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**Analysis of the impact of S&OP process and system
development on the pulp and paper supply
planning and its work tasks**

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ABSTRACT:

Market instability, for example due to Covid-19 pandemic and other worldwide events, has positioned companies to focus more on forecasting supply and demand. Sales & operations planning is one process for doing this. Process has been used since the late 70s and has been growing since. In accordance with the aforementioned reasons, the aim of the study was to find out how the current organization can support the implementation of the S&OP process and system that supports it. To answer this, following research question has been created; How will the S&OP process and the systems that support it change Supply Planning job descriptions, and operational work? Moreover, research aims to define the current job structure and job descriptions in the Supply Planning team and how the process changes organizational structures. This paper is conducted as qualitative case study. In order to answer the research question, a comprehensive literature review is conducted, and empirical information is collected by interviewing relevant persons (N = 14) within the company. The study also utilizes quantitative and qualitative data from the company's internal systems.

The findings directly related to the research question are that the work tasks of the Supply Planning team do not change at the operational level, otherwise the work tasks of the demand side are moved closer to the sales organization. It has also been suggested that changes are made to the structure of tasks within the team, in which case the team has better resources to support the process. In addition, the research objectives have been met and further action points for improvements are presented. Increasing the current organization's support for the process takes place through development proposals, which are transferring of the role of Demand Planner to sales coordinator or sales planner, launch of Demand Review, launch of Executive S&OP and identification of current challenges. The challenges have also resulted in a proposal for an incentive system for the S&OP team and upper management, as well as a proposal to shorten the cycle in the monthly review period of 3-9 months and quarterly to 3-18 months.

The practical implications of the research are significant in terms of developing the process of the case company, both in terms of presenting clear development steps and in terms of raising general awareness. The validity of the research results is supported by the large number and diversity of the interviews in addition to relevant and recent literature reviewed. This study also came from the need for Case company's process research and development. Moreover, because of system development is in progress, the impacts on supply planning team is yet unclear. Hence, the research question remains to be partly unanswered in that regard and thus highlight the need for further studies. Therefore, further studies are required on the perceived benefits of the process and the changes brought about by the system development regarding the operational work maturity and also from the integration of Case's internal actions.

KEYWORDS: Sales & operations planning, S&OP, process development, supply and demand, forecasting

VAASAN YLIOPISTO**Teknologian ja Innovaatiojohtamisen yksikkö**

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ABSTRAKTI:

Markkinoiden epävakaus, joka johtuu esimerkiksi Covid-19-pandemiasta ja muista maailmanlaajuisista tapahtumista, on asettanut yritykset keskittymään enemmän kysynnän ja tarjonnan ennustamiseen. Myynnin ja toiminnan suunnittelu on yksi prosessi tämän tekemiseksi. Prosessia on käytetty 70-luvun lopulta lähtien ja sen huomio on kasvanut siitä lähtien. Edellämäinittuja syitä mukaillen, tämän tutkimuksen tavoitteena on selvittää, miten nykyinen organisaatio voi tukea S&OP-prosessin ja sitä tukevan järjestelmän käyttöönottoa. Tähän vastaamiseksi on luotu seuraava tutkimuskysymys; Miten S&OP-prosessi ja sitä tukevat järjestelmät muuttavat Supply Planning-tiimin toimenkuvaa ja operatiivista toimintaa? Lisäksi tutkimuksella pyritään määrittelemään Supply Planning -tiimin nykyinen tehtävä rakenne ja toimenkuvat sekä miten prosessi muuttaa organisaatorakenteita. Tämä tutkimus on tehty laadullisena tapaustutkimuksena. Tutkimuskysymykseen vastaamiseksi tehdään kattava kirjallisuuskatsaus ja empiiristä tietoa kerätään haastattelemalla asiaankuuluvia henkilöitä (N = 14) yrityksen sisällä. Tutkimuksessa hyödynnetään myös kvantitatiivisia ja laadullisia tietoja yrityksen sisäisistä järjestelmistä.

Suoraan tutkimuskysymykseen liittyvät löydökset ovat, että Supply Planning -tiimin työtehtävät eivät muutu operatiivisella tasolla, mutta kysyntäpuolen työtehtävät siirtyvät lähemmäs myyntiorganisaatiota. On myös ehdotettu, että tiimin sisällä tehtäisiin muutoksia työtehtävien rakenteeseen, jolloin tiimillä on paremmat resurssit tukea prosessia. Lisäksi huomioidaan tutkimustavoitteet ja toimenpiteitä parannuksia varten esitetään. Nykyisen organisaation tuen lisääminen prosessille tapahtuu kehitysehdotuksilla, joita ovat Demand Plannerin roolin siirtäminen myyntikoordinaattorille tai myynnin suunnittelijalle, Demand Review -palaverin käynnistäminen, Executive S&OP -palaverin käynnistäminen ja ajankohtaisten haasteiden tunnistaminen. Haasteiden tunnistus ovat johtaneet myös ehdotukseen S&OP-tiimin sekä johtoryhmän kannustinjärjestelmästä sekä ehdotukseen muuttaa prosessin sykliä kuukausittaisessa tarkastelujaksossa 3–9 kuukauteen sekä neljännesvuosittain 3–18 kuukauteen.

Tutkimuksen käytännön vaikutukset ovat merkittäviä Case-yrityksen prosessin kehittämisen kannalta sekä selkeiden kehitysaskelien esittämisen että yleisen tietoisuuden lisäämisen osalta. Tutkimustulosten pätevyyttä tukee haastattelujen suuri määrä ja monimuotoisuus sekä asiaankuuluvan ja tuoreen kirjallisuuden tutkiminen. Tämä tutkimus tuli Case-yhtiön prosessitutkimuksen ja -kehityksen tarpeesta. Lisäksi, koska järjestelmän kehittäminen on käynnissä, vaikutukset toimitusten suunnittelutiimiin ovat vielä epäselviä. Näin ollen tutkimuskysymys jää tältä osin osittain vaille vastausta, mikä korostaa lisätutkimusten tarvetta tältä osin. Näin ollen lisätutkimusta tarvitaan prosessin koetuista hyödyistä ja järjestelmämuutosten tuomista muutoksista operatiiviseen työhön sekä Case-yrityksen sisäisten toimien integroinnista S&OP prosessin osalta.

AVAINSANAT: Myynnin ja toiminnan suunnittelu, S&OP, prosessikehitys, tarjonta ja kysyntä, ennustaminen

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1 Introduction

1.1 Background of the research

Forecasting is considered the basis of planning, and knowledge of what will happen will prepare the company's various departments for future development as well as their intermediate spaces. Volatile markets, particularly now, have accelerated business interest in sales and operations planning. For example, in the early 2020s, the drivers were a combination of tariffs and trade wars, Brexit, the COVID-19 pandemic, and local events having worldwide consequences, such as the blockage of the Suez Canal in March 2021 (Jonsson et al., 2021). Although market instability is a new norm today, and requires a great deal of adjustment, especially by global firms, Gallego-Garcia and Garcia-Garcia (2020) suggests that dynamic design in this regard is not yet common. According to them, such inconsistencies in planning processes are not followed by knowledge of possible scenarios leading to sub-optimal decision-making, lack of solution in the long and medium term, and thus continuous, cost-increasing and service-level remedial measures in the short term.

IT is viewed as a facilitator of advanced S&OP processes (Pedroso et al., 2016; Danese et al., 2018) as well as a coordination tool to control and assist the S&OP processes (Tuomikangas and Kaipia, 2014; Goh & Eldrige, 2019; Kristensen & Jonsson, 2018). In contrast, according to Seeling et al. (2021), most organizations do not fully support S&OP planning with applicable resource planning systems (ERP), which is one of the characteristics of a mature S&OP process. According to various studies (Kreuter et al., 2021; Ivert & Jonsson, 2014; Danese et al., 2018) highly developed IT-tools are necessary in the fully matured and integrated stage of S&OP. A decade ago, such tools were not as readily available as they are today. Hence, improved digitization has made S&OP a highly popular subject nowadays.

This paper is commissioned by Case Company. The company has an S&OP process and in addition there are ongoing system development, as well as future system projects, to support the S&OP process. The problem and starting point of the study is that the current job descriptions and responsibilities do not fully support the future S&OP process once the system projects have been completed. The study can be considered important in terms of the company's supply chain operations, as the purpose is to map the organization's activities after system projects from the perspective of the S&OP process.

1.2 Aim of the research

The aim of the study is to find out how the current organization is able to support the implementation of the SAP ERP system and the S&OP process. To answer this, following research question has been created; How will the S&OP process and the systems that support it change Supply Planning job descriptions, and operational work? In order to answer the research question, a comprehensive literature review is conducted, and empirical information is collected by interviewing relevant persons (N = 14) within the company as well as relevant data is gathered from company internal systems.

Moreover, study tries to find answers on how the current organization can best to support the process and system development and how this affect on whole Supply Chain structure. Also, research aims to define the current job structure and job descriptions in the Supply Planning team. These objectives will be fulfilled by gathered empirical interview data and through the collection of internal company information.

1.3 Methods and approach

Paper has been conducted as qualitative case study. The research is carried out mainly qualitatively by conducting interviews with appropriate parties (N=14) inside of the organization and with conducting coherent literature review of studied phenomena. The study also utilizes quantitative and qualitative data from the company's internal systems. The methodology of the study is presented in Chapter 3.

To gather background information for this study, a comprehensive literature review is conducted. The literature review is performed using relevant databases such as Scopus, EBSCO and ProQuest. Literature contains peer-reviewed articles and books written within 5 years. The literature review also used older literature that is still considered relevant and can be perceived as necessary for understanding the topic of the study, such as previous literature related to the creation of the process.

Outline of the paper is following. Chapter 2 provides a review of the relevant literature, which comprehensively addressed the characteristics of the topic and the most important aspects of the research. Chapter 3 presents the steps of implementing the study so that anyone can repeat it and get the same result. Chapter 4 presents the company's defined S&OP approach while meeting the research objective; what is the current S&OP structure in the case company. The section contains material from the company's internal databases as well as from the interviews conducted. Chapter 5 aims to break down the analysis of the interviews and databases and to answer the research question: How will the S&OP process and systems that support it change Supply Planning job Descriptions, and operational work? Moreover, this chapter answers the rest of the research objectives; how can the current organization best to support the process and system development and how this affect on whole supply chain structure. First, the findings from the interviews as well as the internal databases are presented and put together according to the research questions and objectives. Following the analysis, suggestions for improvement are presented to the company within the framework of the research question and objectives.

2 Literature review

The purpose of this section is to introduce and discuss research-related material and to open up relevant concepts. The chapter presents a comprehensive literature review on the topic, using peer-reviewed literature, both older benchmark literature and newer literature from various databases. In this literature review, the general features and benefits of S&OP is first reviewed. The steps of the process, the global and proactive model are then presented, as well as the coordination perspective. The process implementation steps are then presented. Finally, the S&OP process is considered in the process industry, where the case company operates, as well as the challenges identified in the process.

2.1 Introduction of S&OP

The S&OP process approach is connected with the framework of Supply Chain Management (SCM) and, according to existing literature, can be considered to offer the most exciting opportunities for the future. Moreover, a lot of work and research is done in today's complex world to implement S&OP processes to meet customer expectations by facilitating efficient supply and demand decisions. S&OP is a monthly process that develops management's ability to strategically target business with tactical plans (Avila et al., 2019), a deeper understanding of which first requires a detailed understanding of the parts of the process and their interactions. The purpose of this section is to introduce the definition of the process, the basic idea, the cornerstones, and the perceived benefits.

