceding stages, such as company interviews, literature review, and a workshop. Thus, the recommendation provided to SKF was grounded in both theory and empirical evidence.

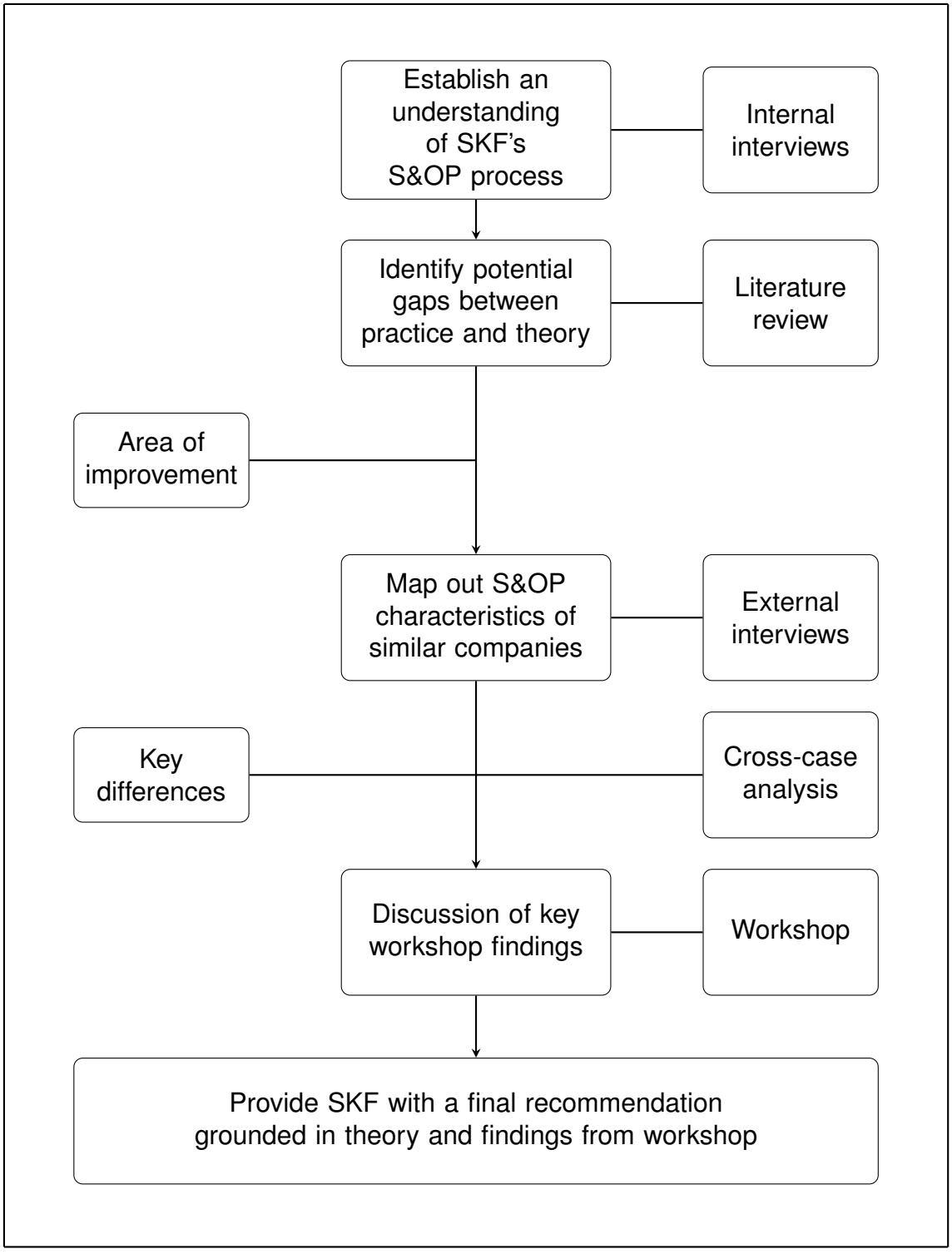

Figure 2.1: Research framework outlining the project's progression.

2.2 Data Analysis

This section offers a comprehensive introduction to the data analysis process employed throughout the project. It begins by discussing the rationale behind the selection of case companies. Following this, it explains the general principles guiding the data analysis, with a brief exploration of relevant current literature. Finally, it describes the types of information selected and their use in the evaluation process.

2.2.1 Selection of Case Companies

The selection of companies to take part in the analysis was of high criticality as it directly impacted the validity and relevance of the findings. Therefore, in order to ensure that the analysis yielded relevant results, companies with similar characteristics to SKF, which were also of interest to SKF, were selected. Examples of aspects evaluated include customer base, physical footprint, product complexity, and overall company setting. When potential candidates had been identified, the companies were contacted and asked if they would be interested in participating in the analysis. If they agreed, interviews were then scheduled. Finally, there was no ranking of potential selection companies in this study. Instead, the focus was to establish contact with many different companies that have a similar context to SKF and then limit the selection to a total of five companies, including SKF, due to time limitations. In this study, Alfa Laval, Getinge, Husqvarna, and Sandvik were part of the analysis.

2.2.2 Data Analysis: The Process

The data analysis process generally adhered to the framework presented by Miles and Huberman (1994) which, as per Koners and Goffin (2007), consists of three stages. First, a *within-case analysis* was conducted, where data from each case was analyzed separately and independently. Next, during the *data reduction* step, key information was summarized and sent back to the original sources for verification. Finally, a *cross-case analysis* was performed, comparing the companies to identify similarities and differences. Subsequently, with the possibility of being redundant, it can be concluded that a cross-case analysis entails comparing the outcomes of independent case studies to any similarities and differences. However, this project doesn't aim to merely identify commonalities and distinctions; rather, it seeks to leverage these aspects to strengthen SKF's S&OP process. Therefore, the data analysis process for this project extends beyond the cross-case analysis by also incorporating *benchmarking*.

According to Camp (1989), benchmarking can be described as "the search for the best industry practices which will lead to exceptional performance through the implementation of these best practices", as cited in Anand and Kodali (2008). However, Fong et al. (1998) proposed that the character of a benchmarking analysis can be categorized further with regards to *nature of referent*, the *content being analyzed* as well as the *purpose for the relationship* between parties involved.

Taking the ideology of Fong et al. (1998) into consideration when describing the benchmarking conducted, the benchmarking can be described as follows (see Table 2.1).

Table 2.1: Classification of benchmarking with parameters from Fong et al. (1998).

Classification parameter	**Features**
Nature of referent other	Global
Content of benchmarking	Process
Purpose for the relationship	Collaborative

As presented in the table above, the benchmarking conducted was of a collaborative nature, which was reflected in the workshop conducted. Furthermore, as mentioned previously, the benchmarking was carried out to investigate the configuration of a business process (S&OP) within companies. These companies, despite operating in different industries, all belong to the industrial sector and have a global presence. Therefore, the benchmarking was, in addition to being collaborative, process-oriented of a global nature.

Finally, the analysis generally built upon interviews together with the selected companies. Furthermore, in order to streamline the process, as well as to guarantee that each interview resulted in the accumulation of information of a similar nature, pertinent questions were compiled in advance. The questions concerned areas that were of great interest to SKF and allowed for an understanding of their S&OP process and how it addresses the selected area of opportunity for SKF. Additionally, the questions for the companies can be seen in Appendix A (see Table A.1). Generally, the questions originated from three separate sources and thus regarded the following:

1. General characteristics of the cross-case companies' S&OP process.
2. Whether the cross-case companies' face similar difficulties as SKF, and if not, how they have managed to address them.
3. Relevant literature.

2.3 Information Gathering

The process of cross-case analysis primarily involves identifying and retrieving the necessary information before conducting any comparisons. Therefore, as presented throughout the comprehensive research framework, this project consistently utilizes information-gathering techniques to gain an understanding of relevant areas. As a whole, retrieving information for this study mostly revolved around acquiring relevant empirical data from all parties involved. To achieve this, interviews were conducted, and documentation from each company's S&OP process was scrutinized.

2.3.1 Interviews

Interviews, described by Patel and Davidson (2019) as a data collection technique based on gathering information by asking questions, were conducted frequently with SKF personnel and representatives from the cross-case companies. Most of the interviews held with SKF employees took place at the SKF headquarters, however, as many people are stationed abroad, a fair share of the interviews occurred remotely through the use of Microsoft Teams. Furthermore, Skärvad and Lundahl (2016) emphasize the importance of interviewing employees from different departments to capture the varied interpretations and perceptions that exist across various segments or process of the business. Therefore, internal interviews were held together with key personnel operating within different business functions relevant to the S&OP process; business functions which were realized during the initial walk-through of SKF's S&OP process, such as sales and purchasing. Furthermore, the interviewees from the case company, as well as the cross-case companies, were carefully selected specialized employees with expertise and experience in S&OP. Therefore, interviews contributed uniquely informative and valuable knowledge for understanding specific aspects of the study.

The interviews were semi-structured, meaning that, although somewhat directed, open-ended questions were asked, leaving the respondent with plenty of freedom to answer (Patel & Davidson, 2019). This approach allowed for two things: first, ensuring no information relevant to the study was left out, and second, enabling the respondent to go beyond the scope of the questions. The interviews were documented through recordings, thereby facilitating their reassessment. After the interviews, the information regarding each company was summarized and sent back to the interviewees for proofreading in order to ensure its validity. A compilation of conducted interviews is available in Table 4.1 with respective companies and roles. Names have not been provided to protect the respondents' privacy. Finally, questions for case companies can be found in Appendix A (see Table A.1). The questions were focused on understanding their S&OP process, assessing them using the maturity model, and determining whether they had similar gaps or had addressed the largest gap found in SKF's S&OP.

2.3.2 Documentation

Documentation, as described by Patel and Davidson (2019) as a form of stored information, can include various formats such as films, voice recordings, and administrative records like machine-generated statistics. It was used in this study to obtain necessary information, either providing new insights or confirming already recognized judgments. In this study, PowerPoint presentations from each company's S&OP process that were used during the interviews were collected. This helped the study gather the right information about each subprocess in S&OP and the KPIs each company focuses on and targets.

2.3.3 Workshop

After conducting interviews with the companies, a cross-case analysis was performed, followed by a workshop. This analysis involved examining the data collected from each company's S&OP process to identify similarities and differences. The workshop served three purposes: first, the authors of the master's thesis presented the S&OP processes of all companies. Furthermore, each respective company had an opportunity to verify or change information, which helped address RQ2 of the study. The second purpose was to facilitate an open discussion about enhancing their S&OP processes and addressing the gap between S&OP and strategic planning, which in turn addressed RQ3 of the study. The questions can be seen in Appendix A. The third purpose was to encourage cross-case companies to participate in the study by discussing their challenges at the end of the workshop and taking inspiration from each other.

2.4 Process Assessment

The cross-case analysis utilized a maturity model developed by Danese et al. (2018). This model helped assess which stage SKF's S&OP currently stands. It aided the study in identifying primary weaknesses and challenges, which will later help answer RQ1. Furthermore, the maturity model was used to assess the other cross-case companies. A detailed description of the maturity model can be found in Section 3.2. Finally, another part of the assessment involved identifying similarities and differences in S&OP between SKF and the other cross-case companies. The study utilized the S&OP process explained by Ross (2015), which is detailed in Section 3.1. This aided in addressing RQ2 and was presented during the workshops.

2.5 Research Quality

To provide the case company with a well-founded recommendation on how to enhance their S&OP process, it is paramount that the conducted research is of adequate quality. To ensure that the study's results are both accurate and credible, aspects such as validity and reliability were thoroughly addressed. Fur-

thermore, setting the eventual outcome aside and instead concentrating on the journey there, research ethics were also deliberated extensively.

2.5.1 Validity

As presented by Yin (2018), validity in research means that the data collected should be objective and accurately represent the results of the study. In other words, validity refers to the appropriateness of the measurement, where the data collected must be objective and reflective of the context. To verify the validity of the project, the theory of triangulation was assessed, which, according to Ammenwerth et al. (2003), entails the employment of various sources of data, observers, methods, and/or theories in investigations of the same phenomenon to confirm or cross-validate findings. The internal part of the research, i.e., the aspect focusing on gaining an overall understanding of SKF's S&OP process, was validated through various sources, including interviews and documentations. However, the external part of the research, which examined the S&OP processes of other companies, faced limitations regarding triangulation due to the availability of only one source of information per company. While not ideal for ensuring the validity of the results, it was necessary to manage time constraints. Whether incorporating four external companies was the right approach, rather than placing greater emphasis on a smaller number of companies, remains uncertain. However, efforts were made to optimize the situation, such as verifying with the sole sources of information that the interpretation accurately portrayed the S&OP process of the companies.

Furthermore, the concept of validity can be divided into internal and external validity. Internal validity pertains to whether the way in which a study was planned, carried out, and analyzed enables dependable answers to the research questions raised within the study. External validity, on the other hand, extends beyond the confines of the research and assesses whether the findings of a study can be generalized to other contexts (Andrade, 2018). Concerning the project, acquiring a thorough and accurate grasp of SKF's S&OP process was essential for ensuring internal validity. Failing to do so correctly would have significantly increased the chances of the outcome being sub-optimal or even completely erroneous. Furthermore, obtaining a careful comprehension of relevant literature as well as the processes of the cross-case companies was also of great importance. Without grasping these two aspects, it would be exceedingly challenging to pinpoint a concrete development opportunity tied to the literature, let alone utilize empirical data to analyze SKF's potential course of action. In the context of external validity, achieving a complete generalization of the results proved unattainable as they were expressly tailored to align with SKF's operational framework. Were the results to be fully generalized, encompassing all companies irrespective of context, they would likely fail to address the specific challenges and opportunities currently encountered by SKF. Hence, the findings are generalized only to the degree that they remain relevant for other companies facing circumstances similar to those of SKF.

2.5.2 Reliability Through Trustworthiness

Reliability in research is often interchanged with the idea of replicability and repeatability, one definition being the degree to which a measurement, given repeatedly, remains the same (Golafshani, 2003; Patel & Davidson, 2019). Furthermore, as discussed by Golafshani (2003), although commonly associated with quantitative research, reliability as a concept is often used in all kinds of research, including qualitative research. However, its purpose within qualitative research is far from evident, as there is a strong opposition. Stenbacka (2001) mentions that reliability has no relevance in qualitative research, as it is often characterized by subjective interpretations, which can complicate the replicability of the outcomes. Instead, Stenbacka (2001) claim that repetitive correctness, i.e. the concept of reliability, only has value in research typified by unconditional intersubjectivity.

Given the ambiguities surrounding the notion of reliability in qualitative research, numerous qualitative researchers opt to entirely avoid the term. Instead, they employ alternative expressions, with 'trustworthiness' emerging as a frequently used substitute (Brink, 1993; Golafshani, 2003). For example, Lincoln and Guba (1985), as cited in Adler (2022), suggest that qualitative research should not be assessed using scientific measures such as reliability and validity. Instead, they propose that it should be evaluated based on trustworthiness, which can be determined by considering the credibility, dependability, and confirmability of the work. Furthermore, Adler (2022) claim that transparency is the most important aspect when assuring the trustworthiness of a qualitative research, and that it can be obtained partly by presenting the theoretical framework of the research, justifying for why certain procedures have been selected, or by highlighting that the theory or practice used is one among many. Furthermore, Adler (2022) work discusses various methods to promote transparency, including the aforementioned triangulation as well as reflexivity. The latter involves researchers being mindful of how their social position, personal background, and beliefs could potentially lead to bias, thereby influencing objectivity.

In relation to the project, reliability was ensured through trustworthiness and extensive transparency. Initially, a comprehensive research framework was presented, detailing each step of the research process. Moreover, given that interview sessions posed a high risk of potential misinterpretations, proactive measures were taken to mitigate this risk. These measures involved recording and transcribing the interviews to ensure the accuracy of the information presented. Subsequently, after transcribing the interview data, a compilation of the relevant information was conducted. However, before incorporating this information into the report, it underwent a cross-referencing process and was sent back to the interviewee for confirmation. Furthermore, regarding the theory applied and the methods used throughout the research process, transparency has been established by briefly discussing alternative frameworks before presenting arguments regarding the decision made.