2.1.1 Definition

S&OP was introduced in the late 1970s, after which the process began to evolve because companies needed to adapt to changing circumstances, and these new practices replaced the old operations planning. With the help of various organizations such as APICS (American Production and Inventory Control), it began to evolve from aggregate production planning, through Material Resource Planning, to the current process, which used

different designations such as Integrated Business Planning and Integrated Business Management. Finally in the late 1980s it was defined as a business process aimed at balancing supply and demand. With the proliferation of the Internet, ERP systems, and the spread of optimization software, the S&OP process has become clearer and is now perceived as the cornerstone of design not only within the organization but throughout the supply chain. (Danese et al., 2018; Ambrose & Rutherford, 2016)

This definition has been elaborated in studies to date and according to Avila et al. (2019), S&OP is now often described as decision making tool to support operators in maximizing opportunities, minimizing risks, and making informed trade-offs based on profitability. Moreover, according to Gallego-Garcia & Garcia-Garcia (2020), combining S&OP and risk management has been identified as a key part of the S&OP process. According to Avila et al. (2019) S&OP is a described as mostly monthly process that develops management's ability to strategically target business with tactical plans, thereby continuously gaining a competitive advantage by integrating customer-centric marketing and sales plans for new and existing products in supply chain. The process gathers all business plans such as sales, marketing, procurement, and financing into one integrated plan. Kreuter et al. (2021) characterizes S&OP as an operations management policy that consists of cross-functional meetings and involves different departments and their decision-makers in companies. S&OP seeks to merge the goals of a number of different functions and stakeholders, which typically conflict with each other, such as the goal of sales to meet customer requirements to maximize returns and the goal of operations with low production costs.

Tuomikangas and Kaipia (2014) present the S&OP process both as a dynamic planning and decision-making process as a collaboration between different functions and as a method-based process based on the use of facts in decision-making, especially to minimize costs and maximize profits within constraints. According to them, S&OP is expected to act as a communication and decision-making process that covers and supports the company's key resources, product volume and product range. In addition, they present

the coordination framework at S&OP, which includes the S&OP process, S&OP organization, tools and data, performance management, strategic orientation and S&OP culture. In accordance to this framework, they emphasize that the most important part of the S&OP process is the creation of a suitable culture and environment. They also emphasize the tactical role of the process in terms of the company's strategy and operational planning.

Moreover, Rokonuzzaman (2018) presents that S&OP process integrates sales operations planning directly into a company's marketing plan and organizational business, and thus serves as a tool for determining production, inventories, sales, their forecasts, and profitability planning. Noroozi and Wikner (2017), on the other hand, present S&OP primarily as a generic process and independent of any implementation context such as a particular industry. They also, similarly to Avila et al. (2019), emphasize the traditional definition of the process as a balancer of supply and demand plans. Thus, we can state that the definition of the S&OP process is multifaceted. There is a common line in all definitions, but at the same time the perspectives are different and thus create a multifaceted purpose for the process.

S&OP will focus its business planning and business strategy vertically and its supply and demand plan horizontally in the medium term (Tuomikangas & Kaipia, 2014). According to numerous studies (Kristensen & Jonsson, 2018; Gallego-Garcia & Garcia-Garcia, 2020; Danese et al., 2018) the scope of the S&OP process typically covers a 3-24 month time horizon during which it seeks to merge strategic and operational plans while balancing supply and demand, but Seeling et al. (2021a) and Ambrose and Rutherford (2016) emphasizes that, there are large differences between industries. 12- and 18-month reference period is also typical and suits for some businesses better. In this period, Rokonuzzaman (2018) states that the goal of S&OP is to create and develop various plans, such as a strategic initiative plan, a sales and production plan, an inventory plan, and a financing plan. Furthermore, he presents that effective achievement of the desired S&OP goals requires continuous review and observation of the entire supply chain network. Market

data and key business performance metrics have been shown to be two important features when synchronizing supply and demand through the S&OP planning process.

To conclude, Avila et al. (2019) presents that the S&OP description can be divided into five main attributes; 1) It is integrated and multidisciplinary tactical planning process; 2) It combines business plans into one plan; 3) It comprises a planning horizon of more than 18 months; 4) It combines operations and strategy, and; 5) S&OP is a value creating process and relates to the company's results.

2.1.2 Basis

The S&OP process is strongly linked to supply chain management (SCM), demand and supply, and volume and mix. S&OP seeks to balance these aspects (Nemati et al., 2017). It is therefore important to define these key issues in order to achieve a comprehensive understanding of the process. Thus, here is presented the fundamentals of S&OP process; SCM, supply and demand. This section also presents ways to balance supply and demand in a concrete way.

Supply Chain Management (SCM) is concerned with optimizing the management of services and goods so that all stakeholders in the supply chain are taken into account. Supply chain management covers the functions from the procurement of raw materials to the delivery of the final product to the customer (Vandana & Sana, 2020). The goal of management is to increase communication within the chain and thus improve cost efficiency. Brinch et al. (2018) states that SCM is an important feature today for companies that strive to meet customer requirements by balancing quality, time, and cost. SCM seeks to improve the company's long-term performance throughout the supply chain by coordinating its businesses. Fluctuations in demand are either known or surprising. Known fluctuations in demand affecting product sales can be defined as seasonal, such as weather, and non-seasonal, such as supply. The predictable variation is the change in demand that can be predicted. Products with high variability cause problems in supply chain management, as during low demand stocks become oversized, while during high

demand there is a high chance of depletion. To this problem, S&OP is vital to supply chain performance, as it specifically aims to balance supply and demand. (Chopra, 2020)

Because of the predictable fluctuations companies need to balance supply and demand. Supply is managed, for example, by warehouses and internal capacities, while demand is managed by, for example, short-term price changes and campaigns. Capacity can be managed by combining labor flexibility, the use of seasonal workers, the use of specialized and flexible facilities, subcontracting, and product flexibility planning in production processes. Inventories can again be managed by creating a higher inventory of high or predictable demand products as well as using common components across multiple products. Demand management price changes and campaigns need to consider three things: buying in advance, growing the market, and stealing something new. As the market grows, consumption takes place from new or existing customers, and when a new one is stolen, the customer is taken away from competing companies. In advance purchases, the company's sales do not increase, but the demand for the product shifts, which must be carefully considered so that the low-selling product is not consumed in a wave of high demand, which makes it more expensive to serve the demand model. (Chopra, 2020)

Volume and mix also need to be reviewed. Volume is more important and larger concept than design in the mix, as it defines the quantities to be produced and sold by product family. The mix is more detailed than this and companies tend to focus too much on it because they sell them to customers. However, it has been shown that when volume design at the top level is done comprehensively, mix planning is easier. This should also be the focus of the S&OP process when considering priorities. (Wallace & Stahl, 2008)

2.1.3 Benefits

This section presents the perceived benefits of the S&OP process at a general level, from different industries. It has been found that the benefits of S&OP are manifold and can be both quantitative and qualitative. Ivert and Jonsson (2010) present the perceived

benefits of the S&OP process from the perspectives of the design organization and the demand side. It has been found that the benefits of identifying future events and facilitating the analysis of what-if scenarios and the overall and optimal supply are perceived as benefits in the design organization. On the demand side, the benefits have been found to be increased supply chain knowledge, planned comfort and increased reliability of the demand plan. In addition, it has been found that users increase their understanding and confidence in planning in the S&OP process when using Advanced Planning Systems at the same time.

Avila et al. (2019) presents S&OP benefits in their study and it is found that a successful S&OP process could improve forecast accuracy up to 50 percent, reduce inventories, reduce production downtime, and increase deliveries on time. In addition, an effectively executed S&OP process can increase turnover and improve the of new product launch success by fifth. Thus, S&OP will increase the company's ability to adapt to unexpected events with the necessary support from technology and analysis methods. Additionally, they show that companies that implement the S&OP process thoroughly have better performance operationally than those that use it partly or not at all. Santa Cruz et al. (2019) also show in their study that after the implementation of S&OP, excess inventories decreased by almost 50% and at the same time the observed number of demand forecast errors decreased by more than 70%.

In line with that, Rokonuzzaman (2018) presents that the use of S&OP and related information systems will lead to more stable production, higher forecasting accuracy, capacity utilization, lower total costs, better quality for customers and thus higher customer satisfaction. In addition, Kristensen and Jonsson (2018) have found similar benefits in their study and further states that S&OP practices enhances an organization's tendency with its suppliers and customers. It has also been found that a robust and responsive S&OP can ensure a stable supply chain with high performance in operational, financial and marketing processes. Thus, the successful use of S&OP has been found to have a variety of benefits for the entire Supply Chain. Pedroso et al. (2016) states in accordance that

S&OP has a good relationship with company and manufacturing output. As a result, the relevance of S&OP reflects the fact that it provides organizations with the means to succeed in a highly competitive market. S&OP also has a good relationship with company and manufacturing success.

In addition, Danese et al. (2018) emphasizes the qualitative benefits of S&OP, which may not be directly reflected in the numerical result, but indirectly affect efficiency. In addition to the quantitative benefits that have already emerged in previous studies, they also outline the flow of information between different departments, such as between demand (sales) and supply (production) factors.

In addition, Kristensen and Jonsson (2018) present a definition of efficiency for presenting the performance of an S&OP process. The efficiency of a process determines how much it positively affects the operational performance of the business. They recognize that resource use and demand planning are linked to process efficiency. Report availability and forecast accuracy serve as performance metrics. Similarly, Santa Cruz et al. (2019) identifies S&OP efficiency and effectiveness as components of the entire S&OP model along with the main process. Effectiveness includes data quality, demand definition, and available resources. The efficiency component includes data, processes, people, and organization. Combining the efficiency components according to the model into the S&OP process brings more efficient inventory management and thus cost-, time- and quality savings.

In addition, according to Ambrose and Rutherford (2016), group cooperation in the S&OP process showed the most significant direct connection to S&OP efficiency, but at the same time they are also promoting a link between group contributions and S&OP effectiveness. They also contend that in the S&OP environment, contextual influences of information and policy quality, as well as common incentives, have both direct and indirect relationships with S&OP effectiveness results. They further present that

organization should design sufficient incentives to S&OP teams as it is found to be most significant enabler to S&OP effectiveness.

2.2 S&OP process

The S&OP process covers traditionally five different stages, which are reviewed by the company's Supply Chain and other departments. This section introduces the process and its five steps to achieve a holistic understanding. Moreover, the global model and the predictive model are also presented, and the concept of S&OP coordination is explained to deepen the purpose of the process.

2.2.1 Overview

Central to the job description of the S&OP process is the comparison of forecasts with the operating budget, the review of different scenarios to support decisions, and the coordination of tactical and strategic plans. According to Rokonzaman (2018) and Gallego-Garcia & Garcia-Garcia (2020), market information and key business performance metrics to better match supply and demand have been identified as important tools for the success of these areas. The traditional S&OP process, first introduced by Wallace & Stahl in 2006, proceeds through five different steps (Figure 1).

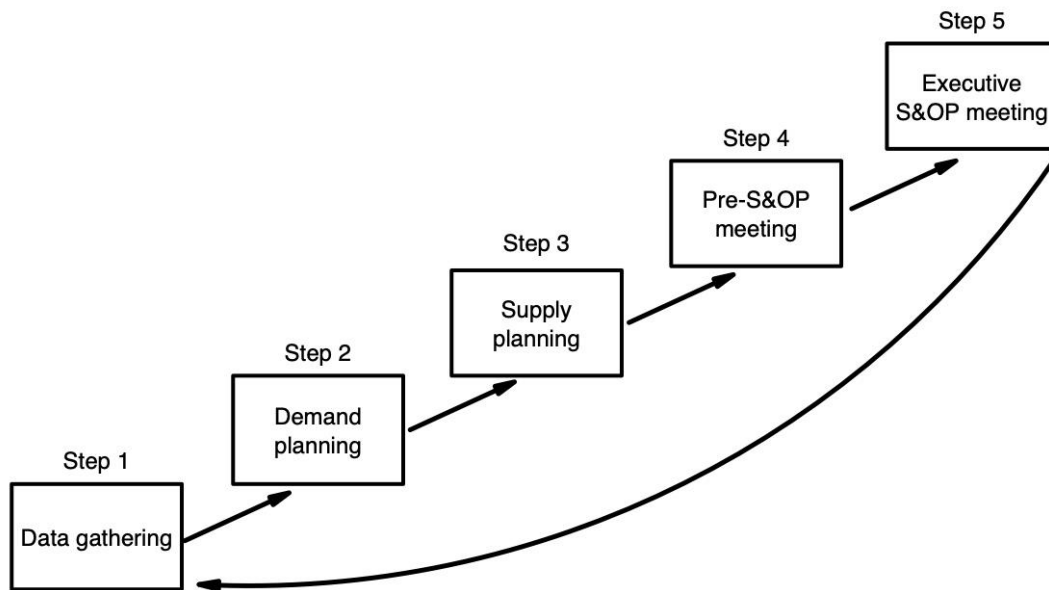


Figure 1 S&OP process steps (Adapted from Wallace & Stahl, 2008)

According to numerous studies (Kreuter et al., 2021; Gallego-Garcia & Garcia-Garcia, 2020; Kristensen & Jonsson, 2018; Ivert and Jonsson, 2010) the five steps and actions in the S&OP process are product planning, demand planning, supply planning, a pre-S&OP meeting and an executive- S&OP meeting. The first three of which relate to product, demand and supply and the last two relate to S&OP meetings and decision-making. First, the S&OP process creates an unrestricted demand plan, then a constrained supply plan, and finally a consensus-based supply and demand plan (Seeling et al. 2021). These include gaps, a plan to close them and an economic analysis.

Tuomikangas and Kaipia (2014) present in their study a maturity model of the S&OP process that shows that the initial S&OP process is reactive without formal meetings or planning, while moving to a more advanced process, it becomes more integrated and formalized through both internal and external collaboration and common plans aiming for unified plans and a company-optimized result. Consequently, according to Ambrose and Rutherford (2016), characteristics within the organization that foster social cohesiveness and autonomy have a direct impact on the overall success of S&OP mainly

through cooperation. Moreover, Avila et al. (2019) also present the maturity model in their study. The last step, the ideal process model, is practically impossible to achieve but should be used as a benchmark to develop the process. These maturity models are further examined later in paper (section 2.3.4).

2.2.2 Data gathering

The first step in the S&OP process is data collection. Wallace and Stahl (2008) and Avila et al. (2019) point out that this step is usually done by Information Systems department and should be done within few days after last meeting of previous cycle. In this phase of the S&OP process, the goal is to collect an unconstrained number of anticipated sales, product and financial data. In other words, at this stage, all the information about the current situation of the company and the decisions made at the end of the last cycle is collected. Collected information about the products, activities, sales and finances are entered and loaded into the company's system. This input must be available to sales and marketing services in order to build a demand plan. In contrast, Seeling et al (2021) and Bower (2016) suggest that many firms today perceive the first stage as "portfolio management" more than "data gathering," for example, due to shorter product lifecycles and changing market data. They suggest that the goal of the portfolio management step is to make better use of the results of step 2 than the data gathering as it is already described as automation. Moreover, Kreuter et al. (2021) address in their study that data collection is not considered to be the first step in the cycle as it should now be automation due to data from IT systems. This further increases the importance of support for IT systems in the S&OP process.

2.2.3 Demand planning

In this phase of the S&OP process, the goal is to use an unconstrained amount of anticipated sales data, collected by sales organizations. Seeling et al. (2021) states that demand planning is carried out over an 18-month time horizon, but that Gallego-Garcia & Garcia-Garcia (2020) also presents short-term (daily to weekly) and medium-term (one

to three months) planning as demand planning horizons. Sales organization is considered as key input for Demand Review and thus own this step (Kreuter et al., 2021). On the other hand, according to Wallace and Stahl (2008), it is the responsibility of the heads of sales and marketing departments, in terms of their own competence, to override statistical forecasts, when necessary, for example when the past is not a suitable predictor of the future due to a new product, price changes or industry dynamics. In accordance, Avila et al. (2019) and Ambrose and Rutherford (2016) point out that this unconstrained forecast should thus focus on customers' willingness to buy when production constraints are ruled out. Above all, Wallace and Stahl (2008) emphasize the importance of people's own knowledge over statistical forecasts. It is the job of marketing and sales management people to use their knowledge of these factors and possibly the roles of others to make a management forecast, that is often more accurate than a statistical forecast because statistical forecast strongly corresponds to past data. However, statistical methods have evolved over the years and in some situations may be considered to be better at forecasting beyond sales knowledge.

According to Ambrose and Rutherford (2016) the consensus unconstrained sales forecast must include projected marketing initiatives such as new product releases, as well as promotion and marketing plans. Bagni et al. (2022), Wallace and Stahl (2008) and Ivert and Jonsson (2010) take into account a new product development and product awareness. Ivert and Jonson (2010) presents that this forecast tends to focus on product groups and is broadly forward-looking, corresponding to the overall budget cycle. Bagni et al. (2022) states the need of creating and presenting production plans for new products at S&OP. Their study shows new product introduction is vital for company success and that a new product-specific S&OP process is a possible alternative that might coexist alongside a classic S&OP process. This is in line with Wallace and Stahl (2008) as they highlight the need for including both existing and new products to this forecast. At this stage, it is important to include the product development department as well, as knowledge of new products and their schedules is also needed to plan and forecast sales, which can change the sales forecast.

Wallace and Stahl (2008) also emphasize that after the creation of new forecasts, the work has not yet been done at this stage and the key background assumptions of the forecasts need to be documented. This is important both for S&OP transparency as the process progresses and for continuous learning between cycles. In line, Ambrose and Rutherford (2016) suggest that forecasting future demand should take place in units, after which it must be transformed into monetary terms to assist continuing financial reconciliation. This means including the finance department and sales manager at this stage of the process as well. The result of this Demand Planning is, however, a forecast approved by management. Involving the sales manager before the final plan allows you to ask questions, challenge assumptions and figures, make changes at this point, avoid surprises at the S&OP meetings, and most importantly, this helps ensure that the plan is indeed “approved by management”. Thus, this forecast reflects the best sales knowledge of the future. Moreover, Avila et al. (2019) and Wallace and Stahl (2008) emphasize that at this stage, it is also necessary to compare the realization of previous sales and delivery plans with the actual quantities delivered. Setting goals includes, for example, stock sizes and the order backlog.

This results in an unconstrained demand plan that serves as the basis for the entire S&OP process (Avila et al., 2019). To be able to develop coherent plans, Bharadwaj (2018) emphasizes the need of timely and correct data inputs in order to improve the reliability of future planning. Thus, after this step, all participants should have a holistic picture of the company’s demand. Product changes and their dates have been brought to the attention of top sales managers. Thus, accurate forecasts can be made for the next phase, where the supply department makes plans to match demand.

2.2.4 Supply planning

Next stage in the S&OP process is the creation of the initial supply plan. This stage could be also called capacity planning phase. The S&OP forecast chart for the final step and unconstrained demand plan will serve as input for this step (Seeling et al., 2021). As a

first step, Wallace and Stahl (2008) present a modification of operations plan if needed. This is the responsibility of the operations department. A change in sales forecasts, inventory levels, or in the customer order backlog are usually the main reasons why an operations plan should be modified. According to Avila et al. (2019), at this point, the organization's supply chain teams and key actors, such as production and procurement departments, gather information about internal availability, such as manufacturing, logistics, warehousing capacity, and other internal capacities. In many cases the sales forecast exceeds the supply capacity so much that it cannot be achieved. The problem may occur, for example, due to the company's production, or for reasons beyond the company's control, such as raw material suppliers. Thus, new operations plan should be tested for its feasibility. Wallace and Stahl (2008) suggest that spreadsheets can be used for this, but numerous current studies (Gallego-Garcia & Garcia-Garcia, 2020; Kristensen & Jonsson, 2018; Rokonuzzaman, 2018; Tuomikangas and Kaipia, 2014) have emphasized the importance of S&OP support systems and their essential use to make the process a success.

The output of the supply planning phase is rough capacity and delivery report and a list of supply problems that cannot be solved or that require decisions at a higher hierarchical level. Resourcing is one common such problem. According to Ivert and Jonsson (2010), the supply plan consists of production volumes and production deliveries for each time period of the design horizon. The unconstrained consensual demand forecast is then used as input and analyzed in accordance with the business plan for the most efficient solution in terms of profitability, customer service and operating profit. Thus, combining these inputs and the demand plan creates the initial supply plan (Ambrose & Rutherford, 2016).

Some actors, as in the demand planning phase, have formal joint meetings at this stage, while others see this process stage as informative and has informal "one to one" -meetings only. Moreover, this phase involves largely the same aspects as demand planning phase; the finance side must be included to bring knowledge to financial changes in the production plan as supply plan is communicated in monetary terms (Seeling et al., 2022).

Changes in products must also be taken into account at this stage, so product management must be included.

2.2.5 Pre – S&OP

The purpose of the Pre-S&OP meeting is manifold. The objectives relate to decision-making related to balancing supply and demand (Avila et al., 2019; Wallace & Stahl, 2008). Pre-S&OP is a monthly series of meetings with leaders at different levels and regions. The meetings set out plans for demand, supply, products and financial connectivity. At this stage, the S&OP team which usually consists of the sales, marketing, finance and operational departments of the organization, meets and develops a final supply and demand plan. This will serve as a guideline for the upcoming cycle (Avila et al., 2019). According to Wallace and Stahl (2008) and Ambrose and Rutherford (2016), at this meeting, key participants are usually S&OP process owner, managers from the demand planning phase, including product development, operations managers from the supply planning phase, and one or more managers from the finance. It is their responsibility at this stage to review resource constraints according to data from past stage. If there are a lot of constraints, sales and marketing should react at this point and set priorities to serve customers in these circumstances. They also point out that in addition to sales performance, inventories, production figures and orders, this meeting should also review the validity of the supply and demand strategies for each defined product family on a quarterly basis.

According to Ambrose and Rutherford (2016) and Wallace and Stahl (2008), one main goal is to come up with decisions for updating the operation and sales plan for those deemed necessary in the previous phase, identify key gaps and cuts in the plans and to develop strategies to address these issues. Therefore, presentation of changes in supply and demand strategy will be needed, if found necessary in the previous stages. Moreover, compiling and structuring the agenda for the next S&OP phase as seen as one output. They should be arranged so that only one set of recommendations regarding them is set up for following Executive S&OP meeting. This will serve as the guideline for the meeting.

Thus, it requires the identification of areas of disagreement and decisions on how to present the current situation at the executive S&OP meeting.

According to Avila et al. (2019) and Seeling et al. (2021b), the result must be a balanced plan from a supply and demand perspective that also meets the company's business and strategic goals. Risks, different scenarios and consequences need to be considered. Revenue, profit metrics, inventory and other metrics are analyzed by reviewing up from the enterprise level to the production-line level in order to ensure a full understanding of the financial and operational implications of the decisions. Once the consensus has been reached, a proposal for a delivery plan and production plan, including other preliminary decisions based on the plans drawn up, will be submitted to the company's top management to executive-S&OP meeting. Once the agreement has been reached, the top management team decide on the final delivery and production plan and decide on future actions. Wallace and Stahl (2008) additionally highlight resolving disagreements over disputed similar issues by making scenario proposals and modeling in monetary and unitary amounts to clearly present their financial implications. Additional desired output is an updated financial outlook for the forthcoming period under review, which includes the most recent review from sales. This is done rolled and monetary amounts in the business plan.

In summary, the goal is to obtain agreement on demand and supply strategies and to explain alternative scenarios if consensus can be achieved. At the same time, a revised financial plan is created to evaluate actual results to the business plan. Ideally, nowadays, these meetings are connected to a cloud-based platform so that all content and plans are in one place. Pre-S&OP is first and foremost a decision-making meeting and should be the starting point for all participants, even though this is the meeting before Executive S&OP meeting.

2.2.6 Executive S&OP

This is the culmination of the entire monthly S&OP process. This meeting should be attended by S&OP manager and upper executives such as the CEO, Vice Presidents of Sales, Operations, Finance, Logistics, HR, Product Development. Usually, managers from other areas, such as supply chain, mills, and finance from previous stages, are also involved to add value to the meeting (Ambrose & Rutherford, 2016). The emphasis is on evaluating S&OP proposals from last step, authorizing modifications, comparing financial S&OP plans to business plans (budgets), and making decisions (Seeling et al., 2021).