2.5.3 Research Ethics

Ensuring ethical conduct throughout the entirety of any research process is crucial. Hence, as advocated by Dooly et al. (2017), the foremost principle guiding the research was to 'do no harm'. As discussed by Orb et al. (2001), ethical dilemmas are present in all research domains; however, the implementation of appropriate ethical principles can effectively prevent or mitigate harm. When delving into ethical practices of qualitative studies, the protection of research participants appear to be fundamental (Blomkvist & Hallin, 2015; Säfsten & Gustavsson, 2020). As an example, Capron(1989), as cited in Orb et al. (2001), mentioned that all research should be guided by the principles of respect for people, beneficence, and justice.

With regards to the work of Orb et al. (2001), ethical principles discussed include autonomy, beneficence, and justice, which in short relate to the rights of participants, doing good for others without inflicting harm, as well as fairness and the prevention of exploitation of research participants. In the context of the research project, ethicality was ensured in accordance with the aforementioned principles. Initially, research participants were given comprehensive information about the project, empowering them to make well-informed decisions regarding potential involvement. They were also given the opportunity to withdraw at any moment, as well as to remain anonymous in the report, thereby maintaining both personal and business confidentiality. Furthermore, to uphold ethical standards, interviews were recorded and transcribed only with the consent of the interviewees. Additionally, interviewees were given the chance to review the report prior to publication, and were invited to offer feedback if they preferred any information to be omitted.

3. Literature Review

According to Knopf (2006), a literature review can be conducted in three different contexts, one of which involves serving as a preliminary stage in a larger research project. This section aims to provide the reader with pertinent information regarding sales and operations planning, encompassing the S&OP process, the more immediate sales and operations execution, as well as the aspect of maturity and its diverse frameworks. Moreover, the information in this chapter is crucial for a thorough understanding of the theory, which is considered essential to fully comprehend the remainder of the project.

3.1 Sales and Operations Planning

Sales and operations planning, commonly abbreviated as S&OP, was first introduced in the 1980s as a business process with the primary objective of balancing supply and demand in the tactical planning horizon (Ling & Goddard, 1988, as cited in Dittfeld et al., 2021). Furthermore, the process aims to achieve this objective by aligning strategic and operational plans, thus overcoming the silo approach and fostering cross-functional collaboration among business functions towards a common goal (Dittfeld et al., 2021; Kristensen & Jonsson, 2018). Alternatively, the process aims to achieve both vertical alignment between business strategy and operational planning, as well as horizontal alignment between supply and demand plans (Jonsson et al., 2021). In doing so, successful organizations can experience improved operational performance with regards to inventory levels, service level, forecast accuracy etc., which in turn enhance financial and competitive performance (Wagner et al., 2014, as cited in Kristensen & Jonsson, 2018).

Although seemingly straightforward, there are several aspects that require consideration regarding the management of an S&OP process. Jonsson et al. (2021) classify these considerations as environmental factors, which can originate internally or externally. Moreover, examples of internally derived aspects include commitment to S&OP output and dedication to a specific numerical target, whereas externally derived aspects encompass a myriad of events ranging from the COVID-19 pandemic to the blockage of the Suez Canal in 2021, as well as the ongoing technological revolution (Jonsson et al., 2021).

The S&OP Process

With regards to the design of the S&OP process, there appears to be a theoretical consensus on the essential characteristics that necessitate consideration for the establishment and maintenance of a successful S&OP process. Both Jonsson et al. (2021) and Lapide (2004) identify a similar range of aspects as evaluatively critical for the success of S&OP processes, with Lapide (2004) going as far as labeling these aspects — such as cross-functional participation, a structured

meeting agenda, etc. — as "success factors". However, despite this informal consensus, the design of S&OP processes varies due to context-specificity, meaning that different contexts may require the S&OP process to bridge different gaps (Kristensen & Jonsson, 2018).

Furthermore, disregarding the aspect of context-specificity, one can describe the general structure of an S&OP process as being in compliance with the work of Ross (2015), in which the process is divided into five steps: S&OP data gathering, demand planning, supply planning, pre-executive S&OP meeting, and finally, the executive S&OP meeting. Before delving into the specifics of each step, Ross (2015), similar to Jonsson et al. (2021) and Lapide (2004), suggests that incorporating specific components is fundamental and a prerequisite for succeeding with S&OP. Ross (2015) explains that an understanding of the process structure and ownership is essential, along with supplementary information technology to facilitate operations. Additionally, companies must define S&OP performance measurements that are important, as well as determine how to work with granularity and product groups (Ross, 2015).

Step 1: S&OP Data Gathering

As per Ross (2015), only once the preliminary components are in order, can the first step of the S&OP process commence. This step is introductory and focuses on gathering data to verify data files necessary for generating new S&OP grids and graphs. The data files in question, which are also used to create new data for the demand planners to use for forecasts, are built upon information regarding total sales, current backlog, production from the previous period, as well as the inventory or backlog at the end of the period. Finally, the data is communicated to relevant personnel regarding supply and demand.

Step 2: Demand Planning

With the demand and sales data obtained from the first step, the second step aims to utilize this information and compare it to the current forecast. Following the review, the development of a new forecast for the upcoming period begins, taking into account any changes such as new products, sales initiatives, competitor activity, and so on. The forecast employs pyramid forecasting, using sales data of individual products to create forecasts on the product group level. Once the forecast has been reviewed by a senior sales and marketing executive, it can be entered into the S&OP grid.

Step 3: Supply Planning

In the third step, supply planners utilize the production and inventory information gathered in the first step to assess the company's past supply performance and to modify the supply plan accordingly, ensuring inventory and backlog targets are met and addressing any potential gaps. Resource Requirements Planning (RRP) is employed to ensure sufficient resources are available to achieve the desired levels. In instances of under- or overcapacity, various measures can be

implemented, including workforce reductions, introducing extra shifts, outsourcing, or even expanding facilities. Decisions regarding these alternative solutions are made in the subsequent stage, namely the pre-executive meeting.

Step 4: Pre-Executive S&OP Meeting

In the penultimate step, planning teams convene to review past planning outcomes and address as many outstanding issues as possible before the executive S&OP meeting. Additionally, they aim to gather extensive supporting information for decision justifications, scenario planning, etc. Finally, a comprehensive and organized list is compiled of all remaining issues to be addressed during the executive meeting — those on which planning teams failed to reach consensus during the pre-executive session.

Step 5: Executive S&OP Meeting

Finally, the fifth and final step in the S&OP process involves a meeting between the executive team and representatives from both demand and supply, during which senior managers resolve any remaining issues. Additionally, the S&OP plan is evaluated based on its performance with respect to key performance indicators, and adjustments are made if any areas are found to be lacking. The outcomes of the executive S&OP process include a clear record of all decisions made, potential modifications to the business plan, finalized S&OP grids and graphs, as well as authorization to implement the S&OP plan.

3.2 The S&OP Maturity Model

Transitioning to the concept of maturity models, these are explained by Danese et al. (2018) as frameworks involving a sequence of stages acting as an evolutionary path, i.e., the path of maturity, ranging from an initial stage to a stage of greater establishment. Furthermore, as cited in Danese et al. (2018), Poeppelbuss et al. (2011) argue that the overall idea of maturity models is that the progression among the evolutionary stages is beneficial to organizations, which aligns well with the interpretation of the term maturity found in Van Looy et al. (2011). Moreover, as a consequence of the evolutionary and progressive stages provided by maturity models, potentially offering valuable insight into organizations and facilitating decision-making, their occurrence has been common, emerging in various contexts and being applied to areas such as information systems, supply chain management, and S&OP (Danese et al., 2018). According to Grimson and Pyke (2007), an S&OP maturity model can be described as a framework for assessing an established S&OP process in order to pinpoint key areas of improvement. However, as cited in Danese et al. (2018), Bruin et al. (2005) argue that the frameworks can be used for more than just an assessment, as their purpose can be descriptive, prescriptive, and comparative. In other words, Bruin et al. (2005) suggest that maturity models help to paint a picture of the current state, contribute to the establishment of a development plan, and allow for external benchmarking.

Furthermore, in the study conducted by Danese et al. (2018), a comparative analysis among several well-known and respected maturity models laid the foundation for the proposal and establishment of a new S&OP maturity model. In the study, Danese et al. (2018) highlight that, although S&OP maturity models from existing literature might vary in terms of the number of evolutionary stages or the pinpointed dimensions, one consistent similarity among the frameworks is the progression throughout the pursuit of excellence. Indeed, all maturity models analyzed in the work of Danese et al. (2018) consist of an initial stage where companies, in the absence of an established planning process, find themselves working in a reactive manner, as well as an ideal final stage marked by a high level of cross-functional and cross-organizational integration, with a proactive way of working.

The S&OP maturity model proposed by Danese et al. (2018) comprises four dimensions labeled as suitable for studying the dynamics between different maturity stages – which is the primary focus of the theoretical framework. As explained by Danese et al. (2018), the then-current literature predominantly emphasized the assessment of a process's maturity and allowed for overall planning regarding its development. However, when it came to actual execution, the frameworks lacked guidance on how to proceed. Thus, the framework proposed by Danese et al. (2018) also seeks to, in the words of the authors, "explain the dynamics of evolution from one stage to another rather than the characteristics of each stage." Returning to the foundational dimensions, these consist of the following (see Table 3.1).

Table 3.1: Clarification of the evaluative dimensions in the maturity model by Danese et al. (2018).

Dimension	Brief explanation
People and organization	Refers to the overall culture and attitude towards S&OP. As put by Danese et al. (2018), the people and organization dimension regards the human component and includes features such as commitment, roles, clear division of responsibilities, etc.
Process and methodologies	Concerns the methods employed to accomplish strategic objectives. It encompasses the overall structure, the frequency of meetings, the content discussed during these meetings, and various other factors.
Information technology	Encompasses all supportive technology and software used throughout the process.
Performance measurement	Concerns the utilization of Key Performance Indicators (KPIs) to assert both the overall performance of an organization and the "effectiveness of the S&OP process", according to Danese et al. (2018).

Finally, in terms of the evolutionary stages, the frameworks by Danese et al. (2018) builds upon the work of Grimson and Pyke (2007), as they share a common terminology when addressing process maturity. The terminology used includes the following stages: *No S&OP process*, *Reactive*, *Standard*, *Advanced* and *Proactive*. The framework can be seen in its entirety in Table 3.2.

Table 3.2: The maturity model proposed by Danese et al. (2018).

<table>
<tr><th>Dimensions</th><th>Stage 1
No S&OP process</th><th>Stage 2
Reactive</th><th>Stage 3
Standard</th><th>Stage 4
Advanced</th><th>Stage 5
Proactive</th></tr>
<tr><td rowspan="3">People and organization</td><td>Lack of sponsorship from business executives</td><td>Some collaboration between demand and operations</td><td>New planning culture with non-dedicated S&OP team</td><td>Formal S&OP team with executive participation</td><td>The S&OP process owner becomes coordinator of the entire network</td></tr>
<tr><td>No team of S&OP</td><td rowspan="2">No definition of responsibilities</td><td>Clear roles and responsibilities</td><td>Collaboration with main customers and/or suppliers</td><td rowspan="2">Participation of top management of all partnering companies</td></tr>
<tr><td>Silo culture domination</td><td>Excellent commitment</td><td>Development of new skills and personnel training</td></tr>
<tr><td rowspan="2">Process and methodologies</td><td>No formal S&OP process</td><td>Emerging but still inconsistent process</td><td>Formalized and structured process</td><td>Process balanced with the external network partners</td><td>Dynamic process</td></tr>
<tr><td>Frequent re-planning and revenue focus</td><td>No financial integration</td><td>Regular meetings
Financial integration</td><td>Demand and supply plans jointly aligned</td><td>Event-driven meetings</td></tr>
</table>

Table 3.2 Continued.

Dimensions	**Stage 1** *No S&OP process*	**Stage 2** *Reactive*	**Stage 3** *Standard*	**Stage 4** *Advanced*	**Stage 5** *Proactive*
Information Technology	Individual managers keep own spreadsheets	Many spreadsheets or functional solutions	Integrated demand and supply planning software	Technology to access external partner data and share information with them	Innovative technology to support decision-making (e.g. on risk management and scenario analysis for profitable trade-offs) using information dispersed in the supply network and beyond
	No consolidation of information	Some consolidation but done manually	Improved data rationalization and integration capability		
Performance measurement	Basic measurement	Functionally specific metrics	Integrated internal supply chain metrics to manage trade-offs	External supply chain metrics to support decision-making at the supply network level	Assessment of the impact on company profitability
		Measure of how well Operations meets the sales plan		New product introduction metrics	Measurement of the impact on the ecosystem (e.g. social impact, global environmental impact, etc.)
				S&OP effectiveness	

3.3 S&OP Success Factors and Common Pitfalls

As reported by Kristensen and Jonsson (2018), the design of an S&OP process might vary from that of other organizations as the process “may be required to solve the same type of problem in different contexts.” However, although there is a plethora of different S&OP designs, current literature suggests a consensus regarding common critical elements necessary for an S&OP process to be considered as well-established and robust, as well as common pitfalls to try and avoid.

As previously mentioned, in 2004, Lapide introduced a set of twelve factors thought to enhance, or even excel, one’s S&OP process Lapide (2014). Since then, Lapide has revisited his previous work and, considering advancements in the industry, established a reassessed list of what he himself refers to as foundational S&OP factors, i.e., factors necessary for a sustainable and resilient business process (Lapide, 2014). Furthermore, Lapide describes that for an S&OP process to maximize its benefits and avoid collapsing "like a house of cards" when enhanced, it is crucial that the following ten factors are functioning effectively.

To start with, the structure and regularity of S&OP meetings appear to be crucial, as emphasized by Lapide (2014), who advocates for a recurring and iterative process. In the first two foundational factors, Lapide (2014) underscores the importance of holding "that specific meeting" even if no new topics are introduced, as well as adhering to a predefined and structured meeting agenda. Additionally, this structured agenda should incorporate both a review of past performance — conducting a root-cause analysis to better understand the outcomes — as well as an assessment of future prospects. In the third to fifth factors, Lapide (2014) explains how the planning horizon should be as long as the longest supply-demand lead time – including resource lead times and lead times connected to sales and marketing activities – as well as the importance of starting off with an unbiased and unconstrained forecast, and to come prepared for meetings. Expanding on that point, Lapide (2014) elaborates on the significance of the baseline forecast to incorporate all known aspects in regard to upcoming demand and that it should be generated by a professional forecasting organization. Furthermore, regarding the importance of preparedness, Lapide (2014) emphasizes the need to translate the demand forecast into terms that each function can understand and operate comfortably within. For instance, finance may prefer to analyze demand in terms of dollars, while production may prefer units. Additionally, preparations should include staying updated on all known future impacts, such as upcoming marketing campaigns or plant shutdowns. Transitioning to the sixth through eighth factors, Lapide (2014) underscores the significance of cross-functionality. This entails that managers from all relevant business functions not only attend regular meetings but actively participate. Additionally, these managers should have clearly defined roles, enabling them to leverage their expertise effectively. According to Lapide (2014), these participants should also receive full clearance from senior management to operationalize decisions made throughout the process. Lastly, the last two foundational factors pertain to the formation of a dedicated, central S&OP

team tasked with facilitating and moderating the process without imposing outcomes. Additionally, it emphasizes the significance of establishing a consensus-based plan with a clear division of accountability. In this regard, Lapide (2014) reiterates the importance of, and strongly advocates for, translating the demand into the language of functional managers to ensure their understanding of their commitments. Table 3.3 provides a comprehensive list summarizing all ten foundational success factors identified by Lapide (2014).

Table 3.3: A table of ten factors identified by Lapide (2014) as foundational when designing a resilient S&OP process.