According to Ambrose and Rutherford (2016), S&OP teams should be allowed to generate comprehensive solutions and defer decisions to upper management only when group consensus cannot be obtained. Consequently, according to several studies (Wallace & Stahl, 2008; Seeling et al., 2021; Avila et al., 2019) at this stage, decisions are made on the problems and issues raised as a result of the previous step, either by accepting the proposals from pre S&OP meeting or by choosing a different direction. For example, changes in production or acquisitions that bind a prominent amount of costs and require permission from the highest level of the hierarchy are authorized. The main KPIs are also reviewed at this stage and business plans are modified accordingly. The outcome is a monetary version of the business plan and, if differences are detected, the conversion of the sales and operations plans into a format based on the information in the S&OP process. This will serve as a guideline for the future. The decisions should be recorded, and one output is the final chart of the changes that have taken place during the meeting. Simply put, decisions are made on matters on which the pre S&OP team did not reach a consensus and proposals are accepted if appropriate.

KPIs are used to measure S&OP performance and the main key performance indicators are also reviewed at this stage. In accordance, Avila et al. (2019) identifies performance monitoring as an important feature in the S&OP process. In accordance with Seeling et al. (2021), they emphasize the successful implementation of the process requires KPIs monitoring in each cycle to promote improvements. These vary from industry to industry,

but the most important KPIs for S&OP are operational and commercial metrics, and these should be shared among all groups and departments involved in the process to increase transparency.

Moreover, Avila et al. (2019) and Wallace & Stahl (2008) highlight that this phase also consists of publishing the created and approved S&OP plan and presenting its implementation to all stakeholder departments in the organization, such as the operations department, sales, marketing and finance, within two days of Executive meeting. This ensures that everyone is aware of their role in the process, such as sales awareness of the agreed quantities and that production and operational departments know what the agreed quantities are to be produced and delivered.

2.2.7 Global S&OP

The development and implementation of a single S&OP process could be disadvantageous for a multinational organization due to competition in the international operations, supply networks, and marketplaces. Multinational manufacturing businesses have several operations in various countries and continents, as well as broad supply networks, necessitating the integration of various S&OP plans globally. Hence, the S&OP process may need to be split down according to company-specific criteria and then aggregated in order to standardize worldwide plan integration, assure public exposure, and accomplish the organization's global strategy. This consolidation allows for the extension of a local process into a worldwide S&OP. This global S&OP process includes two more phases, in addition to the previous five: a global roll-up meeting and a global executive meeting. (Seeling et al., 2021a)

The global summary aggregates S&OP data from subsidiaries or business units throughout the world. A global executive meeting is attended by the organization's CEO, COO, CFO, regional or divisional directors, and global vice presidents. They assess consolidated data, KPIs, financial outcomes, global project status and progressions, and critical issues before making decisions. S&OP process additional sixth and

seventh planning scopes will gradually extend and combine into a multi-year strategy plan for worldwide corporations. (Seeling et al., 2021a)

2.2.8 Predictive S&OP model

The predictive S&OP model has also received attention in current studies (Gallego-Garcia & Garcia-Garcia, 2020; Seeling et al., 2021b; Dittfeld et al., 2021). Its benefits have already been demonstrated, so it is also considered in this work. The steps and actions could vary a little between traditional steps because the perspectives are different, but they are mainly overlapping and thus they are generally similar and operating S&OP manager adjusts the process to suit own industry. Gallego-Garcia & Garcia-Garcia (2020) research was carried out in the automation industry and compared the integrated predictive S&OP model with the traditional five-point process model. They identify three areas for improvement over the traditional model. The targets relate to sales planning with demand scenarios, preparation of long-term solutions, and medium-term decisions. In the traditional model, sales plans are based on forecasts, and also relying heavily on history, but research emphasizes that these do not take enough into account possible scenarios. As a result, the prevailing scenario is not taken into account during the current planning period and is not monitored sufficiently.

In long-term planning, what-if scenarios affect sales and delivery plans at least to some extent. These allow the company to anticipate the effectiveness of the measures proactively by acting in advance to avoid unwanted results. The study shows that at this stage, companies do not analyze the effects of future scenarios and identify policies to avoid adverse scenarios. Importance of scenario planning is emphasized in numerous studies such as Dittfeld et al. (2021), Avila et al. (2019) and Seeling et al. (2021b).

Accordingly, a study by Seeling et al (2021b) showed improvements to steps 1, 4 and 5 of the Wallace and Stahl model. Scenario modeling and financial analysis, especially before the "Pre-meeting" and "Executive meeting", is mentioned as improvements to the original model. Thus, these companies will have to take corrective measures to maintain

the stability of the system. Thirdly, according to Gallego-Garcia & Garcia-Garcia (2020) research shows that in the medium-term, companies recognize that certain events have taken place, but that planning measures are not implemented due to excessive bureaucracy, lack of coordination or different interests within company. As a result of these improvements, a predictive model has been derived (Figure 1).

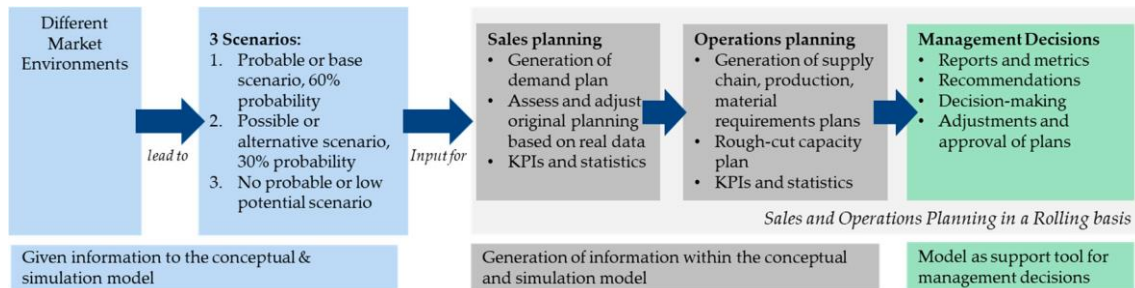


Figure 2 Predictive S&OP (Gallego-Garcia & Garcia-Garcia, 2020)

Model starts with market. Based on market knowledge, three different probability scenarios are derived; probable, almost impossible, and in between. Based on these scenarios, a sales plan is developed and is modified based on actual and expected demand values. An operations plan is then drawn up, taking into account the supply chain, production and other internal capacities. Decisions are then analyzed using KPIs to improve sales and delivery performance of operations.

Gallego-Garcia and Garcia-Garcia (2020) divides the model into three planning sections, short-term (less than 1 month), medium-term (1 month - 1 year), and long-term (1–4 years) design, in contrast to the traditional model, which focuses only on long and medium term. These can also be called short-term corrective adjustments, medium-term preventive planning and long-term predictive planning. First, long-term plans related to future scenarios are identified. Expected models can be derived from these scenarios and thus possible decisions and measures can be made as alternatives for the future, usually related to investment or procurement. The boundaries of decisions in the long run will be determined on the basis of this predictive analysis. Next, in the medium term, forward-looking planning takes place in terms of comparing actual and expected

demand. Thus, for the observed anomalies and based on long-term scenario modeling, it is decided whether to implement these defined scenarios. Supply chain dynamics and the comparison of scenario similarities with long-term plans are the subject of analysis and decision-making. Finally, short-term measures are thus linked to the coordination of options prepared in the long term and those to be implemented in the medium term. The occurrence or non-occurrence of expected scenarios will result in remedial action by the company in the short term.

The benefits of a predictive model have been found in many studies, such as Gallego-Garcia and Garcia-Garcia (2020) and Seeling et al. (2021b). Benefits included improved customer service, faster delivery times, lower inventory levels and lower volume losses. More efficient investments were also taken into account, leading to operational savings. The predictive S&OP model is presented to prepare management decisions more far-reaching and to define future inefficiencies more efficiently, which enhances the use of resources in the supply chain. This model is particularly suitable for those facing market uncertainty and a variety of potential demand scenarios. However, the generalizability of studies are limited by the fact that simulation and organizational structure were used here, S&OP meetings, and interfaces between organizational areas were not considered in this simulation model.

2.2.9 S&OP Coordination

Tuomikangas and Kaipia (2014) examined the coordinating viewpoint in the existing S&OP literature, which included 99 comprehensive studies. The findings from the literature are combined to create a coherent framework known as the S&OP coordination mechanism framework (Table 1). The framework highlights the tactical function of S&OP between business and operational strategy, as well as the need of establishing a distinct type of leadership and culture inside the firm. They suggest six key coordination mechanisms for S&OP; S&OP process, S&OP organization, S&OP tools and data, performance management, strategic alignment, and S&OP culture and leadership. They highlight the tactical function of S&OP as a way of integrating business strategy with operational

planning, but also the need of building a distinct leader behavior and culture in the firm, by synthesizing the two viewpoints. Furthermore, the S&OP coordination structure stresses S&OP's function in facilitating the link between business and operational strategy.

Table 1 S&OP coordination mechanisms (Adapted from Tuomikangas & Kaipia, 2014)

S&OP coordination mechanism	Description	Objectives	Constructs
S&OP organization	Formal organizational S&OP structure	To identify the organizations' actors and units that are participating in S&OP	Decision making authorities, decisions for centralization/decentralization and responsibilities
S&OP process	Formal and consistent procedure for carrying out S&OP	To specify how various sub-plans are developed and shared in S&OP	Decision-making methods and cooperative planning involving both internal and external parties
S&OP tools and data	S&OP tools for collecting, sharing, reserving and refining data needed for decision making	To offer better quality data to S&OP in accordance with requirements, as well as to assist S&OP using purposeful IT tools	Input and output data, techniques for processing and storing data and IT tools that enable S&OP
Performance management	Optimization and measurement of company performance	To ensure that the business objectives are met	Practices for managing financial performance, operational and process performance as well as goal setting and follow-up process.
Strategic alignment	S&OP serves as a bridge between corporate strategy and operational planning, strengthening the organization's strategic business goals.	The role of strategy implementation in operations in achieving the company's strategic aims	Linking the company's strategic goals to operational planning and supporting the firm's strategic business goals via the development of new goods, services, and business strategies
S&OP culture and leadership	To support and improve S&OP, a culture and leadership are required.	To foster a leadership and organizational culture conducive to the successful deployment of S&OPs.	Top management, dedication, and trust demonstrating collaborative behavior activities that promote and enhance formal planning, such as communicating, and employee training

According to Tuomikangas and Kaipia (2014), mechanisms influence and are affected by one another. Performance management lays the groundwork for all actions. Strategic fit is the "roof of the building," emphasizing the need of vertical synchronization. S&OP procedures are supported by tools and data, which are positioned underneath it. The organization is assisted by the S&OP culture and leadership. Cross-functional coordination is crucial, and it necessitates procedures and organization as complimentary parts.

Furthermore, Goh and Eldridge (2019) investigated the influence of coordination framework given by Tuomikangas and Kaipia (2014) on performance in supply chain. They determined that strategy alignment has the most beneficial impact on supply chain performance. Tools, S&OP structure, and culture all have a considerable beneficial impact on performance. The study also indicated that when the product diversity is considerable, tools add greater value. Moreover, rigid conventional S&OP processes and timetables have a negative association with performance. As a result, they proposed that a company's capacity to rearrange procedures and reordering might be the coordinating mechanism that substitutes rigid processes.

2.3 Process implementation

While there are significant benefits to the S&OP process, such as more accurate forecasts, more manageable inventory levels, and better customer satisfaction, its successful implementation creates problems for companies. Numerous recent studies show that it is essential for S&OP to design according to the company's own attributes (Ivert et al., 2015; Kaipia et al., 2017; Kristensen & Jonsson, 2018), which makes its implementation even more challenging as each company and business market is different. The process's execution may be viewed as a collaborative effort between a cross-functional group of middle level managers, analysts, and sufficient tools. To ensure the process's success, the team must coordinate supply and demand plans, both in specific and as a whole, while also adhering to the business strategy. According to Ambrose & Rutherford (2016), S&OP navigating has been defined as 60% change management, 30% process, and 10% technology, thus emphasizing the relevance of social and process-related aspects.

In accordance, Wallace and Stahl (2008) argue that while the S&OP process is streamlined and easy to understand, its implementation within a company's processes is difficult, and identifies the five most common reasons for it. The first three points relate to the novelty of the process and the change it brings to the company, and to people's job roles. Resistance to change can thus generally be experienced as one major stumbling

block. The fourth point is about understanding employees. Employees' demand and need the necessary information about the process and the future to fully understand it so that they are willing to make the necessary changes. The flow and transparency of information is thus considered important to enable the implementation of the process. The fifth point relates to the management of the company. They are usually busy, so they don't have time to hone the process, but the finished product should be immediately available. This impatience of management can undo the implementation of the whole process. Consequently, Kristensen and Jonsson (2018) addresses that lack of top management support increases the possibility of failure in S&OP process implementation.

Although the S&OP frameworks developed in current research (Tuomikangas & Kaipia, 2014; Noroozi & Wikner, 2017; Kristensen & Jonsson, 2018) provide more information about the different stages of the process and help to understand the process as a whole. Kreuter et al. (2021) state that they do not provide knowledge of systematic process implementation and development. Maturity models provide limited additional information for this because, as noted, "one-size fits all" does not materialize in the S&OP due to its customization requirements for companies. They also note that maturity models support implementation planning by setting specifications for the elements of a more advanced process, but do not provide information on how these can be achieved. However, these maturity models are taken into consideration in this chapter, as they do bring overall value on understanding implementation process at least in some extent (Danese et al., 2018).

Pedroso et al. (2016) states that although synchronization between the company's demand and supply is crucial for success, organizations lack the necessary administrative tools to accomplish the desired results and merge or harmonize demand and supply needs. Therefore a structured implementation path is needed. According to Wallace and Stahl (2008), the implementation of an S&OP may take more than eight months, but they point out that the benefits are already visible earlier. The duration of the implementation is affected by the nature of the S&OP process as a monthly process. In contrast, Pedroso

et al. (2016) states that there is major gap in the literature about implementation of the process.

Kreuter et al. (2021) present in their study a new S&OP implementation model that utilizes the Enterprise Architecture Management (EAM) function. In the five-point method, the first two relate to the assessment of context-specific S&OP challenges and the analysis of the contextual suitability of the original S&OP design from the perspective of contingency theory. The next three steps are related to the indicative EAM function. These steps guide the introduction and further development of context-sensitive design to increase the efficiency of the S&OP process. Their study found that implementation is more effective in conjunction with the EAM function, at least in terms of the innovative, complex, and quality-driven nature of the case company. They emphasize further empirical research on this model before generalizability, so this section focuses on the traditional implementation formula.

Wallace and Stahl (2008) recommend that the person in charge of the implementation process be an experienced and tenacious worker with the ability to motivate others. Person should have participated in at least one successful S&OP process deployment. Before beginning the process, the person in charge of implementation should consider a few factors. There will be resistance to change, as with any new process that alters employees' working habits. According to Danese et al. (2018) there are distinction between sales department and others in S&OP process; during S&OP implementation, sales and marketing departments, without exception, oppose the entire process. Sales consider the S&OP process as a supply chain management tool, which, on top of that, necessitates a major sales department involvement. If commercial attendance at meetings is not at the appropriate level, the S&OP process is not fully supported, and the process will eventually become ineffective. As a result, the key to the implementation's success is people. Therefore, according to Wallace and Stahl (2008), before beginning the implementation, all parties should have a thorough understanding of the process.

Participants must realize all of the advantages of the process as well as the degree of effort required.

One of the most crucial things to accomplish before beginning the implementation process is to ensure that senior management approves and endorses the S&OP (Wallace & Stahl 2008) as lack of commitment from upper management has been presented to potentially cause failure in the process (Kristensen and Jonsson, 2018). As a result, the process begins by persuading at least one properly authorized person from upper executives, who should also be a member in the S&OP process. The presentation meeting should cover at least most of S&OP's capabilities, and how it operates. A good technique to present competencies is to highlight some of the company's difficulties and explain how the S&OP will solve them. Furthermore, S&OP cannot operate without a strong team. A ideal S&OP team is multidisciplinary, with managers or important players representing each function. The most crucial aspect is that individuals from each department have the ability to implement modifications made in S&OP inside their respective region. These individuals will also present the S&OP to their respective departments.

After the attendees are persuaded, the process should begin with a live pilot phase. The pilot's goal is to reduce risk and familiarize individuals with the new method. The following stage will be growth, in which all product families will be incorporated into the process and business improvements will begin. The final stage is complete financial integration, which should not occur until the process has proven to be reliable and trustworthy. A well-executed implementation procedure usually takes roughly nine months as each meeting is only held once a month (Wallace & Stahl, 2008). According to the Pedroso et al. (2016) approach, S&OP implementation entails a combination of the four components: establishing an S&OP department, discipline, the capacity to make adjustments, and the ability to learn from prior failures. Wallace & Stahl (2008) have presented S&OP process implementation stages as pilot phase, extension phase and financial integration phase and thus next, those implementation phases are presented. Then, S&OP maturity

stages and maturity frameworks is featured. After that, S&OP systems and their importance is presented.

2.3.1 Pilot phase

Typically, according to Wallace and Stahl (2008), pilot period lasts three months. The ultimate goal of the pilot phase should not be to increase business, but to enlighten members on how the S&OP operates and how it creates benefits for senior management. Because S&OP serves as a link across strategic planning sessions and daily operational choices, top management assistance is required to provide leadership, facilitate the integration, encourage the team, and promote formal planning. This guarantees that the company's strategy is consistent (Pedroso et al., 2016).

During this phase, the following topics should be mentioned: assigning duties, establishing a process timetable, identifying units and numbers to be evaluated, establishing a planning horizon, selecting product families, and establishing demand and supply approaches. According to Pedroso et al. (2016) some concerns must be explicitly established before deploying S&OP, such as who is the process owner, who is participating, who will operate with spreadsheets, policies accepted, further data, and support tools. Responsibilities and preliminary information should be delegated, and members should then be given decision-making authority. In addition, all participants must be ready for meetings, and S&OP must adhere to an organized and established timetable. Training and process understanding are required.

The first month of the phase should be allocated for preparation and education. Fundamentals of demand and supply strategies are defined during the second month. The third and final month is dedicated to carrying out the entire S&OP process, including all of its components. The choice about whether to terminate or continue with the implementation is taken at the completion of the final month. In the perspective of various departments, there are significant variances in how product categorization should be performed in S&OP. Product categorization is often done in a way similarly to how they are

displayed to consumers in product catalogs. Simultaneously, manufacturing aims to categorize them based on production processes or how they are manufactured, such as MTS or MTO. Finance will often group things by location or nation. In addition, it is advised by Pedroso et al. (2016) that while implementing S&OP, product families with low complexity to be chosen first, so that the process may be performed out more simply.

In the pilot phase, data requirements, and how they are displayed must be examined. It is critical to establish the units, amounts, and currencies that will be used to guarantee that everyone is on the same page. Data can be obtained through an ERP. S&OP software should be compatible with the company's ERP and inversely. It is preferable to have automatic data feeding so that manual feeding does not use anyone's time. The advantages of the systems are discussed later in this section (Wallace & Stahl, 2008). Noteworthy, Pedroso et al. (2016) states that in its early phases, the S&OP process does not necessitate the use of modern information technology, therefore spreadsheets and simple tools suffice. As the process progresses, the necessity for increasingly sophisticated software becomes more apparent.

As stated, Operations department plans supply and manufacture in accordance with the Sales forecast, which are almost never accurate, and thus there are room for improvement. Forecast variances should be examined to identify potential biases, even in the early implementation stages. The goal is to discover a continuous series of projections that are either too high or too low. Salespeople have a tendency to overestimate their forecasts, especially for long-term. Also, in this phase, new items should be examined as soon as feasible. Supply must be aware of the potential for strong demand for new items. On the other side, overly optimistic new product projections may result in massive obsolescence if sales stagnate. Thus, the demand forecasting for new products requires a great deal of attention. Operations will respond to the sales department's goals by supplying all necessary supplies while focusing on keeping stocks as low as feasible to reduce costs. (Wallace & Stahl, 2008)

After everything is in place, the actual live pilot may begin. Furthermore, this will be the first time the entire five-step S&OP procedure is carried out. It is best to start with a small product family because one of the key goals of the pilot is to demonstrate to upper management that how S&OP operates and helps the organization. (Pedroso et al., 2016; Stahl & Shedlawski 2012)

2.3.2 Expansion phase and financial integration

According to Wallace and Stahl (2008), following a successful pilot stage and senior management authorization, it is time to deepen the S&OP's implementation throughout the business. Because the remainder of the product categories are brought in during this phase, it is recommended that a schedule get prepared. There is no need to rush into all of the product groups simultaneously because it will simply result in an overflow of work, which will most likely cut away the S&OP's efficiency. It is preferable to begin with a minimal number, such as one product family every month, and then, as experience grows, more could be included. Finance, according to Seeling et al. (2022), contributes value by enabling choices on costs, profit margins, operating expenses, and return on investments. However, financial planning is not included in the pilot period.

Nevertheless, it's an important to begin with some basic financial planning as it has been stated by Seeling et al. (2022) to be necessary for successful S&OP. For instance, a good place to start is to translate long-term estimates in units to monetary and compare them to the finance department's business strategy. Converting is straightforward when the product's estimated average sale price is used. Something is incorrect if there are significant disparities. Wallace and Stahl (2008) further state that many things happen during this phase, which may cause lost focus of the S&OP's key goals. It would not be unreasonable to remind individuals of regulations, such as obligations, meeting schedules, and policies.

According to Wallace and Stahl (2008) the finance department can make forecasts based on its own preferences, which are less related to the supply and demand plans created at S&OP. So, for this reason, integration only needs to be included in the process in the final stages of implementation, when it has already established a position in the supply chain and enjoys the trust of management. Similarly, according to Pedroso et al. (2016) it is advised that the involvement of the S&OP team and top management adequately assist the process implementation, especially in instances where organized discipline is necessary, changes are not widely accepted, or are particularly complicated.

If it were included at an earlier stage of implementation, there is a risk that managers will not know what forecasts to follow. On the contrary, the economic perspective should be involved throughout the process, so that it can advocate economic integration at an early stage (Wallace & Stahl 2008). It has been suggested that, at least in the phases of the demand plan, supply plan and the pre-S&OP meeting, economic calculations are in place and should be created to analyze the effects of different scenarios. Moreover, finance supports S&OP by monitoring demand and supply risks and making it easier to compare the plans of the operational business sectors to the budget. (Seeling et al., 2022; Wallace & Stahl, 2008)

Thus, it can be concluded that financial integration should be left to a later stage in the implementation phase, but it should be included as soon as possible as the maturity phase progresses. Financial integration makes it possible to monitor changes in the process and compare them with the financial business plan, as the forecast is translated into monetary amounts at various stages of the S&OP, as stated. A comparison of different product families is important in the S&OP process, and financial analysis brings transparency to this. (Wallace & Stahl 2008)

2.3.3 Enablers of implementation

In addition to the steps in the implementation of the process, it is also necessary to take into account the factors that enable the implementation and, in the absence of which,

influence its events accordingly. The findings indicate that top management involvement, cross-functional convergence, measurement and performance evaluation, information systems, and learning processes and training are essential success factors for S&OP implementation. In order to ensure a successful S&OP deployment in challenging circumstances, these four primary enablers must be prioritized. (Pedroso et al., 2016)

According to Pedroso et al. (2016) S&OP department facilitates S&OP implementation by supporting a formal organization dedicated solely to S&OP challenges. S&OP adoption should be accompanied by some sort of planning and decision framework. The ability to learn from prior failures enables experience from earlier attempts at adopting S&OP, or even previous S&OP cycles, can provide intriguing insights, and analysis to seek for improvement spots. Furthermore, because it is difficult to replicate, and then it becomes a competitive advantage. The ability to make adjustments is critical, just as it is in other process implementations, because changes necessitate a shift in thinking and a shift in viewpoints or paradigms. Consequently, there will be no assistance from upper executives or the dependability of other participants, rendering the initiative ineffective. Discipline is a cultural element that must be addressed if S&OP adoption is to be successful. Cultural factors play a crucial role in S&OP process implementation because they determine dispositions to embrace developments and a feeling of discipline.