	Foundational S&OP success factors
1.	Ongoing routine S&OP meetings.
2.	Structured meeting agendas.
3.	An unbiased baseline forecast to start the process.
4.	A planning horizon as long as the longest supply-demand lead time.
5.	Pre-work to support meeting inputs.
6.	Cross-functional participation.
7.	Clearly defined functional roles at the meetings.
8.	Participants empowered to make decisions.
9.	An unbiased, responsible organization to run a disciplined process.
10.	Internal collaborative process leading to consensus and accountability (by leveraging a forecast/planning hierarchy).

Diving further into existing literature, examining prevalent mistakes that could adversely impact the S&OP process, rather than focusing on factors contributing to success, Bower (2005) sheds light on some of the most common pitfalls encountered by companies of any size and across industries. The first of twelve common pitfalls pertains to a misalignment between S&OP and corporate strategy. As Bower (2005) outlines, while the harmony between strategy and tactical execution constitutes a fundamental principle of S&OP – where mature processes

assess operational deviations and align them with strategic objectives, it is frequently observed that these two elements are not in sync. Furthermore, Bower (2005) describes that it is common for a strategy to be developed only to be shelved and revisited occasionally, instead of being continuously reviewed to ensure alignment, often due to the absence of an organizational forum where strategic performance can be assessed. In an S&OP process, the review of strategic performance would enable continuous monitoring, allowing for the identification of gaps and their reporting to senior management. It would also illuminate the overall corporate strategy, facilitating enterprise-wide alignment toward a common goal (Bower, 2005).

Continuing with the discussion on the twelve common pitfalls, parallels emerge between the insights of Bower (2005) and Lapide (2014). Bower (2005) highlights the significance of proactive engagement in S&OP, as opposed to passively treating it as just another reporting session. Additionally, one effective remedy suggested is establishing a clear division of responsibility and appointing an impartial S&OP facilitator, both of which serve to reinforce engagement (pitfalls two and six). Given this analysis, parallels can be drawn to Lapide (2014) perspectives on accountability and the structure of a central S&OP organization (success factors nine and ten). Moreover, in pitfalls three and nine, Bower (2005) highlights a common error: relying on an unrealistic single-number forecast for the S&OP process, neglecting to integrate external information pertinent to future demand. This closely mirrors Lapide (2014) observations in his third and tenth success factors, emphasizing the need for an impartial baseline and the creation of a consensus-driven plan.

The final common pitfalls that resonate with Lapide (2014) work are pitfalls number four, ten, and eleven. Pitfall number four, as discussed by Bower (2005), addresses the mistake of failing to uphold a regular meeting schedule, resulting in occasional missed meetings under the assumption that no new topics will arise. Furthermore, pitfall number eleven pertains to a lack of understanding of proper S&OP etiquette. Lapide (2014) addresses these issues in success factors one and two, emphasizing the significance of adhering to a routine and maintaining a structured agenda. Lastly, pitfall number ten can also be paralleled with success factor two, where Bower (2005) emphasizes the significance of measuring performance, a practice that Lapide (2014) incorporated into his structured meeting agenda.

However, not all of the common pitfalls from Bower (2005) are comparable to the success factors reported in Lapide (2014) – one pitfall even acting in contradiction to the advice of Lapide (2014). To begin with, pitfall number one which regarded the disconnect between S&OP and corporate strategy has already been brought up and will therefore not be discussed further. This, however, is not the only aspect that fall outside of the scope of Lapide (2014) work. As reported by Bower (2005), a common pitfall (see pitfall eight) is the omission of products undergoing life cycle changes from the S&OP process. This oversight is surprising given that events such as new product launches, promotions, and discontinuations frequently influence forecasting accuracy, potentially necessitating costly mitigation

measures. To tackle this issue, Bower (2005) proposes dealing with life cycle changes early in the S&OP process to ensure seamless operation and minimal costs.

Furthermore, pitfalls seven and twelve highlight the error of excessive fixation on last month's numbers rather than maintaining a comprehensive view that spans both past and future trends, while also providing guidance on mitigating the impact of office politics on the S&OP process. These tips include, among others, providing personnel with training, identifying resistance, and requiring that all materials be shared with all meeting participants prior to the meeting to avoid surprises, which aligns with success factor number 5 regarding preparation (Lapide, 2014). Finally, the last pitfall (see pitfall five) concerns the downside of maintaining a short-term planning horizon, with three months up to a whole year described as being "far too short" (Bower, 2005). Moreover, Bower (2005) explains that by limiting the planning horizon to a year or less, there is an excessive emphasis on tactical execution rather than on overall strategic targets. Instead, the suggestion is that the planning horizon should be extended to two years or more (Bower, 2005). While this does not directly contradict the recommendations of Lapide (2014), it does not entirely align with the principle of aligning one's planning horizon with the longest lead time either. A complete list of all twelve common S&OP pitfalls can be found in Table 3.4.

Table 3.4: A table of twelve common S&OP pitfalls reported by Bower (2005).

	Common S&OP pitfalls
1.	There is a disconnect between S&OP and corporate strategy.
2.	Senior management indecision.
3.	The Single-number forecast is not reality based.
4.	We meet every month... more or less.
5.	The process focuses on the balance of the year.
6.	The S&OP leader also owns supply or demand planning.
7.	Leaders are “obsessed” with last month’s sales.
8.	S&OP ignores product life cycle management.
9.	S&OP ignores or excludes extrinsic (external) business trends.
10.	Failure to measure and monitor progress.
11.	No understanding about proper meeting procedures.
12.	Office “politics” undermines progress.

3.4 Planning: Operational, Tactical and Strategic

Similarly to Bower (2005) observations on the interplay between strategy and tactical execution, Lapide (2011) delineates that the S&OP processes, influenced by strategic planning outputs and directing daily operations, serve as the link connecting strategic plans to operational execution. However, Lapide (2011) explicitly states that he does not consider strategic planning, which is characterized as a long-term planning process, to be a component of the S&OP process. Instead, he identifies the S&OP process as a “medium-term tactical planning process” and states that, by incorporating strategic planning into S&OP, there is a risk of diverting too much focus away from medium-term planning, with attention instead being directed towards the distant future.

To clarify the role of the S&OP process, described as the "linchpin" planning process, Lapide (2011) outlines three distinct planning levels and elaborates on their interplay, with the main differences being the planning horizon and granulation in time. What follows is a short explanation of each planning level as well as information regarding their interconnection, as per Lapide (2011). Furthermore, in

Figure 3.1, a model depicting the different planning processes, as well as their interplay, is shown.

Strategic Planning

As per Lapide (2011), strategic planning is a planning process which looks far into the future and usually involves establishing a plan based on where the company sees itself in three to five years. Notably, strategic planning stands apart from other planning processes due to its extensive planning horizon, which allows for anticipation of significant shifts in the business environment.

As reported by Lapide (2011), companies' long-term plans will be subject to macro factors that can potentially alter the entire playing field, including its products, supply base, etc. Furthermore, alongside the vision of the company's future presence, a set of clear targets and milestones that need to be fulfilled for the company to reach its strategic plans will also be established. These milestones serve as the basis for deriving operational performance indicators, i.e., key performance indicators linked to operational performance, which are then utilized to ensure alignment between operational performance and overall strategic targets (Lapide, 2011).

Tactical Planning: S&OP

Tactical planning, exemplified by S&OP in this scenario, typically entails a shorter planning horizon ranging from six months to two years and, instead of a time granularity measured in years, it emphasizes months and weeks. Furthermore, Lapide (2011) clarifies how Figure 3.1 illustrates that the alignment between supply and demand is driven by strategic objectives established in the strategic planning.

Operational Planning

In contrast, operational planning is characterized by its immediate focus on the near future, typically spanning one to two weeks. This timeframe allows for addressing deviations and adjustments on a day-to-day basis, given the granularity of time measured in days or even hours. Importantly, operational planning, like tactical planning, is derived from a broader and more encompassing planning process, notably the supply and demand plans established within the S&OP process, as depicted in Figure 3.1 Lapide (2011).

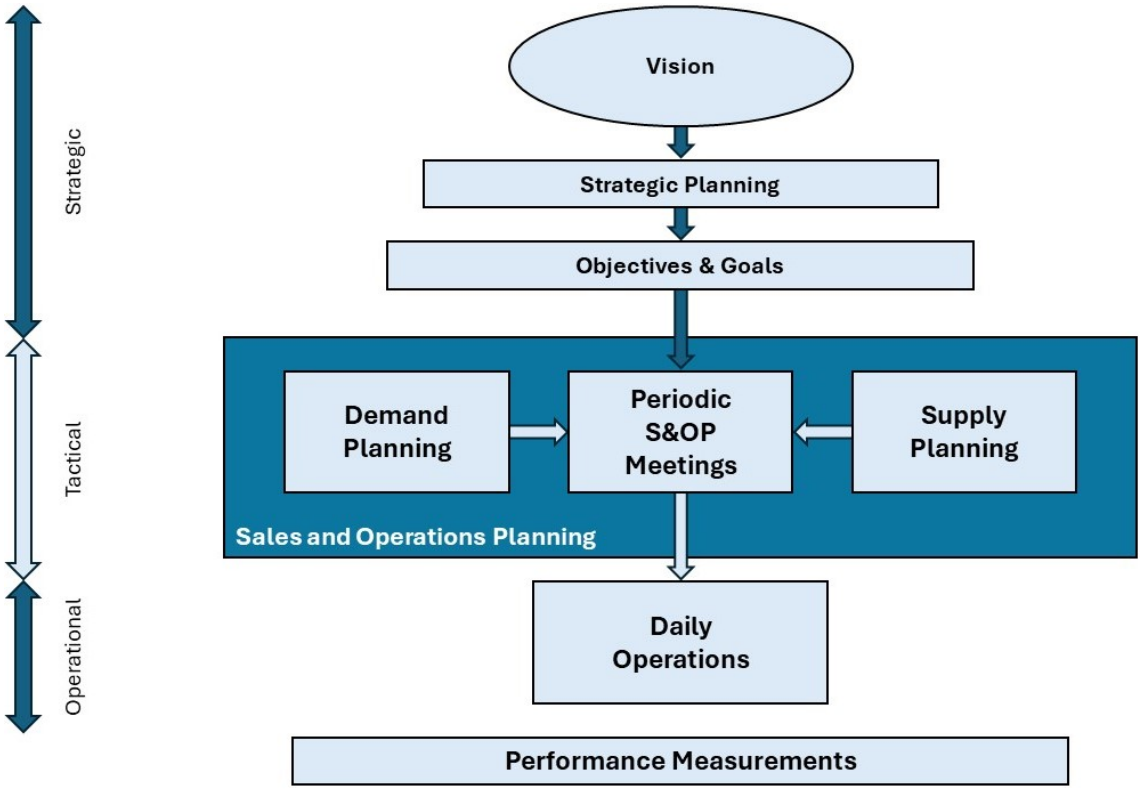

Figure 3.1: Mapping of the interplay between the strategic, tactical and operational planning processes, Tan, (2006), as cited in Lapide (2011).

Finally, Lapide (2011) highlights that it is crucial to maintain each planning process as distinct entities. Attempting to merge two separate planning processes could potentially jeopardize or even derail the company from achieving its strategic targets. This risk arises from the possibility that attention may be diverted from critical aspects of forward planning due to the different timeframes inherent in each process. Moreover, the integration among each distinct planning process is also deemed crucial, as the interaction among these processes determines the alignment throughout the organization and influences the attainment of strategic operational objectives.

4. Empirical Findings

As outlined in the methodology, significant emphasis was placed on comprehending the S&OP processes of the companies participating in the cross-case analysis. This chapter aims to introduce the remaining participating companies and to present the data collected during information-gathering events, including interviews with company representatives, workshops, etc. It is crucial to note that the empirical data is based entirely on the statements of company representatives. The information has not been modified by the authors in any manner and has been validated and endorsed by the company representatives since its retrieval.

4.1 Company Profiles

In the selection of companies to participate in the cross-case analysis, adherence was given to the criteria outlined in the methodology. Given SKF's pivotal role as the case company in shaping this thesis, their input significantly influenced the selection of participating companies, resulting in the inclusion of *Alfa Laval*, *Getinge*, *Husqvarna* and *Sandvik*. The upcoming section offers a brief introduction to the profiles of these companies. For more detailed information about SKF, please refer to Section 1.2.

4.1.1 Alfa Laval

Alfa Laval leads the way in providing innovative solutions in heat transfer, separation, and fluid handling globally. By leveraging these core technologies, Alfa Laval is dedicated to enhancing the efficiency and competitive edge of its clients in various sectors worldwide. The company is committed to identifying the unique challenges faced by its customers and delivering eco-friendly products and solutions tailored to meet their specific needs. As of 2022, the company operated a network of over 100 service centers, capable of providing services in more than 160 countries. Alfa Laval has around 20,300 employees and reported a turnover of 52.1 billion SEK in the same year.

Alfa Laval is divided into three divisions: *Marine*, *Energy*, and *Food & Water*. This report focuses on the Energy division, which has the highest turnover. The Energy division is structured into three business units, each with its own S&OP process due to their products. This report gathers data from the Gasketed Plate Heat Exchanger (GPHE) business unit's S&OP process. Furthermore, the GPHE business unit comprises seven assembly factories and three component factories located in South America, USA, India, China, Korea, Japan, and Europe. While most products in GPHE are assemble to order (ATO), there are also some make to stock (MTS) operations for components. The total number of SKUs is estimated to be around 300, but their configurability means that there is no fixed quantity of items.

4.1.2 Getinge

Getinge is a leading global player in the life science sector, specializing in delivering products and solutions to enhance clinical outcomes and streamline workflows at hospitals and other institutions. Their extensive offering encompasses a wide range of products for intensive care, cardiac and vascular care, operating rooms, and sterile goods management. With over 11,000 employees, the company boasts a robust international presence, operating in 40 countries and conducting sales in 133 countries. Production takes place in facilities located across France, China, Germany, Poland, Sweden, Turkey, the Netherlands, the United Kingdom, and the USA. In total, Getinge operates 20 production facilities and three distribution centers situated in Singapore, the USA, and the Netherlands. In 2022, the company's turnover amounted to 28.3 billion SEK, highlighting its significant role and success within the life science industry.

Getinge operates within three core business areas: *Surgical Workflows*, *Acute Care Therapies*, and *Life Science*. The S&OP process serves as a comprehensive framework encompassing all business areas and nearly all of the company's approximately 10,000 SKUs. The primary objective of Getinge's S&OP initiative is to achieve a delicate balance between demand and supply. This involves proactively identifying potential issues, managing shortages, making necessary adjustments, discussing potential postponements for customer projects, and ensuring seamless operations across the board.

4.1.3 Husqvarna

Husqvarna Group is a multinational manufacturer of outdoor products, including robotic lawn mowers, chainsaws, trimmers, ride-on mowers, and irrigation solutions, as well as equipment and diamond tools for the construction and stone industry. Catering to both professionals and consumers, its products and solutions are distributed through direct sales, dealers, and retailers across over 100 countries, with the aim of shaping urban environments of the future. In addition to providing service and support for working with hard materials such as concrete and stone, Husqvarna Group reported a turnover of 54.2 billion SEK in 2022. With a global presence, the company employs approximately 13,800 individuals across 40 countries.

Husqvarna Group comprises three divisions: *Forest & Gardens*, *Gardena*, and *Construction*. Each division has its own unique set of products, markets, and strategies tailored to its specific sector within the broader outdoor power equipment and construction industries. Consequently, each division operates independently, with its own S&OP process. This report focuses on data collected from Husqvarna's Construction division, which has 1500 active finished products and 225,000 parts and accessories. Additionally, Husqvarna Construction operates seven factories located in the USA, Sweden, Poland, Bulgaria, China, and India, along with five global distribution centers worldwide and 60 local warehouses/service centers in all active markets. Notably, North America represents the largest

market, contributing 46% of total sales across 12 product groups. Within Husqvarna Construction, the majority of products are MTS, while the remainder are make to order (MTO).

4.1.4 Sandvik

Sandvik is, in their own words, a global industrial conglomerate with approximately 41 000 employees, working to provide their customers with solutions that enhance productivity, profitability, and sustainability. These solutions include machines, services, digital solutions, etc., mostly to the manufacturing and mining industries, as mines acts as their largest customer segment by far, covering 51% of their total sales, with Europe as their largest market, covering 26%. Since its establishment in Sweden in 1862, Sandvik has experienced significant growth and currently operates within three main business areas: *Mining and Rock Solutions*, *Rock Processing Solutions*, and *Manufacturing and Machining Solutions*, with sales reaching approximately 170 countries, reporting a revenue of 114 billion SEK.

As each business area has its own independent S&OP process, focus was directed towards Mining and Rock Solutions, which is a smaller and fairly new business area within Sandvik. The Mining and Rock Solutions division operates three production sites located in Sweden, China, and India, as well as six distribution centers situated in Belgium, China, Australia, South Africa, and the USA. The division produces approximately 500 crushers per year, with equipment contributing to one-third of the revenue and aftermarket services accounting for the remaining two-thirds. Furthermore, the division's product portfolio includes around 14,000 SKUs.

4.1.5 Company Representatives

The table below (see Table 4.1) lists the profiles of the company representatives who have provided pertinent information for the study. These representatives are seasoned professionals with a profound understanding of S&OP, offering invaluable data and expertise. Note that the names of the representatives have been omitted due to privacy concerns.

Table 4.1: List of the profiles of company representatives.

Company	Work title
SKF	Head of Demand & Supply Management
	Head of Sales & Operations Planning
	Senior Business Analyst and Project Manager
	Business Process Analyst
	S&OP Strategic Demand Manager
	Supplier Change Manager
	Global Strategic Purchasing Manager: Direct Material
Alfa Laval	Head of Sales & Operations Planning
	Global Supply Planner PHE
Getinge	Director Global S&OP and Business Process Excellence
Husqvarna	Director of Operational Excellence & Strategy
	Supply Chain Management Director
Sandvik	Global S&OP Manager Aftermarket

4.2 Overview of S&OP Processes

This section will give a brief overview of each B2B company's S&OP process, along with their strengths and weaknesses.

4.2.1 SKF

SKF operates two distinct S&OP processes, one for the Industrial Market (IM), and one which incorporates Automotive, Seals, and Aerospace. As stated, this report focuses solely on the S&OP process concerning the IM segment, defined as a global process with a monthly frequency, aimed at balancing supply and

demand. Additionally, the SKF S&OP process is divided into regions, with four distinct divisions. This process integrates all operational plans of the business into a single coordinated plan per region, considering factors such as cost, inventory, and service targets. The planning horizon is 12 months forward (18 months during business planning), with all forecast data stored at the lowest granularity level to enable aggregations at different levels. Additionally, SKF has established a central S&OP team comprising six employees tasked with ensuring that the necessary processes and tools are in place to support the execution of the S&OP processes within the organization. The teams also provides education sessions and training for professionals. S&OP was initiated in 2010 but was paused between 2015 and 2018 to focus on value creation and the core business, which, at the time, did not include S&OP. At that time, the relationship between time and value was not considered essential. Finally, SKF has a phase in and phase out process for items, but it occurs automatic within the data system and the focus is more on replacing items. This is executed outside of the S&OP process.

Furthermore, the S&OP process involves a total of 130 to 150 people and comprises 55 production facilities and 60 distribution centers located all over the world. The total number of SKUs is approximately 150,000 - 60% of which being MTS and the remainder being MTO.

SKF's primary KPIs within S&OP revolve around Sales Forecast Accuracy (SFA) and its impact on other planning areas. Moreover, SKF aims to stay within +/-5% bias at the regional level and continuously analyze segment-wise trends to correct over or under-forecasting. According to SKF, the forecast for three months ahead is compared against the actual results for that month. Additionally, SKF monitors Supplier Capacity Accuracy (SCA) to ensure supplier capacity can meet expected demand, and Production Performance Adherence (PPA) to minimize discrepancies between actual and planned production. Through these KPIs, SKF strives to enhance their forecasting accuracy and efficiency in the S&OP process to meet market demands and optimize operations.

The strength of SKF's S&OP process lies in its ability to develop a common plan to meet customer demand while also planning at the item level. SKF has a dedicated S&OP team, which provides opportunities to enhance the monthly process and tools. Additionally, SKF effectively phases in new item introductions. However, one weakness at SKF is the lack of executive involvement in the S&OP process. Currently, S&OP is implemented region by region, and not every executive participates in the monthly meetings. Another weakness is that SKF does not take advantage of strategic phasing out of items in cooperation with the S&OP process and lacks a predefined framework for prioritizing orders in constrained scenarios within capacity planning. There is also uncertainty regarding forecast calculations and a need for improved user experience by reducing system complexity and improving the S&OP report structure, as noted by the S&OP team.

On a general level, SKF S&OP process can be described as having three subprocesses: Sales Forecasting, Supply Review and Supplier Capacity Planning.

What follows is a more in-depth description of what these sub-processes entail. Figure 4.1 depicts a compilation of SKF's sub-processes and activities.

Sales Forecasting

The S&OP process is initiated with Sales Forecasting - a process aiming to establish a forecast of upcoming demand through historical demand and market insights. It starts off with a sales review, during which sales teams responsible for different regions provide their respective strategic demand manager with data and market insight gathered through various sources including regional market reviews, customer information, and macro-economic developments. Once the information has reached the strategic demand managers, they make adjustments to a system-generated forecast, based on sales history and created automatically at the beginning of the period. These unconstrained forecasts then serves as input to the area-specific demand review meetings, in which representatives from the demand and supply organizations discuss and analyze the sales forecasts. In these meetings, the reviewing process entails assessing factors influencing demand and evaluating the accuracy of prior estimations. Following potential alterations stemming from the demand review meetings, these forecasts serve as the next step in the S&OP process - the *Supply Review*.

Furthermore, SKF divides its sales forecast into two categories: Forecasting Individual Business (FIB) and Forecasted Aggregated Business (FAB). FIB products typically represent items purchased in large quantities by important returning customers, making it reasonable to forecast at the item level. This involves predicting the quantity of a specific product that a particular customer will buy during the upcoming period and how the inventories of affected warehouses will change. FAB, on the other hand, compiles all products where forecasting on an item level does not add any significant value. Instead, the quantities are compiled and the forecast takes place on an aggregated level. At present, SKF's sales forecast comprises approximately 80% FAB and 20% FIB.

Supply Review

The second step of SKF's S&OP process is the Supply Review, which aims to determine the production volumes required to meet future demand, stock, and service targets, while also addressing any constraints hindering the fulfillment of the unconstrained forecast. The Supply Review begins with Manufacturing Supply Planning (MSP), assessing the necessity of adjusting production capacity to align supply and demand, and subsequently adjusting the master scheduling system accordingly. If production cannot be adjusted to align with supply and demand while maintaining stock and service levels, a constraint is imposed on the forecast. In SKF's terms, this occurs when the sales plan exceeds the supply plan. In such cases, orders must be prioritized. Currently, the factory has the authority to prioritize orders without a predefined framework. However, the primary principle guiding this process is to ensure each customer receives a fair share.

Initially, it is the supply planner in the factory who needs to solve the issues. If

the issues are not resolved at this level, the factory will attempt to address the constraints. Only if the constraint cannot be resolved at the factory level will SKF look to localize production to another SKF factory in a different region. In the worst-case scenario, the originally mentioned factory needs to prioritize orders without a predefined framework.

Supplier Capacity Planning

The Supplier Capacity Planning marks the third and final step of the S&OP process. Its purpose is to secure material and component supply by sharing information regarding upcoming demand with key suppliers, i.e., how much SKF are likely to buy during the upcoming period. The demand information consists of one consolidated forecast per product group and supplier, where the demand for the next 12 months is expressed in units, tons, or kilograms - providing a clear indication of future demand alternations. Currently, SKF collects these volume plans from 55 factories globally and sends them to approximately 130 suppliers worldwide.

SKF has divided Supplier Capacity Planning into three steps: *factory review*, *regional purchasing & supply chain meeting*, and *supply review*. The factory review involves each factory detailing its supply needs and sending this information to the central S&OP team. Once the S&OP team has received all the data, they consolidate the information to create a single consolidated forecast for every global supplier. Before proceeding to the next step, representatives from the central S&OP team, regional purchasers, and regional supply chain representatives meet to verify the volumes. After this verification, the file is sent to the respective category manager. In the last two steps, the regional purchasing & supply chain meeting and the supply review, entails the category manager providing the global suppliers with the demand information before suppliers themselves assess their own ability to meet SKF's demand.

Finally, it is important to point out that escalation can occur in all three subprocesses. Moreover, SKF operationalizes the S&OP plan, which further provides input for financial planning.

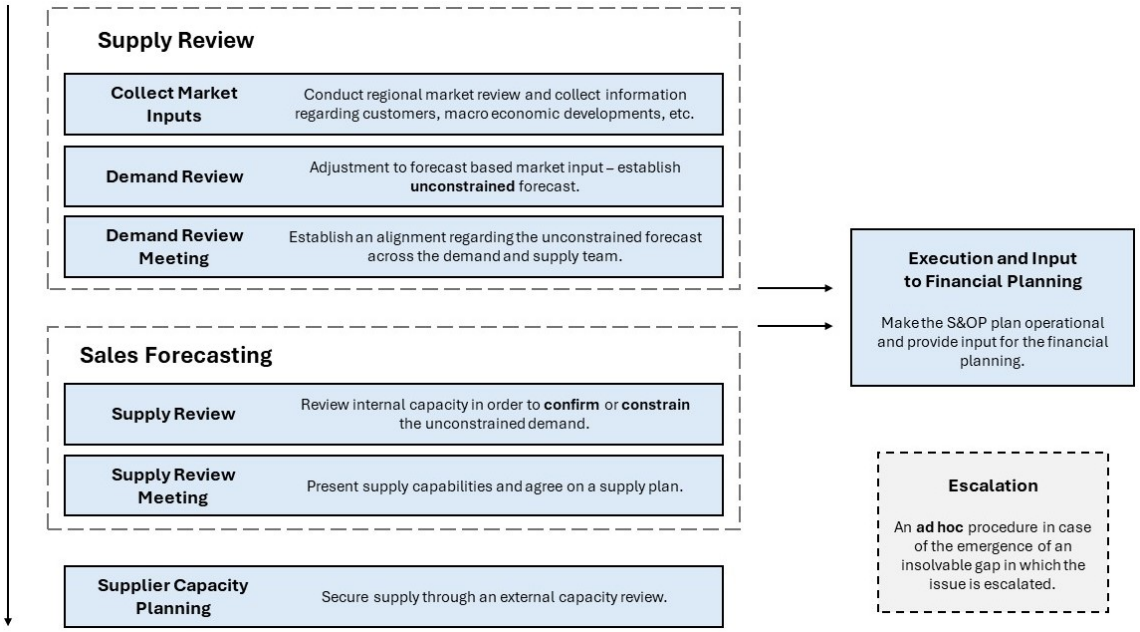

Figure 4.1: Compilation of SKF's S&OP sub-processes and activities

4.2.2 Alfa Laval

In Alfa Laval GPHE, the S&OP team comprises two full-time dedicated workers and seven representatives from each factory, although the latter are not full-time dedicated. Moreover, there are approximately 50 other people who are more or less involved monthly by providing input, processing information, or making decisions. The company's goal with S&OP is to establish a common plan and commitment. The S&OP process occurs monthly, with a planning horizon of 4 to 18 months, and the planning objective is completed units. Alfa Laval GPHE initiated the implementation of S&OP as a concept in 2018, led by operations development, and became actively engaged in the process since 2019.

Alfa Laval GPHE strengths include collaboration and commitment, as the organization aims to drive the process forward, considering it a pivotal part of their future plans and demonstrating alignment between sales and operations. Currently, they are focusing on improving various aspects of their S&OP process. In the global supply planning process, the team aims to integrate sourcing and capacity planning. Moreover, to elevate S&OP to the next level, Alfa Laval works on balancing the supply chain triangle, meaning how to improve the ability to balance service, cost, and cash throughout the whole process and ensure that Alfa Laval makes data-driven decisions and avoids sub-optimization.

Alfa Laval GPHE monitors several critical KPIs across its operations. These include demand planning metrics such as forecast accuracy and bias, supply planning indicators like planning adherence, and sales and operations measures such as order entry efficiency, unit sales, revenue generation, and delivery pace. The

company places particular emphasis on two primary KPIs: return on capital employed and planning adherence. While accuracy in forecasting is important, Alfa Laval values stability in forecast variation and the ability to manage it effectively overachieving absolute precision. Finally, inventory management KPIs are used to optimize resource utilization. Alfa Laval GPHE's S&OP consists of five steps, which are described below

Product Portfolio Planning

The first step involves monthly review meetings to assess challenges within the product portfolio from both sales and operations perspectives. The product manager, along with representatives from supply, demand, and finance departments, collaborates to evaluate product performance, supply-demand dynamics, and financial viability. By analyzing key metrics and fostering cross-functional dialogue, the team aims to identify and address issues promptly, ensuring alignment between sales and operations functions.

Before proceeding to the next step, Alfa Laval implements phase in and phase out plans, which are submitted prior to the demand planning process during the Product Portfolio Meeting. Subsequently, the sales team reviews the plan, and ultimately, they are responsible for approving the total volume. Sales may also suggest changes if they identify any issues with the plan. Typically, sales do not encounter any issues as they collaborate closely with the product manager during the plan creation process.

Demand Planning

In the second step of Alfa Laval's S&OP process, the focus shifts to demand planning. The primary objective is to generate a sales forecast to be delivered to the supply planning team. This step entails a week-long meeting where representatives from both local and regional sales organizations, alongside managers from each sales area, collaborate to submit the forecast to supply planning. This information is then integrated into the forecast tool, ensuring visibility in demand planning. The forecast calculation uses different methodologies depending on the sales pattern. After business unit sign off the forecast is released to operations.

Supply Planning

Step three in Alfa Laval's S&OP is the supply planning process, where the forecast is handed over to factories for assessment. This stage involves conducting a supply review to evaluate the feasibility of meeting volume demand, considering unconstrained demand, and conducting gap analysis. Two types of meetings are held: local supplier review meetings, where factories attempt to resolve gaps internally. If the issues are not solved, they are escalated to the global supply meetings in weeks 2-3, aiming to find global solutions. During the global supply meeting, prioritization discussions occur to address urgent matters. Alfa Laval explains that not all opportunities and issues identified can be solved within one

cycle, so the company works on them in parallel. The output of the global supply review meeting is always a proposed supply plan for the Executive S&OP to approve.

Executive S&OP Meeting

In step four, the Executive S&OP Meeting, the plan is adjusted as needed. Attendees include the head of the business unit, head of operations, global supply planning, demand planning, head of sales for each area, and representatives from finance. Depending on the situation, additional attendees may be involved. It is during the Executive S&OP meeting that all plans are combined and the final plan is submitted. They are also the final decision-makers for any unsolved gaps or business opportunities.

Notably, scenario planning is seen as part of the S&OP process. The difference is that it might not follow all steps in the exact same order as Alfa Laval normally does, and it might not involve as many people. A scenario is often raised during Alfa Laval's Executive S&OP meeting or during demand planning, and it is then handed over to the next step in the process for an "on top" evaluation.

Execution

The final step is Execution, meaning that Alfa Laval ensures that whatever decisions have been made actually happen. Sometimes, decisions are taken several months before this stage, so it's not necessarily linear with the rest of the stages. In addition to the execution meeting, Alfa Laval holds an annual strategic meeting where key stakeholders come together to assess alignment with long-term objectives and evaluate milestone achievements. While this meeting is distinct from the S&OP process, representatives from S&OP are involved to ensure coordination and alignment between operational execution and strategic goals. This strategic meeting provides an opportunity for comprehensive reflection on the company's trajectory and ensures that tactical plans remain aligned with overarching strategic objectives.