Hence, according to Pedroso et al. (2016), it is critical for the company to be able to make adjustments. Moreover, participants commitment is seen as a enabler. This is already addressed in the pilot phase, when the responsibilities and meanings of the participants are defined. The involvement of participants is therefore seen as important for the success of the process. Thus, it is proposed by them, that a formal framework to facilitate S&OP implementation, the ability to learn from prior failures, and a strong sense of dedication are critical enablers for accomplishing successful S&OP process implementation in a complex context.

2.3.4 Maturity stages

Maturity models provide a simple yet efficient method for assessing the process quality. Maturity models often feature a series of phases that depict a progression from a basic to a more mature state. Maturity models can serve three functions: descriptive, prescriptive, and comparative. They permit for the assessment of process maturity within a firm, the development of a path for progress, benchmarking between organizations and sectors and, ultimately, support the process implementation to company (Keruter et al. 2021). The main assumption behind maturity models is that the continuous progression across the model's many stages is advantageous to organizations. (Danese et al., 2018) Furthermore, most of them enhance their internal processes first, whereas the most advanced organizations expand their coordination and orientation efforts all across the supply chain. Several models have been created to assess the maturity of S&OP processes (Avila et al., 2019; Danese et al., 2018; Tuomikangas & Kaipia, 2014). The model by Grimson & Pyke, established in 2007, has been used as a frame of reference for S&OP maturity models (Danese et al., 2018). The 5-stage model highlights vertical and horizontal convergence to increase profitability, as well as senior management engagement in S&OP meetings which are relevant insight still today.

Danese et al. (2018) constructed a conceptual framework, following Grimson & Pyke model with some modifications, comprising transition through one stage of maturity to another. The refined version of the benchmark model can be considered highly usable for maturity identification. The suggested framework, in particular, covers four dimensions of S&OP: People and organisation, Process and methodologies, Information Technology and Performance measurements, and five maturity stages: No S&OP process, Reactive, Standard, Advanced and Proactive (see Figure 3). They describe the progress of process growth from deficient design processes to more advanced processes where collaboration is extended to the entire supply chain and beyond. However, the penetration according to the model brings a couple of things to consider. As company moves to the next stage of the model, supervisors should not try to develop all aspects of the model

at the same time, but this should be done in a guided way, with systematic time management and exploring the consequences of dimensional interaction.

	Stage 1 No S&OP process	Stage 2 Reactive	Stage 3 Standard	Stage 4 Advanced	Stage 5 Proactive
People and organisation	No S&OP team Silo culture Inadequate support from business executives	Some cooperation between demand and operations Responsibilities not defined	New planning culture with non-dedicated S&OP team Roles and responsibilities is defined clearly Strong commitment	Organized S&OP team with involvement from executives Collaboration with major clients and/or suppliers New skill development and staff training	The owner of the S&OP process takes on the role of network coordinator. Participation of all partnering companies' top executives
Process and methodologies	No formal S&OP process Dense re-planning and revenue focus	Developing but yet incoherent procedure No financial integration	Process is formalized and organized Meetings at frequent basis Financial integration	Processes are balanced with external network partners. Demand and supply strategies are in alignment.	Meetings with a dynamic approach and an event-driven agenda
Information technology	Individual managers have their own spreadsheets No information consolidation	Profusion of spreadsheets or functional solutions Some consolidation, although it is done manually	Demand and supply planning technology integrated Enhanced data rationalization and integration capacity	Technology for accessing and sharing data with external partners	Innovative decision-support technology (e.g., risk management and scenario analysis) based on information disseminated across the supply network and beyond
Performance measurement	Basic measurements	Metrics are functionally specific Measures how effectively Operations achieves the sales plan	Internal supply chain statistics that are integrated to control trade-offs	External supply chain statistics to assist in supply network decision making. Metrics for new product introduction S&OP effectiveness	Evaluation of the influence on company profitability Assessment of the influence to ecosystem (e.g. social impact)

Figure 3 S&OP maturity model (Adapted from Danese et al., 2018)

People and organization relate to the S&OP process's overall culture and human element. This dimension is connected to the company's objective and strategy and contains aspects such as planning environment, dedication, positions and duties. Process and methodology refer to the actions and techniques used to achieve strategic objectives, and hence include all S&OP operational practises including the S&OP structure and the frequency and nature of meetings for the various phases of the S&OP process. Supporting and enabling software, as well as information exchange platforms, are included in information technology. Lastly, according to the continuous improvement method, performance measurement refers to the utilization of cross-functional KPIs for monitoring both a performance of the company and the success of the S&OP process. Noteworthy, In the S&OP process responsibilities and roles, such as the demand planner, must be clearly identified and defined. The involvement of staff must also be taken into account at an early stage, as this is a prerequisite for changing the process and carrying it out, as the committed S&OP team will reduce obstacles in the later stages of the process. (Danese et al., 2018)

The latter phases of maturity models are desired stages for a business to pursue. According to the findings of Danese et al. (2018), activities to develop organizational structure tend to appear earlier in the process and technique changes, which are then stabilized with IT-tools and performance measures. The significance of the link between people, process, and IT in S&OP is also emphasized in Kreuter et al. (2021) research. Danese et al. (2018) study also demonstrates that evolution between maturity stages is not sequential, and as the process evolves into more mature dimensions, evolution becomes more complex, and dimensions become increasingly coupled to each other, necessitating the management of multidimensional elements simultaneously.

Avila et al. (2016), in turn, have developed a four-point S&OP process maturity model. The maturity steps are the marginal process, rudimentary process, the classical process, and the ideal process. The last stage is the most sophisticated and basically impossible process to achieve, becoming the benchmark towards which firms aim to accomplish and against which progress is measured. Each step may be stated in terms of meetings held, plan alignment, and technology utilized. Maturity model is presented in Figure 4

	Stage 1 Marginal Process	Stage 2 Rudimentary Process	Stage 3 Classic Process	Stage 4 Ideal Process
Meetings	Informal meetings Poor scheduling	Routine schedule Low attendance and participation	100% attendance and participation	Event-driven meetings
Plans alignment	Fragmented demand plans Supply plans not matched to demand plans	Demand plans coordinated Supply plans adapted to demand plans	Demand and supply strategies are in sync Collaboration with a small number of suppliers and customers	Internal and externally coordinated demand and supply strategies External cooperation with most suppliers and customers
Technologies used	Minimal technological support A overabundance of spreadsheets	Independent multifunctional APS system Independent demand planning system One-way limited systems	Demand and supply planning tools are combined Manually introduced external data into the procedure	Workbench for advanced S&OP Externally facing collaboration software that is linked to internal demand-supply planning systems

Figure 4 S&OP process maturity model (Adapted from Avila et al., 2016)

In both models, the final maturity steps are desirable but virtually impossible to complete. However, they serve as a benchmark for S&OP cycles and development phases. Although Danese et al. (2018) and Avila et al. (2016) use different dimensions in their models, they are congruent as a whole. Avila et al. (2016) have merged stages 1 and 2 together, compared with Danese et al. (2018). The first stage organization in both models is distinguished by an absence of S&OP sessions, activities, and measurement techniques. Silo culture dominates, there are no formal S&OP teams, and technology is confined to individual spreadsheets. For most businesses, the last step of maturity models is nearly unrealistic, aiming to execute cooperative decision across the organization and network. Teams are cross-functional and inter-organizational, and the process develops more balanced and flexible, with a focus on event-driven discussions and long-term strategic plans that promote the company's growth ambitions.

2.3.5 System

As shown in the maturity stages (Danese et al., 2018; Avila et al., 2019), in the more advanced stages of the S&OP process information technology should incorporate real-time tracking and problem-solving systems, as well as the capacity to support current network performance assessment, therefore measurements should target and the influence on the ecosystem. According to Danese et al. (2019), once the process has been validated and standardized, it should be managed using a consistent and supporting IT infrastructure, with suitable KPIs in place to monitor performance and any issues in order to prepare future actions and maintain level of commitment to process. Moreover, the importance of the relationship between people, process, and IT and their interoperability for effective S&OP planning has been highlighted in various studies (Kreuter et al., 2021; Ivert & Jonsson, 2014; Danese et al., 2018) and has been taken into account in S&OP maturity models.

One of the goals of S&OP is to meet the changing needs of customers and strive to minimize inventory and operating costs throughout the supply chain. In addition, numerous studies show the importance of systems that support this in achieving these goals at S&OP. In their study, Gallego-Garcia & Garcia-Garcia (2020) emphasize that without S&OP-enabled technology and system processes to meet customer needs and a complex market, it will not be possible to achieve a company's S&OP goals and full supply chain benefits. Kreuter et al. (2021) address that due to large amount of data, IT tools is mandatory enabler and building block to S&OP. Furthermore, Kristensen & Jonsson (2018) and Rokonuzzaman (2018) emphasizes that the S&OP process requires an operational planning and control system, as the purpose of the process is to combine a strategic and operational plan, and this will not be possible without the implementation of the necessary systems thoroughly. Rokonuzzaman (2018) and Kjellsdotter and Jonsson (2010) further emphasizes the importance of system implementations that if the S&OP process and information systems are not uniformly designed, the definition of supply chain strategy will be inefficient and thus lead to instability in the supply chain network. Thus, the

operation of S&OP and information systems must be seamless in intersections so that efficient decisions can be made throughout the supply chain.

According to Tuomikangas and Kaipia (2014), enabling technology is necessary for the implementation of the S&OP process, but emphasizes that in the pilot phase of the process, or in the implementation phase, it is more important to create a functional business process than a stylish IT tool. According to them, the IT tools will only be useful in the transition to advanced and proactive S&OP phases, when S&OP customized optimization tools should be introduced to enable data sharing and increase transparency. They further state that the S&OP process can be difficult to handle without adequate software system support due to its large scale. In the study by Seeling et al (2021), only 33% of firms that used the S&OP process utilized systems that support it. This led to poor transparency in the company regarding poor data sharing, as well as inefficient what-if scenario creation and analysis.

2.4 S&OP in process industry

Process industries (PI) are combinations of continuous and discrete manufacturing, and their unique properties are tied to the continuous production component. The characteristics of the process industry in S&OP are manifold, mostly linked to resource and capacity efficiency, which is consistent with the critical necessity of resource management in process industries. Characteristics for process industries include an alternate recipe, co- and byproduct manufacturing, restricted warehouse capacity, storage time constraints. In manufacturing continuous objects (COs) transform into discrete objects (DOs). COs cannot be measured in pieces and must instead be quantified in terms of volume or weight, whereas DOs may be counted in parts and batches (Noroozi & Wikner, 2016).

Moreover, specialized machinery, capital-intensity, the substantial consequences of equipment malfunction, long lead-times for capacity expansions, and the comparatively low work-in-process place an emphasis on managing resources in PIs, implying less

flexibility in reacting to demand changes (Noroozi & Wikner, 2016). In contrary to other sectors, most PIs often create commodity products with smaller variation and higher quantities, resulting in inflexible sequencing in the manufacturing process. Thus, the emphasis on S&OP in PIs is on supply planning and monitoring. Furthermore, because to the capital-intensive nature of PIs, any improvement in lowering costs and maximizing profit may be very valuable. (Noroozi & Wikner, 2017;2016)

Moreover, Dittfeld et al. (2021) conducted a multiple case study, based on 17 interviews, which explores the S&OP practices of seven businesses in the process industry. They state that organizations plan their sales and operations planning according to the design environment, emphasizing the risks management associated with material supply, capacity supply, and demand. Hence, maintenance planning, inventories capacity constraints, energy consumption, and productivity utility percentages should be incorporated into process industry S&OP models (Noroozi & Wikner, 2017). In accordance, Noroozi and Wikner (2016) present decision variables for process industries to be considered in S&OP (Table 2). However, they further state (2017) that previous research lacks unified theoretical foundations that may be utilized as a guide for the design and implementation of S&OP in process industries.