4.2.3 Getinge

Getinge's S&OP process is conducted on a monthly basis, with an 18-month planning horizon. In Getinge, 14 people work full-time on the S&OP process. Given the mix of MTO and MTS products, where MTS products are more prevalent, planning is done at an aggregated level. The company actively engages in handling tenders, which involves submitting detailed proposals to secure contracts for various services or products. One of Getinge's strengths lies in its ability to create transparency through the sharing of critical information, enabling early identification of potential issues. However, a significant weakness lies in the trust placed in forecasts, especially concerning MTO scenarios, which may impact decision-making. Getinge's focus on Sales and Inventory Operations Planning (SI&OP) involves meticulous management of inventory levels within distribution centers for

MTS products. For MTO products, there is a heightened emphasis on aligning forecasts with actual orders and developing scenario planning frameworks to enhance adaptability and responsiveness.

Getinge places a strong emphasis on four key performance indicators within its S&OP framework, namely forecast accuracy, days of inventory on hand (DIO) for MTS products, forecast bias, and On-Time-In-Full (OTIF) performance. Of these indicators, forecast accuracy is identified as the most critical KPI. The company's focus on inventory management revolves around maintaining balanced stock levels, particularly for MTS products, assessed through DIO. Additionally, OTIF performance is crucial for factory operations as it measures delivery punctuality to distribution centers or end customers. There is a recognized need for improvement in the latter. Overall, these KPIs are integral to ensuring efficient inventory management and delivery performance across Getinge's supply chain operations. Getinge S&OP consists of four steps, which are described below.

Pre- DRM Strategy Meeting & Baseline Generation

The first step in Getinge S&OP process is the Pre-DRM Strategy Meeting and Baseline Generation. During the Pre-DRM Strategy Meeting, key stakeholders such as sales, marketing, global demand planner, and supply planner come together to strategize and prepare for the upcoming demand review meetings (DRM) sessions. The objective of these meetings is to align priorities and objectives across departments to ensure effective collaboration during the DRM process. Simultaneously, Baseline Generation involves analyzing actual orders and utilizing statistical forecasting techniques to generate baseline forecasts for MTS products. By examining historical data and market trends, stakeholders can develop accurate forecasts to serve as a foundation for subsequent planning activities. Overall, the Pre-DRM Strategy Meeting and Baseline Generation set the stage for the DRM process, enabling cross-functional collaboration and informed decision-making to meet demand effectively.

Demand Review Meeting

Step two of the S&OP process is the Demand Review Meetings, which typically extend beyond a week due to the sole responsibility of one individual for sales service units (SSUs) across multiple countries. During these meetings, sales and marketing teams discuss the new unconstrained forecast, which spans 18 months. The focus is primarily on the top ten SSUs with the highest volume, including significant markets like the USA and China, which collectively contribute 40% of sales. Other key markets such as France, Germany, Switzerland, and Sweden are also highlighted. The global demand planner reports to the global sales department, referred to as commercial operations, while supply planners report to specific production sites. Before finalizing the forecast, there is a discussion of any changes, and approval is granted by the global demand planner and the commercial operations director.

Global Forecast Consolidation & Supply Review Meeting

Step three of the S&OP process is Global Forecast Consolidation and Supply Review Meetings. Here, supply planners at Getinge engage in internal discussions with production planning to assess the feasibility of new plans and determine if adjustments are necessary to address potential shortages. However, a notable gap exists in the supply chain process as Getinge does not directly communicate with suppliers to confirm their capacity to fulfill the company's demand. Purchasing is checking new demand and transfer to the suppliers, but this check is not consistent overall production sites, posing a risk to the supply chain's efficiency and resilience.

S&OP Meeting

Step four of the S&OP process involves convening a global S&OP meeting. This meeting serves as the culmination of the outcomes from both demand review and supply review meetings. Here, stakeholders discuss KPIs, inventory levels, and other relevant metrics to ensure alignment between demand and supply strategies on a global scale.

Additionally, there is an Executive S&OP meeting held each month, which serves as another forum for strategic discussion on an aggregate level. The purpose of this meeting is to improve the decision-making process within the organization. While issues are highlighted during this meeting, there is recognition of the need for a more refined decision-making approach. The senior management regularly joins this meeting to provide input and guidance. It's worth noting that the organization has been running the S&OP process for 10 years, starting in 2014.

4.2.4 Husqvarna

Husqvarna Construction has two S&OP processes, one for Equipment & Finished Goods and another for diamond tools. The principles, process, and thinking are the same but have different S&OP managers and organizations. In Husqvarna Construction's S&OP process, many people from different functions are included, such as sales, demand planning, supply planning, factory managers, factory controllers, product management, and the executive management team. Moreover, one employee work full-time on the S&OP process. Additionally, supply and demand planners work on their tasks while simultaneously improving the S&OP process. Approximately 75 people are involved in contributing to the S&OP process. Furthermore, the company aims to align demand with supply through its S&OP process, which occurs monthly with a planning horizon of 12 months, focusing on product groups and models. Husqvarna Construction explains that their strength in the S&OP process is the commitment and engagement at all levels, from demand and supply planners to executives. This is an established concept that everyone understands.

Husqvarna Construction faces challenges stemming from a lack of integration with IT systems, as a consequence of the many acquisitions, and a short-term

operational focus, which hampers long-term planning and decision-making processes. Issues like forecast accuracy results in inefficiencies in operations, where reporting takes precedence over strategic decision-making. Additionally, misalignment within the Parts & Accessories segment complicates operations, requiring a cohesive approach aligned with the category's portfolio ownership. Clarifying objectives, defining targets, and sharing responsibilities are essential steps to address these challenges. The introduction of new categories and leadership has led to fresh expectations, temporarily pausing the S&OP process until alignment is achieved. Husqvarna Construction's main improvement activities going forward include implementing S&OE for Spare Parts & Accessories and relaunching S&OP for Equipment. These initiatives aim to enhance coordination, decision-making, and overall operational efficiency within the organization.

The focus within Husqvarna Construction revolves around demand and supply management, with key metrics such as forecast accuracy and OTIF performance driving operational efficiency. Demand forecasting accuracy is crucial as it directly impacts customer satisfaction and supply chain effectiveness. Previously targeted at 70% at the article level, the company has shifted its focus to model-level forecasting to maintain high motivation levels. Forecast accuracy ranges between 10-60%, depending on whether the model are high runners or not, with product group levels achieving between 50% and 80% accuracy. On the supply side, the availability of products OTIF is closely monitored, along with various KPIs related to inventory management. These metrics are pivotal in ensuring the smooth flow of products through the supply chain, ultimately contributing to customer satisfaction and business success. Husqvarna Construction's S&OP process consists of four steps, which are described below.

Demand Planning Meeting

In the first step of the S&OP process at Husqvarna Construction, known as the Demand Planning Meeting, decisions are made for the upcoming month and up to a 12-month timeframe. During this meeting, the global sales team and the global supply chain management team convene to meticulously review and commit to a demand. The discussion covers major changes in demand patterns, updates on category activities (phase in/phase out projects), and market intelligence. Preparation for the Demand Planning Meeting begins with the sales companies and demand planners develop a bottom-up sales plans. These plans are then translated into central demand plan which equals the net demand. Both sales plan and central demand plan are presented in Demand Planning Meeting where product management, supply planning and demand planning are present. Decisions are made for the upcoming month and up to a 12-month timeframe.

To facilitate forecasting, Husqvarna Construction utilizes a sophisticated tool known as Logility. This system analyses past sales data and adjusts the central demand plan accordingly. Despite the system's capabilities, there are instances where it may not fully account for the phase in and out of products, or where discrepancies arise between the financial plan and market realities. In such cases, manual ad-

justments and expert insights are crucial to ensuring the accuracy and reliability of demand forecasts.

The phase in and phase out process involves product managers using analytics to assess demand trends and propose product changes. Once approved by the sales team, the supply chain organization evaluates inventory levels and develops a strategy for phasing out obsolete products. Factors such as cost, and timing are considered to ensure effective transitions.

Supply Planning Meeting

Step two of the S&OP process is the Supply Planning Meetings, which involves the crucial process of inventory planning followed by supply planning preparation. This step entails the meticulous preparation of new numerical projections for each factory for a rolling 12-month period. The aim is to ensure alignment between projected demand and the capacity of each factory to meet it. During the Supply Planning Meetings, the following tasks are undertaken matching net demand with available production capacity and component availability and making decisions on how to best meet demand under capacity constraints, providing manufacturing with an update on category activities, obtaining an update on the purchasing ability to supply, and ensuring product availability.

Supply Planning & Demand Planning Loop

Step three of the S&OP process involves the Supply Planning & Demand Planning Loop meeting, where issues related to capacity and volumes are addressed. This meeting serves as a platform to reconcile any discrepancies between supply and demand forecasts, ensuring that production capacity aligns with projected volumes.

Executive S&OP Meeting

Step four of the S&OP process is the Executive S&OP Meeting, where various discussions take place, such as adjusting capacity due to insufficient volumes. During COVID-19 on upcoming weeks and analysing market volatility. This meeting focuses more on reporting, with the entire management team present. The meeting benefits from strong support from the management team, enhancing sponsorship for the S&OP process. Husqvarna Construction does not have a designated strategic S&OP meeting but several processes where strategic decisions are taken. People in Executive S&OP Meeting are involved in these forums to ensure that this is incorporated in S&OP process. Occasionally, ad hoc meetings may occur, particularly if there is a noticeable increase in demand.

4.2.5 Sandvik

Regarding the S&OP process of Sandvik's business unit for Mining and Rock Solutions, the process itself is divided into two separate processes - one for Equipment (EQ) and one for Aftermarket (AM). The EQ S&OP process has been in

place for approximately 20 years; however, the AM process was initiated more recently, around 2 years ago. Although seemingly similar in terms of structure, the major difference between the two processes is the generation of forecasts. The forecast for EQ is fully qualitative, whereas the AM process relies on historical and statistical data. In other words, the EQ S&OP process builds its forecast based on opportunities, with sales personnel manually inputting these numbers into the forecast, as most of the EQ products are MTO. On the other hand, AM forecasting relies more on statistical methods, as most of the products are MTS. Both processes have a monthly frequency and a horizon of twelve months forward, focusing on planning objectives at an item level.

Sandvik's strategy benefits from the regularity and consistency of meetings, which is facilitated by a structured organizational approach. Strengths also encompass Sandvik's capacity to capture sales data directly from end-customers, integrating it seamlessly into the sales forecast. Furthermore, Sandvik facilitate adjustments to the warehouse management system in response to changes in demand, ensuring a flexible and responsive process. However, the process is not perfect and one improvement area includes enhancing demand planning in the AM segment, aiming for better qualitative input through focused insights from major customers, such as dealers, and monitoring their stock levels. Sandvik is also looking into improving the demand planning for EQ by incorporating both statistical and qualitative inputs, moving beyond just opportunities. Finally, as voiced by the company representative, there is also a need to develop more accurate measurements for the forecast of supply.

Regarding the KPIs of Sandvik, these revolves around the management of forecast bias in order to ensure accurate sales projections. Their target is to maintain a bias within +/- 10% for each sales area and +/- 25% for sales areas and product groups. If bias exceeds 25% consistently for three months, it prompts qualitative adjustments to forecasts. Sandvik prioritizes discussions with the sales organization to understand market dynamics, emphasizing volume accuracy over individual item accuracy. This KPI is monitored monthly to ensure alignment between projected sales and actual performance. Sandvik Rock Solutions's S&OP process consists of five steps, which are described below.

Product Portfolio Planning

The process begins with Product Portfolio Planning, a crucial step at Sandvik involving the management of product lifecycle transitions, including phasing out obsolete products and introducing new ones. It is important to note, however, that while there is a phase in/phase out process, it lacks a formal framework and tends to occur on an ad-hoc basis. Additionally, during the Product Portfolio Planning stage, product owners are responsible for identifying opportunities for AM growth. This may involve assessing market opportunities and adjusting the availability of selected product items. After the completion of the Product Portfolio Planning, Sandvik has an aligned product portfolio, going into the next step.

Demand Review: Sales Forecast

Moving forward, the next step is the part of the Demand Review which focuses on creating a Sales Forecast. This process involves utilizing statistical methods and manually incorporating exceptional demand to generate an unconstrained forecast, meaning a forecast of demand that ignores current capacity limits. As mentioned earlier, in this step, AM utilizes historical data and statistical methods, while EQ relies solely on qualitative assessment. Regarding AM, to generate the statistical sales forecast, demand planners analyze data from the past three years, placing greater emphasis on more recent data. Subsequently, Sandvik generates a new 12-month forecast, with data clustering either conducted to consolidate sales from the same sales area or from significant customers.

Demand Review: Supply Forecast

The third step in the S&OP process, and the conclusive phase of the Demand Review, is the Supply Review. Its primary objective is to formulate a supply forecast, essentially projecting the forthcoming demand from suppliers. This forecast is crafted by adjusting the previously determined sales forecast, factoring in internal inventory levels, and ensuring harmonization with anticipated sales figures. Subsequently, the global planning team undertakes monthly recalibrations of all inventory and safety stock levels. Additionally, manual adjustments to the supply forecast may prove essential, especially for strategically significant stock-up items. Once external demand is identified, Sandvik allocates this demand among suppliers, thus determining which suppliers will accommodate the requirements of each region. In the end, this process results in a single supply forecast for each supplier, detailing planned purchases and future demand for the upcoming period, covering both stock and non-stock items.

Supply Planning

Once the Demand Review is completed, the Supply Planning phase begins, which primarily involves identifying and resolving any potential shortcomings in Sandvik's capacity to meet demand. This process starts with an evaluation of the unconstrained supply forecast along with internal capacity, resources, and other factors affecting production. If necessary, adjustments may be made to the production schedule or procurement strategy to address any supply gaps. Additionally, Supply Planning entails close collaboration with key suppliers, as Sandvik holds handover meetings with them to discuss upcoming demand and potential capacity constraints. If capacity gaps are identified, solutions such as outsourcing or reallocating resources are considered. The result is a comprehensive plan detailing how demand will be fulfilled while optimizing resource usage and mitigating risks.

Execution

The Execution phase marks the fifth and final stage of Sandvik's S&OP process, where any outstanding issues are addressed and decisions are put into action. To

begin with, management performs a summary and performance review, which includes creating an agenda for upcoming executive meetings, outlining suggested actions, and identifying any gaps. During these meetings, decisions are made, and ownership of actions is assigned, thereby increasing the likelihood of their implementation. Returning to the performance review performed by management, evaluations may be conducted at the item level, segmented by sales area, to better understand discrepancies. Furthermore, this meeting involves representatives from key functions, including sales, operations, product management, and finance, emphasizing the cross-functional approach. Effective communication is emphasized, with finance developing their financial forecast - discussions often centering around whether this should be incorporated into the S&OP process or remain separate for comparison.

In terms of executive involvement, executives actively participate in the monthly S&OP process. However, challenges emerge when it comes to making actionable decisions. Adjusting forecasts in the EQ sector is relatively straightforward due to a lower number of items, whereas the AM presents a complex challenge requiring a comprehensive item-level analysis. Division managers play a crucial role in these discussions, offering valuable insight and guidance in matters that may be too time-consuming for executives. Furthermore, while Sandvik believes its S&OP process is in line with long-term strategic objectives, particularly focusing on aftermarket growth, strategic discussions currently do not occur within the recurring S&OP process. However, ongoing discussions are underway regarding the establishment of such strategic discussions - primarily aimed at facilitating the identification and onboarding of additional suppliers in the future.

4.3 Workshop Findings

The following section presents relevant information that emerged during the workshop held on April 11, 2024, at SKF's headquarters in Gothenburg, which all of the previously introduced companies attended, either in person or online. This section focuses solely on the gathered information. For details regarding the structure of the workshop and the overall process, please refer to Sections 2.1 and 2.3.3.

Defining Operational, Tactical and Strategic Planning

In terms of different planning levels, it was evident that the companies shared a mutual understanding of the definition of operational, tactical, and strategic planning, as well as the interplay between them and what sets them apart. Regarding the time-span of the planning levels, the overall understanding was that operational planning regarded the near future, with a time-span of approximately 3 months, whereas tactical planning focused more on the medium-term planning which regards approximately four to twelve months into the future. Finally, strategic planning was said to concern planning far beyond the twelve month mark, encompassing long-term objectives and vision.

Furthermore, the companies also share a unified understanding concerning the differences in objectives among operational, tactical, and strategic planning — i.e., what each planning level aims to achieve. For example, the representative from Getinge asserted that tactical planning involves decision-making based on the current operational setup, considering factors such as factories and internal capacity, while strategic planning revolves around anticipating future changes and developments. Representatives from Husqvarna supported this perspective, elaborating that strategic planning entails considerations such as investments, managing product portfolios, and potential mergers or acquisitions.

Furthermore, while SKF representatives were in alignment with the presented ideas, they pointed out the potential occurrence of short-term strategic issues, thereby highlighting the possibility of differentiating between strategic planning and long-term planning. Consequently, it becomes important to precisely define the interpretation of strategic planning.

The Planning Level of Sales & Operations Planning

Expanding on the discussion about various planning levels, conversations arose concerning the scope of S&OP — specifically, the planning level associated with it. Here too, the companies concurred, establishing that S&OP generally can be regarded as a tactical planning process, and that strategic long-term planning is a process separate from that of S&OP. Instead, it was agreed that the incorporation of strategic objectives into the S&OP process is crucial, as well as efficiently coordinating this interplay to enable a smooth and seamless alignment of plans.

Examining the S&OP processes of the companies involved in the cross-case analysis, most company representatives stated that, while they recognize the significance of integrating strategic-level objectives, their S&OP processes were currently not well-aligned with long-term strategic planning. Instead, most of the processes, all of which regarded as tactical planning processes, put greater emphasis on the operational planning, some labeling their S&OP process as a tactical-operational one. However, Alfa Laval constituted an exception as they have established an efficient way to mitigate the otherwise noticeable gap between S&OP and strategic planning – and the magic seems to lie in the overall meeting structure. As presented by company representatives, Alfa Laval achieves this coordination through involving key personnel in the strategic long-term planning, as well as in the final stages of the S&OP process. More specifically, the S&OP process owner possesses insight into both areas, facilitating a top-down approach. This empowers the process owner to effectively communicate strategic objectives and ensure operational performance aligns with them, thereby achieving company-wide alignment. If any deviations were to be uncovered at an operational level, the dedicated S&OP team is responsible for compiling information regarding potential long-term effects, which the S&OP process owner can then forward to the strategic planning team, if deemed necessary. Thus, coordination operates both upstream and downstream, effectively harmonizing all planning levels.

> ***“We [Alfa Laval] have a strong collaboration by sharing information and having one plan."***
>
> *- Head of Sales & Operations Planning, Alfa Laval*

As mentioned, the other companies too saw the importance of strategic long-term planning, although their S&OP process are yet to establish a coordination between that and the already existing S&OP processes. Husqvarna Construction, for example, highlighted that they have a separate strategic planning process that is not part of their S&OP process.

> ***“We [Husqvarna] have a separate process for strategic planning that we plan to loop into the S&OP process, but not as a part of the S&OP process.”***
>
> *- Supply Chain Management Director, Husqvarna*

Scenario Planning as a part of Sales & Operations Planning

Throughout the workshop, all companies either emphasized the pivotal role of scenario planning in their S&OP process or expressed an interest in integrating scenario planning at a later stage. Getinge, for example, currently utilizes a probability framework to assess their likelihood of securing new tenders. However, they recognize the value of incorporating scenario planning to gain insights into whether they possess sufficient capacity to meet demand or if they need to explore alternative options.

At Alfa Laval, scenario planning appears to be crucial for ensuring that operational performance is in line with strategic long-term objectives, as evidenced by the discussions summarized in the preceding section on planning levels. During the workshop, it was mentioned that scenario planning takes place at Alfa Laval during both the local supply meeting and the global supply meeting to address various issues, each with as many potential solutions. These meetings precede the executive S&OP meeting, where all unresolved issues are discussed.

Finally, Husqvarna, which currently employs a purely reporting-based scenario planning method where scenarios are reported to executives for decision-making, emphasized a desire to transition to a more decision-oriented approach. Moreover, they aspire to emulate the framework followed by Alfa Laval, while also underscoring the importance of thorough preparation before the executive S&OP meeting, suggesting that only major issues should be discussed. Additionally,

they advocate for presenting various options alongside their associated opportunities and risks for each option.

4.4 Key S&OP Dimensions: An Overview

The following section provides insights into the organizational settings of the case companies, focusing on their S&OP processes and pertinent dimensions. The summarized data pertaining to this aspect is presented in Table 4.2.

Table 4.2: Organizational settings with contextual S&OP process details.

	SKF	Alfa Laval	Getinge	Husqvarna	Sandvik
Initiation	2010	2018	2014	2019	EQ: 2004 AM: 2022
Frequency	Monthly	Monthly	Monthly	Monthly	Monthly
Horizon	12	18	18	12	12
Planning Object	Item level	Completed units	Product family	Product groups & modules	Item level
Nr. of people primarily working with S&OP	6	2	14	1	1
Nr. of people involved in S&OP	130-150	10 (50)	60	75	65
SKUs	150 000	300 (configurable)	10 000	EQ: 1 500 P&A: 225 000	14 000
Factories	Prod: 55	Assemb: 7 Comp: 3	Prod: 20	Prod: 7	Prod: 3
Distribution centers	60	4	3	4 GDCs 60 local DCs and SCs	6
Production strategy	Prim: MTS Sec: MTO	Prim: ATO Sec: MTS	Prim: MTS Sec: MTO	Prim: MTS Sec: MTO	Prim: MTO Sec: MTS

5. Analysis

In this chapter, an assessment of all companies' S&OP processes will be conducted using the maturity model. The maturity model focuses on companies' strengths and weaknesses in their S&OP processes based on empirical findings.

5.1 Assessment of S&OP Processes

The assessment is based on the maturity model created by Danese et al. (2018) and conducted through interviews with each respective cross-case company. Ratings were assigned to each dimension for each company. Figure 5.1 provides a comparison of all companies' stages in the maturity model.

5.1.1 SKF

SKF has a robust monthly S&OP process for IM, with the majority of the grades falling within stages 3 and 4. One positive aspect is their regular and structured process, supported by a formal S&OP team that collaborates with main suppliers during supply meetings. However, executive participation and alignment between S&OP and strategic planning are lacking. An explanation of SKF's stages in the maturity model is provided below.

People and organization

SKF has a well-defined S&OP process and a dedicated S&OP team in place to ensure effective execution throughout the organization. The S&OP team at SKF provides both standard education sessions for stakeholders and specialized training tailored to specific target groups. For example, they offer comprehensive S&OP overviews for stakeholders and detailed, tool-focused training for employees to promote skill development. Additionally, SKF collaborates closely with key suppliers by providing them with forecasts and verifying their capacity to meet volume requirements. This places SKF at stage 3.5 in the maturity model. However, to advance to stage 4, SKF must incorporate executive participation in the S&OP process with strategic planning. Moreover, SKF is not at stage 5 in people and organization since the S&OP process owner is not the coordinator of the entire network, and the participation of top management from all partnering companies is missing.

Process and methodologies

SKF has implemented a formalized and structured process, ensuring that all steps of the planning cycle are followed consistently and efficiently. This includes clearly defined roles and responsibilities, standardized procedures for data collection and analysis, and documented workflows for decision-making and plan

execution. This places SKF at stage 3.5 in the maturity model. However, SKF has not yet reached stage 4 and 5, as they primarily collaborate with main suppliers but have limited collaboration with main customers in their S&OP process. For example, SKF can establish regular (e.g., monthly or quarterly) S&OP meetings with key customers to review and align on demand forecasts. Additionally, SKF lacks dynamism with event-driven meetings and an emphasis on long-term strategic plans to support the company's growth objectives.

Information technology

SKF has implemented an integrated demand and supply planning software. This software allows the sales team to input demand data, which can then be compared with statistical forecasts and adjusted accordingly. Based on this comparison, the factory can plan capacity, and the supply team can develop corresponding supply plans. This integration represents stage 3 in information technology maturity. To advance to stage 4, SKF must further enhance its capabilities by accessing external partner data and collaborating with them through specialized web-based platforms, which are currently missing at SKF. For example, implementing a shared forecasting tool or platform where SKF and their main customers can input and update their demand forecasts in real-time. This transparency ensures that both parties are working with the same data and can quickly respond to changes in demand. To advance to stage 5 in information technology, SKF must innovate its technology to support decision-making further. This involves leveraging innovative tools and systems to enable more sophisticated analysis, particularly in areas such as risk management and scenario analysis for profitable trade-offs.

Performance measurement

SKF utilizes shared performance metrics to inform decisions that balance conflicting objectives and optimize overall business performance. This approach is evident in SKF's supply review process, which aims to determine capacity planning to meet future demand, stock, and service targets, while addressing any constraints identified in the unconstrained forecast. This review serves as the foundation for supplier capacity planning, crucial for securing material and component supply by sharing demand information with suppliers. Moreover, SKF has a phase in and phase out process for items, but it occurs within the data system and is executed outside of the S&OP process. This integrated internal supply chain metrics approach aligns SKF with stage 3.5 in the maturity model. Furthermore, to advance to stages 4 and 5, SKF needs to strengthen their phase out process for items to eliminate unprofitable products and retain profitable ones through strategic decisions with the help of the product manager. SKF must also emphasize the importance of external supply chain metrics to support decision-making at the supply network level. While SKF considers forecast accuracy and inventory availability, it also needs to enhance collaboration with its main customers in the supply network.

5.1.2 Alfa Laval

Alfa Laval GPHE has a comprehensive S&OP process, with the majority of the grades falling within stages 3 and 4. The S&OP process owner serves as the coordinator for the organization, and Alfa Laval has a formalized and structured S&OP process with executive participation. An explanation of Alfa Laval GPHE's stages in the maturity model is provided below.

People and organization

Alfa Laval has a structured monthly S&OP process and a formal S&OP team with executive participation at the end of the monthly cycle. Additionally, in supply planning, they collaborate with main suppliers by providing forecasts and checking if they can meet the volume requirements. Moreover, the S&OP process owner at Alfa Laval takes on the role of coordinator in the organization through meeting structures. The process owner participates in various meetings during the monthly S&OP process and the annual strategic review meeting. Therefore, Alfa Laval is in stage 4 in people and organization. To reach stage 5, Alfa Laval needs the S&OP process owner to become the coordinator of the entire network and the participation of top management from all partnering companies.

Process and methodologies

Alfa Laval holds both local and global supply meetings to address issues, with factories attempting to resolve gaps internally. If the issues remain unresolved, they are escalated to the global supply meetings with the aim of finding global solutions. Discussions on prioritization occur during these meetings to address urgent matters. This dynamic process allows Alfa Laval to be responsive to changes in production capabilities and supply chain disruptions. Furthermore, Alfa Laval's S&OP process includes strategic planning led by the S&OP owner, and the formal S&OP team participates in the annual strategic review meeting. This ensures they can respond if the top management team makes strategic decisions that will affect S&OP planning. Therefore, Alfa Laval is at stage 3.5 in process and methodologies. To progress to stages 4 and 5, Alfa Laval must collaborate with customers to obtain more accurate actual demand and hold external event meetings with external partners.

Information technology

Alfa Laval utilizes software to integrate demand and supply planning, aiding in the consolidation and analysis of demand forecasts, production plans, inventory levels, and other relevant data. This level of integration reflects Alfa Laval's progression to stage 3 in information technology. To reach stage 4, Alfa Laval needs to enhance its capabilities by incorporating external partner data and fostering collaboration through specialized web-based platforms.

Performance measurement

Alfa Laval monitors several critical KPIs across its operations, placing particular emphasis on two primary KPIs: return on capital employed and planning adherence. While accuracy in forecasting is important, Alfa Laval values stability in forecast variation and the ability to manage it effectively over achieving absolute precision. Additionally, inventory management KPIs are used to optimize resource utilization. Furthermore, Alfa Laval incorporates phase in and phase out processes in its monthly S&OP process. Therefore, Alfa Laval is in stage 3.5 of performance measurement. To progress to stages 4 and 5, Alfa Laval must use external supply chain metrics to support decision-making at the supply level and measure the impact on the ecosystem.

5.1.3 Getinge

Getinge operates one S&OP process across all divisions: Surgical Workflows, Acute Care Therapies, and Life Science. Getinge's S&OP process falls between stage 3 and 4. Their S&OP features a formalized and structured process, regular meetings, and clear roles and responsibilities. An explanation of Getinge's stages in the maturity model is provided below.

People and organization

Getinge has implemented an S&OP approach that prioritizes collaboration and information sharing within the organization. Additionally, the company has established a framework for assessing their success in winning tenders and has maintained collaboration with customers to win the tender. Therefore, according to maturity models, Getinge is currently positioned at stage 3.5 in people and organization. To reach stages 4 and 5, executive participation must integrate emphasis on long-term strategic plans to support the company's growth plans. The S&OP process owner must become the coordinator of the entire network, and there must be participation from top management of all partnering companies.

Process and methodologies

Getinge has a monthly formalized and structured S&OP process in place with financial integration. The process is balanced with external network partners, as Getinge frequently deals with tenders, which necessitates a customer-driven approach within the network. However, there is a lack of joint alignment between demand and supply plans. While purchasing checks new demand and transfers it to suppliers, this process is not consistently applied across all production sites, posing a risk to the supply chain's efficiency and resilience. This places Getinge at stage 3.5 in process and methodologies. To progress to stages 4 and 5, Getinge must collaborate more closely with suppliers to enhance demand and supply plans. Additionally, they should hold event-driven meetings with all partners in the network to enhance the effectiveness of their S&OP process.

Information technology

Getinge has implemented specialized software tailored to seamlessly integrate customer demand with their supply planning processes. This software enhances data organization and coordination, facilitating its management and utilization across the company. Essentially, it enables Getinge to synchronize production and inventory levels more effectively with actual customer needs, leading to a smoother and more efficient supply chain operation. This advancement aligns with stage 3 in information technology. To progress to stage 4, Getinge must utilize technology to access external partner data and share information with them.

Performance measurement

Getinge integrates internal supply chain metrics to manage trade-offs, focusing on forecast accuracy, inventory levels for MTS products (measured by DIO), forecast bias, and OTIF performance. Forecast accuracy is considered the most crucial. The company maintains balanced stock levels, especially for MTS products, and prioritizes OTIF performance for timely deliveries. This aligns with stage 3 in performance measurement. However, Getinge lacks external supply chain metrics to support decision-making at the supply network level and a phase in and out process for products or item level, which are necessary for progressing to stage 4 in performance measurement.

5.1.4 Husqvarna

Husqvarna Construction's S&OP process is robust and falls between stage 3 and 4 for most dimensions. They have an S&OP owner, executive participation in the monthly process, collaboration with main suppliers, and metrics for new product introduction. An explanation of Husqvarna Construction's stages in the maturity model is provided below.

People and organization

Husqvarna Construction has established a formal and structured S&OP process with executive participation. At the final step of their S&OP process is the executive S&OP meeting, benefiting from strong support from the management team, enhancing sponsorship for the S&OP process. Furthermore, Husqvarna Construction collaborates with its main suppliers to ensure they can meet the demand and deliver on time. This places them at stage 3.5 in people and organization in the maturity model. However, they are not at stages 4 or 5 since the company has not coordinated S&OP with strategic planning, and the S&OP process owner does not become the coordinator of the entire network, while participation of top management from all partnering companies is missing.

Process and methodologies

Husqvarna Construction has implemented a formal and well-organized process to ensure consistent and efficient execution of each step in the planning cycle.

This structured approach encompasses clearly defined roles and responsibilities, standardized methods for data gathering and analysis, and documented procedures for decision-making and plan execution. According to maturity models, this places Husqvarna Construction at stage 3.5 in terms of maturity. However, the company has not yet progressed to stages 4 and 5. While they closely collaborate with their primary suppliers, their engagement with main customers in the S&OP process remains limited. Additionally, there is a lack of dynamism with event-driven meetings and insufficient emphasis on long-term strategic plans to support the company's growth objectives.