Table 2 Decision variables in process industry to be considered in S&OP (Adopted from Noroozi & Wikner, 2016)

S&OP attributes	Important factors	Process industry specific and industry generic properties
Demand planning	Demand forecasting	New product introduction Forecast based on sales plan
Supply planning	Resources	Energy cost Variable yield's effect on throughput Capacity requirements Aligned resources/investment on new resources
	Capacity utilization	Bottlenecks Inventory capacity restrictions, backlog level Integration of maintenance plans
	Materials	Supply uncertainty (raw material dependency) Perishability of goods (effects on target stock level) Long lead-time materials
Balancing	Balancing of supply and demand	Integration of different parties involved in the process

Noroozi and Wikner (2017) have conducted a study in which it incorporates the basic S&OP process with the integration approach discussed by Tuomikangas and Kaipia (2014) in an integrative S&OP model (Figure 5) and utilizes it to analyze S&OP in PIs based on its characteristics. In their study, four key integration areas in the process industry were identified; one is horizontal, which conforms to the emphasis on combining multiple processes of the corporation and its supply chain partners, and another three are vertical, financial, risk and scenario management, with a stronger emphasis on internal integration and effectiveness. Noroozi and Wikner (2017) further state that in the process industries, S&OP has mostly concentrated on intra-company operations as well as multisite concerns such as distribution planning integration between a firm and its distribution facilities. Inter-company interactions and other areas of integration have not been stressed to the same level. However, in response to market competitive dynamics, process industries have begun to incorporate these integration areas within their S&OP. Thus, according to them, PIs are more engaged on the traditional concept of S&OP, with a concentration on managing risk, financial integration, and supply chain associate integration. In contrast, Dittfeld et al. (2021) state that in order to manage these risks, the traditional S&OP model favoured in other industries may not be suitable for use in the process industry.

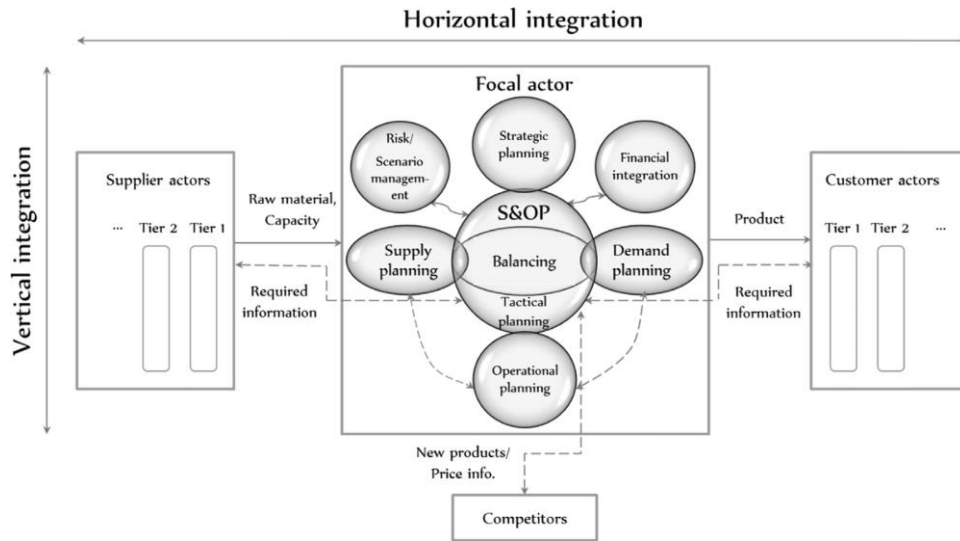


Figure 5 Integrative S&OP model (Noroozi & Wikner, 2017)

According to Noroozi and Wikner (2017), process industries are capital-intensive and typically try to maintain a rate of production for the both capital and labour. In turn, because PIs are also knowledge-intensive, the personnel in PIs should be highly skilled and thoroughly qualified to operate with the specialized equipment. For example, in order to deal with unpredictability in supply and demand, PIs must incorporate risk- and scenario management and analyze scenarios in monetary terms, which is referred as financial integration in literature. In this context, horizontal integration assists to limit risk, while vertical integration helps organizations stay competitive.

In accordance with integration model and vertical risk management, Dittfeld et al. (2021) study emphasizes the proactive design on S&OP concentrating on the primary risk focus resulting from the planning environment. This will further assist process industry organizations S&OP execution in identifying, assessing, managing and monitoring risks in the context of S&OP cycles. This is largely in line with Gallego-Garcia & Garcia-Garcia (2020) predictive S&OP model. Conversely, Dittfeld et al. (2021) also emphasize the reactive function of S&OP, so called S&OP adaption, and present a crisis S&OP meeting that is used as a risk management tool so that the S&OP process can be momentarily modified to accommodate the threat and quick changes posed by the risks. Crisis S&OP meeting can be held for example if multiple plants break down close in time, which will have a

major impact on future availability or reducing planning horizon due to the lack of stability on markets. Noteworthy, the crisis S&OP meeting does not replace any stage of the process cycle but acts as an adjunct if necessary. The structure of the meeting is similar to that of an executive meeting because it has the necessary hierarchical level for large decisions.

Hence, according to Dittfeld et al. (2021), Tuomikangas and Kaipia (2014) and Kjellsdotter et al. (2015), three different process industry specific risk management is presented: 1) companies that strive to balance demand and capacity supply concentrate on demand risk; 2) companies that desire to balance material and capacity supply concentrate on material supply risk; and 3) organizations that aim to maximize internal capacity typically concentrate on capacity supply risk.

2.4.1 S&OP in make-to-stock manufacturing

This section reviews the use of the S&OP process in the MTS production type, and what aspects need special attention here. Most studies, such as Kreuter et al. (2022) and Pereira et al. (2022), present the use of the S&OP process in companies usually with a production strategy of MTS and MTO. These production types have different characteristics on which they focus. The MTS production strategy is usually characterized by the fact that supply is limited to maximum capacity and there will be no change in supply in the medium term. This means that the production machines operate at full utilization under normal conditions. However, capacity can be affected, for example, by resourcing labor. However, in terms of the nature of their production and demand, MTS can be considered easier from an S&OP perspective than other manufacturing strategies.

Many studies about MTS strategy rely on demand whereas supply side is lacking attention. From supply side of S&OP in MTS, which is widely used in the pulp and paper industry, is particularly focused on continuous line production capacity and its management. This is strongly linked to the utilization rate and efficiency of production machinery and labor. Moreover, in most circumstances, supply is constrained by availability of

resources in labor and raw material. Additionally, what comes to the number of production stages in MTS, most people think of single-stage scenarios, mostly because the production is continuous, in which the bottleneck function is more easily detected, or because there is obvious a bottleneck (Pereira et al., 2022). As presented by Noroozi and Wikner (2016), these should be carefully considered in terms of capacity utilization in process industry-relevant S&OP. In the process industry, machines usually run around the clock. Thus, due to the production environment, S&OP balancing is usually done most efficiently through demand and logistics optimization.

According to a study by Ali et al (2018), it is common that, although MTS strategy companies is operating at full capacity the majority of the time, manufacturers are unable to capitalize on seasonal pricing swings and the desire of some customer to buy more for superior products and services. When production restrictions prevent all demand from being satisfied, the implementation of revenue management to arrange promising activities may be viewed as a helpful instrument to assure profitability and enhance connections with less price-sensitive customers. Revenue management is the use of analytics to forecast customer behaviour at the micro-market level and optimise availability of products while using pricing elasticity to enhance revenue and profit. Thus, statistical forecasting and different analytics related to it enhance S&OP planning in such environment and market.

Demand side is generally based on forecasts. Also, at tactical planning level, the production decisions in MTS strategies are made relying on forecasts (Nemati et al., 2017). In process industries, according to Noroozi and Wikner (2016), MTS systems often compete with prices, and hence performance measurements like as cost and productivity are relevant. In accordance with this, Ali et al. (2019) studied demand planning in softwood lumber company which operates with MTS strategy. According to them, forecasting sales and prices are essential components of the S&OP process. They emphasize weekly market forecasting for short-term (1-3 months) periods and monthly forecasts for medium-term (12 months) market timeframes. MTS organizations should adhere to the S&OP level strategy typical of the process industry, which entails mass production, economies

of scale, and efficient equipment utilization. They further state that such in supply constrained environment and price-focused market, company can only fully operate in short-term horizon as it is the market price that determines how much and to whom goods are sold and it fluctuates, for example, according to global actions. Thus, demand planning in S&OP should focus on sales and prices also in longer horizon even though it is operative 1-3 month time horizon that is most affected by price fluctuations.

Furthermore, Pereira et al. (2022) state that because to market consensus of shortening lead-times, these organizations maintain end-product stocks to meet market demand and they must be planned well beforehand. These inventories are also leveraged to absorb changes in demand. As a result, choices concerning the production volume, batch sizes, and inventories of product families are critical in S&OP in these firms. Ali et al (2018) further state that the demand management process performance could be increased if the high-priority customers demand is known before fulfilling low-priority customer orders and if nested booking limits is used. Hence, to face fluctuating environment in S&OP horizon, sales managers should gather information from high-priority customers' needs as early as possibly, thus improving customer relationship management performance. Then, they should focus on customer heterogeneity. Thus, customer categorization is crucial in S&OP horizon in MTS manufacturing strategy, and even so when demand exceeds supply.

To conclude, Nemati et al. (2017) researched the degree of integration of the S&OP process in the flour industry using the MTS strategy. Their results show the absolute superiority of a fully integrated S&OP process compared to a partially integrated S&OP in all situations, especially against demand and market price. So, S&OP has been found to be useful in companies with an MTS strategy, where the market price largely determines inventory levels as well as the amount of products sold.

2.5 Challenges

Although the S&OP process is clearly defined and described, its effective implementation and continued successful use is challenging for companies (Kreuter et al., 2021). This section presents the challenges related to the S&OP process from the perspective of implementation as well as the operation of an already created process. The challenges are largely related to the people as well as the interaction between them, because, after all, the actors in the process are the people.

Due to the complexity of S&OP, the successful implementation of the process alone is not enough, and even then, work must be done to ensure the continuity of the process. This requires employee involvement as after all, the process is operated by humans. Danese et al. (2018) see it as a stumbling block for many companies. According to Tuomikangas and Kaipia (2014) most important part of the S&OP process is the creation of a suitable culture and environment. Creating an appropriate culture inspires employees to commit to the process, its schedules, and other work tasks that involve it. The commitment of employees to the process and the work tasks it creates develops transparency within the company.

Jonsson et al. (2021) states that companies tend to have low commitment to process operation. As with implementation, as the process continues, the involvement and unrestricted attention of the organization's top management, or lack thereof, is seen as a major challenge. Consequently, Kristensen and Jonsson (2018) addresses that lack of top management support increases the possibility of failure in S&OP process. Although they are busy, the involvement of upper management is vital to the success and continuity of the S&OP process, because if top management is not committed to the process, it will not last. Lower managerial level involvement is also important. According to Danese et al. (2018), if attendance at meetings is not at the appropriate level, the S&OP process is not fully supported, and the process will eventually become ineffective. The absence of people from meetings is a sign to others that attending monthly meetings would be voluntary, which undermines the outcome of the meetings. This creates challenges for

operating the S&OP process. People's engagement can be fostered through an incentive (Ambrose & Rutherford, 2016) as well as creating the right kind of S&OP supportive culture for the organization (Tuomikangas & Kaipia, 2014).