Information technology

Husqvarna Construction utilizes software to integrate demand and supply planning. By integrating demand forecasts with production capacities and inventory levels, the software helps optimize production schedules, aligning with stage 3 in information technology in the maturity model. Currently, Husqvarna Construction has not progressed to stages 4 or 5, as they lack access to external partner data and scenario analysis in the S&OP process. Therefore, stage 3 in information technology appears appropriate.

Performance measurement

Husqvarna Construction's operations are centered on effective demand and supply management, with crucial metrics such as forecast accuracy and OTIF performance serving as the backbone for driving operational efficiency. This emphasis on aligning supply with demand and consistently meeting delivery commitments can be viewed as indicative of S&OP effectiveness. Additionally, Husqvarna Construction has implemented a phase in and out process for products in their S&OP. Therefore, they are currently in stage 3.5 of performance measurement. To progress to stages 4 and 5, they need to incorporate external supply chain metrics to support decision-making at the supply network level and consider measuring the impact on the ecosystem, such as social impact and global environmental impact.

5.1.5 Sandvik

The assessment of Sandvik Mining and Rock Solutions' S&OP in EQ and AM was carried out simultaneously since both processes are quite similar, falling between stage 3 and 4 in the maturity model. They have a formalized and structured process, collaboration with main suppliers, and a phase out process for AM. An explanation of Sandvik Mining and Rock Solutions' stages in the maturity model is provided below.

People and organization

Sandvik has a structured S&OP process with clear roles in data gathering, demand planning, and sales planning. They collaborate with main suppliers to se-

cure products by providing forecasts and double-checking if they can meet future demand. Therefore, Sandvik is in stage 3.5 in people and organization. To progress to stages 4 and 5, Sandvik needs to coordinate S&OP with their strategic planning. The S&OP process owner should become the coordinator of the entire network, with the participation of top management from all partnering companies.

Process and methodologies

Sandvik has implemented an S&OP with regular meetings and detailed decision points. Furthermore, demand and supply plans are jointly aligned, with Sandvik's AM utilizing historical data and statistical methods, while EQ relies solely on qualitative assessment in demand review. Supply Planning entails close collaboration with key suppliers, as Sandvik holds handover meetings with them to discuss upcoming demand and potential capacity constraints. This places Sandvik Mining and Rock Solutions at stage 3.5 in process and methodologies. To progress to stages 4 and 5, they need to collaborate more with customers to understand the actual demand and hold event-driven meetings.

Information technology

Sandvik utilizes software to merge demand and supply planning. Through the integration of demand forecasts, production capacities, and inventory levels, the software optimizes production schedules, aligning with stage 3 in the information technology maturity model. Sandvik has not yet to advance to stages 4 or 5 due to the absence of external partner data access and scenario analysis in the S&OP process. Hence, stage 3 in information technology seems fitting.

Performance measurement

Sandvik's KPIs in S&OP focus on managing forecast bias to ensure accurate sales projections. They prioritize discussions with the sales organization to understand market dynamics and emphasize volume accuracy over individual item accuracy. These KPIs are monitored monthly to ensure alignment between projected sales and actual performance, reflecting the effectiveness of Sandvik's S&OP process. However, while they have a phase in and out process on an item level, it lacks a formal framework and tends to occur on an ad-hoc basis. Therefore, Sandvik is in stage 3.5 in performance measurement. To progress to stages 4 and 5, they need to ensure they can deliver what the actual customer demands and implement measurement of the impact on the ecosystem, such as social impact and global environmental impact.

5.1.6 Process Comparison

Figure 5.1 summarizes the stages of S&OP maturity across all companies in the cross-case study. SKF is on par with other companies in most dimensions of the S&OP maturity model, yet there remains room for improvement. In the dimension of people and organization, SKF currently stands at stage 3.5. To progress to

stage 4, SKF must incorporate executive participation and align strategic planning with S&OP processes, similar to Alfa Laval's approach. Alfa Laval has achieved stage 4 by empowering the S&OP process owner to serve as a coordinator within the organization through structured meetings. This process owner actively participates in various meetings throughout the monthly S&OP cycle and the annual strategic review meeting, thereby bridging the gap between S&OP and strategic planning. The necessity for executive involvement and coordination between strategic planning and S&OP lies in ensuring alignment between operational decisions and overarching organizational objectives. Executive participation also provides the authority and resources required to address challenges and drive effective implementation.

What is noteworthy is that while Husqvarna, Alfa Laval, and Sandvik have executive participation in their S&OP processes, they have not successfully integrated S&OP with strategic planning. This is because the focus during the executive S&OP meetings is primarily on resolving issues that occurred during the previous month's process or even earlier. Therefore, they have not reached stage 4 in the people and organization dimension.

Furthermore, Husqvarna, Alfa Laval, and Sandvik have phases in and phases out in their product portfolios as part of demand planning within their S&OP processes. This typically involves collaboration with sales and product managers. In contrast, SKF also implements a phase in and phase out process for items, but it occurs automatically within the data system, with a focus primarily on item replacement. This process is executed independently of the S&OP process. By enhancing collaboration with their product manager in this area, SKF can take a step closer to reaching stage 4 in performance measurement.

Only Getinge has close collaboration with their main customers through regular meetings due to their tenders. SKF can advance to stage 4 in process and methodologies if they establish regular (e.g., monthly or quarterly) S&OP meetings with key customers to review and align on demand forecasts. Finally, none of the cross-case companies reach stage 4 in the information technology dimension, which involves enhancing capabilities by accessing external partner data and collaborating with them through specialized web-based platforms. However, the authors have not delved deeply into the information technology dimension for SKF since it requires practical experience.

Figure 5.1: Assessment of the S&OP processes of companies partaking in the cross-case analysis (Danese et al., 2018).

6. Discussion

This chapter will discuss aspects relevant to answering the research questions. The discussion is based on the literature review, empirical findings, and the conducted analysis.

6.1 SKF's S&OP: Weaknesses and Obstacles

Initially, concerning the weaknesses identified within SKF's S&OP process, more than one gap has been identified. These weaknesses have been identified through interviews, documentation (PowerPoint presentations), and theoretical comparisons. SKFs weaknesses within S&OP can find in Table 6.1.

Table 6.1: SKFs Weaknesses within S&OP: Authors' Identified

Weaknesses
Uncertainty regarding forecast calculations, which leads to inaccurate demand planning.
The need for improved user experience (reducing system complexity and improving the S&OP report structure), which hampers efficiency and user satisfaction.
The lack of a predefined framework for order prioritization in capacity planning causes inefficiencies in resource allocation, highlighting the importance of developing a strategic priority for customers.
The absence of executive S&OP meetings, resulting in a lack of strategic oversight.
A poor strategic phase-out process for items can lead to excess inventory of unprofitable products.
Poor coordination among planning levels, particularly between S&OP and strategic planning, which leads to misalignment in objectives and suboptimal decision-making.

Among these, the biggest gap is poor coordination among planning levels, particularly between S&OP and strategic planning. This is the most significant issue

because it results in a lack of alignment in goals, inefficient resource use, and poor overall performance. It's worth noting that this gap was also discussed with SKF, and therefore, this subject was the focus in the workshops conducted. Additionally, the lack of a predefined framework for order prioritization in capacity planning will also be included for further discussion. This gap is crucial to address as it leads to inefficiencies in resource allocation, making it difficult to meet customer demand effectively.

Despite these weaknesses, the strength of SKF's S&OP process lies in its ability to develop a common plan to meet customer demand while also planning at the item level. SKF has a dedicated S&OP team, which provides opportunities to enhance the monthly process and tools.

Lack of Predefined Framework for Order Prioritization

At SKF, there is no predefined framework for prioritizing orders in constrained scenarios within capacity planning. The factory currently holds the authority to prioritize orders as deemed appropriate, guided by the principle of fair share. However, this approach lacks consistency, leading to variations in decision-making from one situation to another. Such inconsistency can result in confusion and inefficiency within the organization. This might be more part of S&OE because it deals with day-to-day execution. However, it can still be part of S&OP by making strategic decisions in an executive S&OP meeting about which customers to strategically prioritize.

Furthermore, the absence of clear guidelines increases the risk of decision-makers relying on subjective factors or personal preferences in order prioritization. Without a structured approach, there is an increased risk of biases influencing decision-making processes, compromising SKF's ability to ensure fair and efficient allocation of resources. The obstacle lies in the broad range of customer segments and product variants that SKF deals with, making it complex to create a predefined framework for each factory.

According to Danese et al. (2018), SKF should integrate innovative technology to enhance decision-making capabilities, especially if they aim to progress to stage 5. This includes leveraging technology for risk management and conducting scenario analyses to navigate profitable trade-offs. Furthermore, increasing the knowledge among employees who utilize these tools is also crucial. Without adequate training and understanding, the implementation of advanced tools would be futile.

Misalignment Between Operational Performance and Strategic Planning

SKF currently conducts a monthly S&OP process with a 12-month planning horizon. While this process largely aligns with the framework presented by Ross (2015), a significant weakness is the absence of an executive S&OP process, where senior managers resolve remaining issues and authorize the overall S&OP plan (Ross, 2015). Furthermore, the risk from this deficiency is much greater than

merely missing an opportunity to report to superiors. Considering the absence of an executive S&OP process in light of the work by Bower (2005) and Lapide (2011), this omission poses a significant risk of misalignment between the firm's operational performance and its long-term strategic objectives. Specifically, not incorporating an executive S&OP process risks neglecting the organizational forum essential for assessing operational performance against long-term plans, as emphasized by Bower (2005). Lapide (2011) also underscores the importance of integrating strategic long-term planning into the S&OP process, a task ideally suited for executive meetings, given their influence on such matters. While the presence of an executive S&OP meeting alone will not automatically align operational performance with strategic planning, its absence likely results in missed opportunities to achieve this alignment.

6.2 Holistic Process Comparison

In general, all companies adhere to the various stages of the S&OP process, such as S&OP data gathering, demand planning, supply planning, pre-executive S&OP meeting, and executive S&OP meeting. Figure 6.1 is a comparison of all cross-case companies' S&OP processes according to Ross (2015). Moreover, each company in the study utilizes different terminology for their sub-processes, and sometimes activities overlap between stages. For instance, Husqvarna's first step involves demand planning, which encompasses both data gathering and demand planning activities, aligning closely with the descriptions provided by Ross (2015).

Most companies have a step 1 data gathering phase in their S&OP process. The approach to data gathering can vary depending on factors such as industry, company size, products, and market dynamics. The most common practice is for the sales organization to collect demand from customers and compare it with forecasts from their software systems. This aligns with Ross (2015), which explains that data gathering is essential for laying the groundwork before proceeding further. This is important for every company in this study. However, it is noteworthy that Getinge, for instance, utilizes the terminology "demand planning" for both their data gathering and demand planning activities. This distinction is crucial, especially for Getinge, given their involvement in many tender projects, which makes statistical forecasting more complex. Therefore, input from the sales organization, under the label of "demand planning," is essential for laying the groundwork before proceeding further.

Ross (2015) further explains that data files play a pivotal role in facilitating the tasks of demand planners by providing them with reliable information for forecasting purposes. Key components of these data files include total sales, current backlog, production figures from preceding periods, and inventory status at the end of the period under consideration. Interestingly, not all companies mention current backlog and inventory status in their data gathering. The reason might be that they prioritize presenting net sales in the decision supply meeting, which will

give guidance if they have constraints or unconstraints in capacity planning.

Most companies have a step 2 in demand planning, which involves comparing sales input from data gathering with forecasts. The aim is to create a single sales forecast for the factory, which will later be the input for step 3 supply planning. Furthermore, in step 3 supply planning most companies conduct capacity planning in the factory to check if they can meet the demand. They then send the forecast to respective suppliers and check if the suppliers can meet the demand. However, the checking step is not part of Getinge's process.

In this study, none of the companies have a step 4 pre-executive S&OP meeting; instead, they hold a step 5 executive S&OP meeting. During this meeting, many companies address any unresolved issues or problems from previous steps. Additionally, some companies see opportunities for improvement in this consolidated approach. For example, Husqvarna emphasizes that this meeting primarily focuses on reporting, with the entire management team in attendance. They aim to make more decisions within the S&OP process before the executive S&OP meetings, reserving the latter for addressing critical issues only. However, despite structural similarities, many companies express difficulties in effectively integrating S&OP with strategic planning.

It's noteworthy that SKF does not have a step 4 pre-executive S&OP meeting and a step 5 executive S&OP meeting. Instead, in SKF, there is an execution step that is conducted outside of the S&OP process, as outlined by Ross (2015). Therefore, the execution step in SKF is conducted outside of the S&OP process, as illustrated in Figure 6.1

One notable point is that executive management team attendance is not always mandatory in these meetings. Instead, high-ranking managers often participate. This practice may stem from the fact that these managers may lack comprehensive information about strategic planning and execution. However, Alfa Laval has succeeded in bridging the gap between S&OP and strategic planning by ensuring that the owner of the S&OP meeting is also a part of the annual strategic meeting. This helps the S&OP team gain insight into the future and what should be planned.

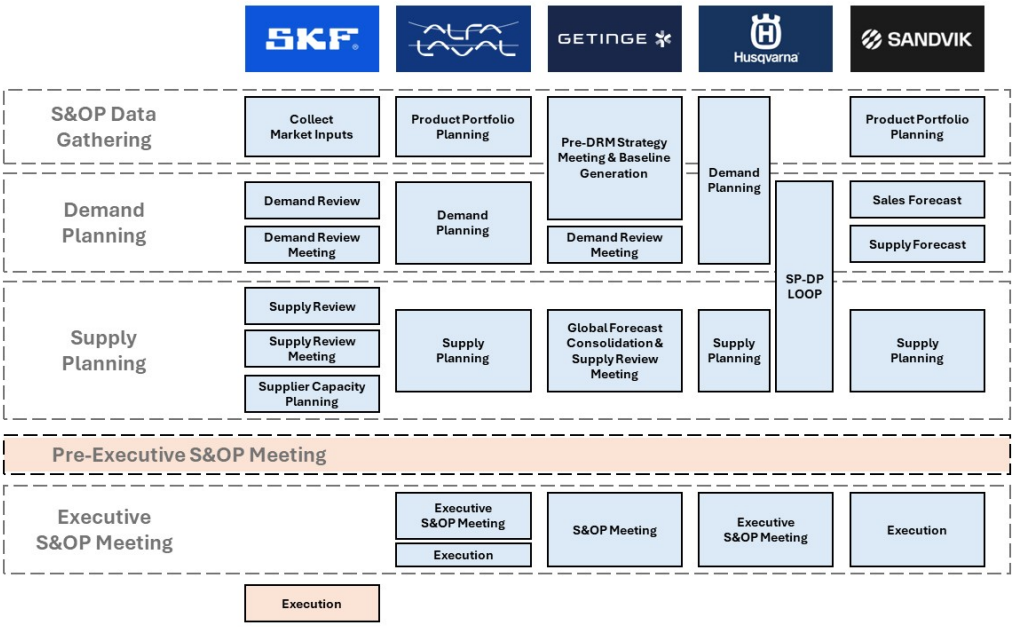

Figure 6.1: A comparison of the S&OP processes among companies participating in the cross-case analysis and existing literature (Ross, 2015).

6.3 Strategic Planning: Theory vs. Practice

The following section aims to discuss findings from both the literature review and the empirical data gathering, and to reflect on potential similarities or differences. Furthermore, the text will weave between topics, establishing connections where feasible, to present a comprehensive understanding of the interplay or disparities between theory and practice.

Reflecting on the literature reviewed earlier in the project, particularly in terms of strategic long-term planning and its integration into the S&OP process, Ross (2015), Lapide (2014), Bower (2005) and Lapide (2011) all address the aspect to varying degrees. Beginning with Lapide (2011) work (see Section 3.4), which introduced three distinct planning levels (operational, tactical, and strategic), it was explicitly stated that strategic planning should not be conflated with the S&OP process. Specifically, S&OP was described as a tactical process at the medium-term level, while strategic planning was deemed a separate process. Nonetheless, its integration into the S&OP process was deemed crucial; the S&OP process described as the vital link between operational execution and strategic objectives, acting as the bridge between the long-term business plan and operational performance in the near future. Analyzing the empirical data gathered from the workshop reveals that the companies involved in the cross-case analysis align with Lapide (2011) perspective. They concur that strategic involvement is an external process relative to the S&OP process, emphasizing the importance of coordination instead. Additionally, the companies adopt Lapide (2011) definition of the three planning levels, albeit with a slight deviation in timeframe, as they consistently exhibit shorter planning horizons.

Proceeding with Bower (2005), one of the twelve common pitfalls reported is the observed discrepancy between operational performance and strategic long-term objectives. Additionally, according to Bower (2005), strategic plans might be developed but revisited only occasionally, often collecting dust on a shelf in the meantime. Lastly, Bower (2005) also emphasizes that this discrepancy may arise due to the lack of an organizational forum for reviewing operational performance in relation to strategic long-term objectives—an issue that mature S&OP processes aim to address.

When considering this issue during the analysis of the companies' S&OP processes, it becomes evident that the gap exists in all cases except for Alfa Laval's. While Alfa Laval does not continuously monitor the fulfillment of strategic objectives, they have established a process that enables them to assess whether an operational deviation will have a significant long-term impact; thereby facilitating potential adjustments to the strategic planning. Moreover, Alfa Laval's process is reinforced by literary support from the work of Ross (2015), which suggests that the final stage of the S&OP process — namely, the executive S&OP meeting — should involve the possible modification of the current business plan. Examining the processes of the remaining companies reveals that, with the exception of SKF, they also incorporate an executive S&OP meeting. However, these meetings do not serve as forums for reviewing operational deviations in relation to strategic long-term matters, resulting in processes that deviate from both Alfa Laval's approach and the literary framework provided by Ross (2015).

Finally, concerning how the coordination between strategic long-term planning and operational performance might be realized in practice, Lapide (2014) provides a helpful tip towards achieving a consensus-based plan by leveraging a planning hierarchy. While this may not be directly related to the coordination between strategic and operational performance, it could serve as a source of inspiration. Expanding on this point, to enhance coordination between planning levels, it could be advantageous to translate the potential implications of scenarios, such as a projected 15% increase in market share in Asia over the next five years, into tangible metrics like the number of SKUs to be produced at nearby facilities. This translation would allow for easy comparison with strategic objectives, enabling benchmarking in case of any deviations from the operational targets derived from these translations. However, regrettably, this aspect was not addressed during the workshop, resulting in a lack of empirical data available for further analysis.

6.4 Leveraging Insights for Process Enhancement

From the perspective of process enhancement, considering the previously mentioned gaps, notably the final one, it is evident that SKF needs to make structural changes to their meeting framework. These changes are essential to bridge the gap between operational performance and strategic long-term planning, or at least to reduce the risk of such misalignment occurring. According to the literature, it is important to establish coordination among the three distinct planning

levels: operational, tactical, and strategic, with S&OP serving as a bridge at the medium-term level between operations and strategy (Lapide, 2011). Furthermore, the report clearly indicates that strategic long-term planning, as viewed by both literature and company representatives, should be considered a process separate from S&OP. However, this does not diminish its importance; rather, the focus should be on how to effectively incorporate it into the S&OP process. This point has been reiterated several times throughout the report. Moving forward, let us explore the measures SKF should take to achieve better alignment between their operations and long-term strategic planning.

To begin with, as previously mentioned, SKF should consider revising their current S&OP process, particularly the monthly structure, to incorporate an executive S&OP meeting. The introduction of a recurring executive S&OP meeting would provide SKF with an essential organizational forum for assessing operational performance in relation to strategic visions, a forum considered crucial by Bower (2005). It should be noted, however, that this might not be an easy task erring that it requires acquiring the interest from executive management. Pro tip: Leverage the fact that it involves achieving strategic objectives and realizing future visions; this approach should certainly raise some interest.

However, as stated earlier in the discussion, merely introducing an executive S&OP meeting without complementary changes is unlikely to address the potential misalignment. Therefore, SKF should draw inspiration from Alfa Laval's framework, particularly how they have established coordination between the S&OP team and the personnel responsible for strategic decisions, who otherwise operate disconnected from the operational level. Furthermore, considering the busy schedules of the executive team responsible for overall strategic visions, it is reasonable to assume that it would be difficult to engage them if the revised structure demands too much of their time. Thus, in addition to the executive S&OP meeting, a pre-executive S&OP meeting should be implemented. This meeting would not only summarize all decisions made but also review operational performance and potential deviations. This information should then be used for scenario planning, translating operational performance into strategic outcomes. Essentially, this process would address the crucial question: *Where will we end up unless we remedy the situation?* After scenario planning has been conducted, the S&OP process owner should be responsible for briefing the executive management team if the company is off course and a change is required. Likewise, the process owner should also be responsible for taking strategic decisions made at the executive level and ensuring they are effectively communicated and implemented throughout the company, reaching the operational planning level. Implementing these changes could establish a more efficient bridge between strategy and operations. Operational deviations would be acknowledged and, if necessary, reported to strategic decision-makers for further analysis.

Finally, SKF should consider utilizing the planning hierarchy recommended by Lapide (2014). As discussed in the section on strategic planning in theory and practice, this approach could facilitate scenario planning and effectively communicate strategic decisions to other planning levels, such as operational planning.

However, since this was not covered during the workshop, there is still limited insight into its functionality. Therefore, it is mentioned only briefly.

7. Conclusion and Recommendation

This concluding chapter aims to provide comprehensive answers to the research questions outlined earlier in the report. Specifically, it will present the identified weaknesses in SKF's S&OP process, as well as highlight the similarities and differences among the companies involved in the cross-case analysis. Additionally, it will address the third and final research question, which focuses on potential improvements for SKF. The chapter will conclude with a final recommendation for SKF, a discussion on the study's generalizability and limitations, and suggestions for future research.

7.1 Addressing Key Research Questions

Beginning with the first research question, which addressed the primary weaknesses of SKF's S&OP process and the main obstacles to its improvement, two key weaknesses emerged during the cross-case analysis.

The initial weakness concerns the lack of a predefined framework for order prioritization, which may result in inconsistencies and suboptimal decision-making. To elaborate, the absence of an objective prioritization method leaves room for subjective judgments influenced by ad-hoc factors. This scenario poses the risk of overlooking potentially more profitable opportunities, causing customer dissatisfaction, and leading to under-utilization of resources. This issue might primarily pertain to S&OE, as it affects daily operations directly. However, it remains a critical topic within the broader S&OP framework because the effectiveness of daily execution has a significant impact on the overall planning process. Addressing this weakness is crucial for aligning strategic plans with operational realities, ensuring that long-term goals are met through efficient day-to-day activities. Furthermore, this issue could benefit from being discussed during executive S&OP meetings. However, SKF currently does not have an executive S&OP meeting, which limits the opportunities for senior management to evaluate and improve order prioritization strategies in line with the company's broader objectives. Examining the primary barrier to resolving this issue, it appears that SKF's extensive range of products and diverse customer base is to blame, as it hampers the prioritization process. The complexity introduced by this diversity makes it challenging to develop a one-size-fits-all prioritization framework, necessitating a tailored approach that can adapt to varying demands and conditions. This challenge is particularly evident in specific factories within particular regions of SKF, where localized factors further complicate the prioritization efforts.

The second and more significant weakness lies in the absence of coordination among planning levels, particularly the disparity between S&OP and strategic long-term planning. As reiterated multiple times within the report, strategic long-term planning is considered a process that falls outside the scope of S&OP, ideally

to be integrated into the monthly processes instead. However, SKF have yet to establish such a coordination, the absence of an executive S&OP meeting potentially contributing to the misalignment. Without coordination between S&OP and strategic long-term planning, SKF results in a lack of alignment in goals, inefficient resource use, and poor overall performance. This disconnect hampers the organization's ability to synchronize short-term operational decisions with long-term strategic objectives, leading to disjointed efforts across different planning levels. The absence of an executive S&OP meeting exacerbates this issue, as it hinders the opportunity for high-level decision-makers to provide guidance and ensure alignment between tactical and strategic planning efforts. Furthermore, one potential obstacle in this scenario is determining the appropriate level and dimensions of executive involvement in the meeting.

Shifting focus from the first research question, the second one delves into the parallels and distinctions between SKF's S&OP process and those of the other companies involved in the cross-case analysis. To begin, it appears that all processes closely adhere to the framework outlined by Ross (2015), as most steps corresponds to either data gathering, demand planning, supply planning, the pre-executive S&OP meeting or the final executive S&OP meeting. Moreover, while there may be minor differences in the terminology utilized, all processes fundamentally aim to achieve similar objectives.

SKF deviates from the Ross (2015) framework by lacking both a pre-executive and an executive S&OP meeting, whereas the other companies in the study have an executive S&OP meeting but not a pre-executive meeting. While most cross-case companies prioritize issue resolution within the month or the month before in executive S&OP meetings, the most significant contrast lies in the coordination between S&OP and strategic long-term planning, which SKF and other cross-case companies have not yet attained, unlike Alfa Laval. Furthermore, while most companies have a phase in and phase out process within their demand planning, involving product managers, SKF employs a phase in and phase out approach for items outside S&OP, which occurs automatically in the data system and involves more of a replacement process.

Lastly, the third and final research question asks how SKF could leverage these parallels and distinctions to enhance their S&OP process, essentially serving as the linchpin of the entire project. The answer to this question, which may have been hinted at in the concluding section of the report, suggests that SKF should utilize the information obtained from Alfa Laval to bridge the gap between planning levels within their own organization, thereby achieving enhanced coordination. Moreover, SKF should recognize the significance of executive involvement, not only to reinforce the S&OP process itself but also to establish a link between the tactical planning level and the strategic one. This connection will facilitate the attainment of strategic long-term objectives, which certainly is of essence to any organization looking to succeed.

7.2 Final Recommendation

In an attempt to narrow down what the findings essentially entails for SKF, and provide some fundamental advice on how to proceed, the following could be said. SKF is encouraged to revise its monthly S&OP structure and involve executive management or other personnel engaged in strategic long-term planning to foster company-wide coordination across planning levels, spanning from strategic to operational. It is advisable for SKF to introduce a pre-executive S&OP meeting where operational performance and potential deviations are assessed. This assessment would translate into strategic consequences before being brought to an executive S&OP meeting, involving strategic decision-makers for further evaluation. The aim is to address issues before the executive S&OP meeting, and if the issues persist, conduct scenario analysis to provide alternatives during the S&OP meeting. For example, one such issue could be SKF's weakness in prioritizing orders in constrained scenarios within capacity planning, prompting a discussion on which customers they should focus on.

Furthermore, the executive S&OP meeting serves as an opportunity for the executive management team to review their alignment with the strategic plan. If there is a misalignment, they can provide directives on what should be prioritized and create an action plan. Sometimes, SKF reviews its business plan and executes strategic decisions such as focusing on specific customer segments in a region, opening or closing factories, or relocating product lines to different facilities. Additionally, SKF should prioritize mitigating the impact of potential deviations and ensure that any adjustments are communicated using terminology appropriate for operational stakeholders.

To involve executives in the S&OP meeting, SKF can introduce a sign-off mechanism for upcoming plans, which can incentivize executives to actively participate in the process. However, relying solely on executive S&OP meetings may not always bridge the gap between S&OP and strategic long-term planning. To facilitate this process, it is advisable for SKF to mimic the actions taken by Alfa Laval and designate a process owner responsible for managing coordination in both directions. Consequently, it is the responsibility of this process owner to determine whether the situation at hand warrants the attention of executive management. This approach ensures a holistic alignment between operational and strategic planning within SKF.

SKF's strengths lie in their establishment of a common plan and a dedicated S&OP team focused on coordinating and improving the process. Leveraging these strengths presents an opportunity for SKF to streamline operations further, enhance cross-functional collaboration, and optimize resource allocation, ultimately driving efficiency across the organization. Finnaly, SKF should investigate how they can incorporate product managers into the S&OP process. By integrating product managers, who possess in-depth knowledge of the product lifecycle and market demands, SKF can enhance the accuracy of their demand forecasting and better align production schedules with market needs.

7.3 Generalizability

A recommendation for other companies in this study is to maintain S&OP at a tactical level. This approach ensures that the company retains control over operational plans. However, it's crucial to involve the S&OP owner and other team members in strategic planning meetings. This integration provides the S&OP team with insights into future developments. Moreover, this practice bridges the gap between S&OP and strategic planning, facilitating informed operational decisions aligned with strategic objectives.

Finally, recommendation for readers outside this study is to employ a maturity model to assess their S&OP process. This approach provides an overview of the current stage of their S&OP. By leveraging such a model, organizations can gain valuable insights, enabling them to take targeted actions for continuous improvement and ultimately achieve their business objectives. However, it's important to acknowledge that a risk associated with maturity models is the subjective judgments involved, which can vary depending on the perspectives and biases of those involved in the assessment process.

7.4 Limitations

A limitation of this study is the assessment of the maturity model for all companies, particularly the case company SKF, primarily based on interviews. While observing S&OP meetings across all companies would be considered a good option, it is not feasible due to time limitations. Furthermore, the authors have not tried the IT tools within SKF's S&OP process. However, companies are believed to be truthful about their challenges because of the workshop, enabling them to have open discussions and draw inspiration from others to solve their own problems.

7.5 Further studies

The purpose of the master's thesis was to identify weaknesses and obstacles within SKF's S&OP process. By evaluating the S&OP processes of other organizations similar to SKF, the goal was to determine how SKF could bridge any potential gaps. During interviews, companies expressed a desire for more advanced analytics to improve decision-making. Therefore, further study in this field is warranted. Additionally, some companies mentioned not having an S&OE in the workshop. Developing a maturity model for S&OE and initiating a model could be valuable areas for future research.

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A. Interview Questions

Table A.1: List of interview questions.

Volume, SKU's, sales units, product lines?
Segments, product families, markets?
Production units, distribution centers?
Share between MTO and MTS?
Can you please, in short, describe which reoccurring activities that make up your S&OP process?
How frequently does the S&OP process occur?
What is your planning horizon?
Which meeting forums exist?
How do you work with granularity throughout the process (product family level, item level, etc.)?
What is your primary aim with regards to your S&OP process? Eg. what kind of decisions are you making (aiming for)?
Would you judge that your S&OP process is more of a tactical or strategic process? Has this changed over time?
How many people within your organization is involved in (are working with) the S&OP process? And how are you organized?
Is there a clear structure, i.e., a clear distinction in roles?
What do you consider as your main strengths and weaknesses?
Main improvement activities you will focus on going forward?
How is the forecast built up? (historical data and qualitative input of trends and changes in demand?)
Who owns and signs off the forecast?

Table A.1 Continued.

What units of measure are you considering (pieces, EUR)?
What key constraints are there? (what level is included in the S&OP?)
Is flexibility in supply connected to forecast variation? How is flexibility level decided?
Are suppliers included in the process? How?
What is your main complexity, i.e., what is it that you struggle with? Main challenges and gaps today?
How is your S&OP process aligned with your overall business strategy?
Is your S&OP process integrated with strategic targets? I.e., does it touch upon long term targets related to, for example, industrial footprint?
How do you handle a situation if there is a constraint in production capacity and/or supply? Do you have a recognized framework for prioritization?
Do you have phase-in and phase-out process of products in place (life cycle management)?
How do you handle potential escalations, is there a framework established? Do you have a shorter, intermittent process in place (S&OE)?
What does the involvement from executives look like, if there is any? Commitment?
What does the collaboration look like with suppliers and customers?
Is there an integration between the S&OP process and finance?
What business functions are included in the S&OP process, do you work cross-functionally?
What technologies do you use to support your process? What is the distribution between manual and automated work processes?
What do you measure throughout the process? (or which KPIs/PPIs are you using to measure the S&OP process?)
Does your process differ between different business areas?

Table A.1 Continued.

What are you looking to get out of the workshop?
What trends or external factors do you think will shape the future of S&OP?
What are you looking to get out of the workshop?
What trends or external factors do you think will shape the future of S&OP?

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