According to Ambrose and Rutherford (2016), S&OP's challenges arise from the interfaces between the marketing and operations subgroups, most often between sales and production. These groups perceive the world in different ways and are frequently at conflict, due to the fact that they have distinct goals and are driven, through incentives, to attain them in different ways. Moreover, according to Danese et al. (2018) and Kreuter et al. (2021), S&OP cross-functionality bring challenges also due to gathering different people and decision makers from different areas. Hence, this will lead to poor transparency within organization. Further, Gallego-Garcia and Garcia-Garcia (2020) highlight in their study that lack of transparency and visibility between supply chain teams causes challenges in operating S&OP. There are also challenges with creating transparency. According to Hulthen et al. (2016) study, promoting comparability and transparency requires standardization. On the other hand, organizations must be able to modify measurements for diverse organizational groupings and levels. While they appear to be conflicting in nature, both issues must be considered when constructing performance metrics that are both informative and contribute to the significant decline of biases in decision making. Furthermore, another challenge they present is the visualization of the metrics. This challenge, in most cases, indicates the lack of proper IT systems.

Moreover, Hulthen et al. (2016) identify S&OP efficiency and effectiveness issues most frequently at the middle stages of process maturity. These include creating cross-functional trade-offs measurements, meetings efficiency measures, information gathering and communication, measure harmonization with strategy and incentive, and measure visualizations. One possible explanation for the frequency at the middle levels is the character of these challenges. The higher the maturity level, the more cases highlighted the issue not only in synchronizing all important S&OP measurements into cross-functional trade-offs, but also in aligning these measures with company strategy and

incentive systems. Hence, their research demonstrates how challenging it is, even in more advanced S&OP processes, to break down functional barriers and develop more cross-functional organizations.

Seeling et al. (2021) states the challenge of implementing S&OP, as a result of which the full benefits are not experienced. They highlight the lack of a complete understanding of the process. In accordance, Jonsson et al. (2021) states that companies are lacking great vision about the process and its outputs. To ensure the process's success, the team must coordinate supply and demand plans, both in specific and as a whole, while also adhering to the business strategy. Because the S&OP process is complex and operational, this is a significant difficulty for the majority of businesses. In addition, companies must constantly adapt the planning process, as situations are constantly changing (Jonsson et al., 2021). In contrast, they also state that S&OP is not intended to be an operative adaptable business process, so it may fail to represent the constantly changing operational environment. Thus, failure to meet these challenges occurred due to changes could result in an unsuccessful future for the S&OP process. Danese et al. (2018) further argue that, as a result, many firms have not achieved fully efficient processes and therefore the desired benefits. Thus, such as silos culture, sales department involvement, top management support, have not been achieved.

2.6 Conclusion

This is concluding segment of the literature review. In this section the main points of segments 2.1, 2.2, 2.3, 2.4 and 2.5 will be reviewed. S&OP planning is a monthly cycling five-step dynamic planning and decision-making process of supply chain management (SCM), in which the aim is to create a joint operational plan in collaboration between different functions, such as supply chain, sales, finance and production. S&OP combines the company's operative functions into one centralized operating model that improves the company's efficiency and competitiveness. According to various studies (Avila et al., 2019; Kristensen & Jonsson, 2018; Gallego-Garcia & Garcia-Garcia, 2020; Danese et al., 2018; Seeling et al., 2021a) the S&OP description can be divided into five main attributes;

1) It is integrated and multidisciplinary tactical planning process; 2) It combines business plans into one plan, “one set of numbers”; 3) It comprises a planning horizon of more than 3-24, depending on the business; 4) It combines operations and strategy, and; 5) S&OP is a value creating process and relates to the company's results.

Five steps of traditional model includes data gathering, demand planning, supply planning, pre S&OP meeting and executive S&OP meeting. The first three of which relate to product, demand and supply and the last two relate to S&OP meetings and decision-making. First, the data is gathered from previous cycle, then the S&OP process creates an unrestricted demand plan, secondly a constrained supply plan is developed, and finally a consensus-based supply and demand plan is established at the end of the monthly cycle (Seeling et al. 2021). In Global S&OP there are additional two meetings: global roll-up, which is the pre S&OP for all subsidiaries, and global executive meeting. Also, predictive S&OP perspective has had attention in recent papers (Gallego-Garcia & Garcia-Garcia, 2020; Seeling et al., 2021b). Model starts with market and based on market knowledge, three different probability scenarios are derived; probable, almost impossible, and in between. These scenarios then lead the S&OP cycle further to supply and demand review and meetings.

S&OP benefits are manifold and they are found in every process that has advanced maturity. Some expressed quantitative benefits are improved forecast accuracy and reduced inventories (Avila et al., 2019), higher capacity utilization and lower overall costs (Rokonuzzaman, 2018). Also, the qualitative benefits of S&OP are expressed which may not be directly reflected in the numerical result, but indirectly affect efficiency such as the flow of information between different departments and customer satisfaction. (Rokonuzzaman, 2018; Danese et al., 2018). However, benefits can be only observed through successful process implementation. Numerous recent studies show that it is essential for S&OP to design according to the company's own attributes (Ivert et al., 2015; Kaipia et al., 2017; Kristensen & Jonsson, 2018), which makes its implementation even more challenging as each company and business market is different. Implementation

process traditionally goes through three phases: pilot phase, expansion and financial integration. Also, the more mature S&OP process, the more advanced IT systems are needed to match the challenges. Moreover, the importance of the relationship between people, process, and IT and their interoperability for effective S&OP planning has been highlighted in various studies (Kreuter et al., 2021; Ivert & Jonsson, 2014; Danese et al., 2018).

The emphasis on S&OP in process industries is on supply planning and monitoring. Dittfeld et al. (2021) state that organizations plan their sales and operations planning according to the design environment, emphasizing the risks management associated with material supply, capacity supply, and demand. Hence, maintenance planning, inventories capacity constraints, energy consumption, and productivity utility percentages should be incorporated into process industry S&OP models.

According to Ambrose and Rutherford (2016), S&OP's challenges arise from the interfaces between the marketing and operations subgroups and moreover, according to Danese et al. (2018) and Kreuter et al. (2021), S&OP cross-functionality bring challenges also due to gathering different people and decision makers from different areas. Thus, as after all the process is operated by humans, Danese et al. (2018) see it as a stumbling block for many companies. This includes such characteristics as lack of transparency or knowledge, low commitment to the process and more widely, not suitable environment for the process.

3 Methodology

The structure of the study is a qualitative case study, in which one organization is examined. In order to answer the research question, the relevant topics have been comprehensively addressed in the literature review. After presenting the basics of S&OP and opening up the concepts, to gather more in-depth information in the study, interviews were conducted with relevant people in the organization. Although the main focus is on one of the company's two business areas, the integration of the process into the other business area is also the subject of research. This has been taken into account in the questions of the interviews as well as in the selection of the persons to be interviewed. In order to confirm the validity and reliability of the results of the study and their presentation, it is important to present the stages of the study, the design and the methods used. Thus, this section first presents the main features of data collection as well as the steps that were covered in this study. The analytical methods used in the study are then presented. Finally, the quality of the study, ie. reliability and validity, is analyzed.

3.1 Data collection

To gather background information for this study, a comprehensive literature review was conducted. The literature review was performed using relevant databases such as Scopus, EBSCO and ProQuest. Literature contains peer-reviewed articles and books written within 5 years. The literature review also used older literature that is still considered relevant and can be perceived as necessary for understanding the topic of the study, such as previous literature related to the creation of the process.

Primary data for the research was gathered by interviews (N=14). The interview is a versatile approach that may be used for a variety of research reasons. It is thus very suitable for this qualitative case study. In the interviews, there is close interaction with the interviewee, which allows for interpretation of the responses as well as improved data gathering from the start. This includes, for example, asking additional questions to obtain more detailed information on the topics mentioned (Hirsjärvi & Hurme, 2008; Saunders

et al., 2012). The interview method was a semi-structured interview. According to Hirsjärvi and Hurme (2008) a semi-structured interview is a non-standardized, discussion-style method for perceiving especially broad things through particular questions. Although most interviews have a same subject and questions, Saunders et al. (2012) imply that questions may differ between interviews, even if the concept and topic are the same.

The interviews were conducted remotely by video calls. Key personnel from the organization involved in the S&OP process implementation and system development were selected for interviews. The S&OP process and the SAP ERP system have already been implemented or are being implemented in the company's various business areas. In order to obtain best practice information and to collect more extensive information, three people who are involved in the implementation of the process in different subsidiaries of the company were also interviewed in this study.

Total of 14 interviews (see Table 3) were conducted in the research. The interviewees were 3 supply planners, 2 supply chain managers, SVP of supply chain, 2 system development managers, VP of sales, sales controller, S&OP manager, solution designer, supply chain development director and VP supply chain development. The aim is to get a comprehensive picture of the S&OP process and future changes for the various departments. This interview portfolio gives comprehensive picture related to S&OP process structure and system development from different areas of organization.

Table 3 Interviewee titles

Department	Quantity
Supply chain	6
<i>SVP, Supply Chain</i>	<i>1</i>
<i>Manager, Supply Planning</i>	<i>2</i>
<i>Supply Coordinator</i>	<i>3</i>
System Development	3
<i>System Development Manager</i>	<i>2</i>
<i>Solution designer</i>	<i>1</i>
Sales	1
<i>VP, Sales</i>	
Finance	1
<i>Sales Controller</i>	
Internal, different BA	3
<i>S&OP manager</i>	<i>1</i>
<i>Supply Chain Development Director</i>	<i>1</i>
<i>VP, Supply Chain Development</i>	<i>1</i>
total	14

Interview questions related to the research question and objectives are presented in Appendix A. The questions were sent beforehand to interviewed persons to make interviews more efficient and to help interviewees to find answers after they have read the interview agenda before. The way the questions are presented, the order and the questions themselves may differ between the interviews, because as mentioned earlier (Hirsjärvi & Hurme, 2008), the nature of a semi-structured interview includes asking additional questions and changing the order and structure of the questions to get the best information. Saunders et al. (2012) further states that questions are dependent on conversation flow, so the order and additional questions vary between interviews.

Interviews always started with a general question about the S&OP process so that the respondent can get inside the topic and get in the right position in their answers. We then moved on to the more specific questions, the order and structure of which varied according to the flow of interviews. There were also specific questions on the topics that arose. In general, however, the structure of the interview is the framework presented in

Appendix A, but there were additional questions for the Supply Chain managers as well as the financial representative due to their job description, for example.

Secondary data for the study were collected from the company's internal systems. This will help to deepen the knowledge about the current state and structure of the organization's S&OP process and the implementation of the SAP ERP system. Secondary data included process charts and cards, tables and relevant presentations. Also, observation on different meetings was used to gather comprehensive knowledge about studied subject.

3.2 Data analysis

In order to draw observations and conclusions from the data collected, it must first be analyzed. Hirsjärvi and Hurme (2008) present the analysis phase of the interviews as the most time-consuming and resource-intensive phase of the work. They emphasize that the method of analysis should be considered when collecting material. Thus, the analysis of the interview data should already take place in connection with the interviews, at least to some extent. They continue to outline the main features of a qualitative analysis: 1) The analysis usually begins at the interview stage. When a researcher also acts as an interviewer, he or she can make observations about the occurrence of factual content, such as repetition, distribution, and frequency, 2) Material is usually analyzed close to the material and its context. This means that qualitative research retains its data in verbal form, 3) The researcher uses reasoning that can be either inductive or abductive, where the researcher has own theoretical guiding ideas for which verification is sought and, 4) Analytical techniques are diverse. There are few standardized methods in the qualitative method, and not one is right or wrong.

There were 14 interviews in this study, the shortest being 20 minutes long and the longest two hours. There is thus a lot of material to be analyzed. The material of the thematic interview is usually rich (Hirsjärvi & Hurme, 2008). All interviews were transcribed. Hirsjärvi and Hurme (2008) present approaches to data analysis. 14 persons content

analysis was used in this study. In this approach, the interviewer interprets the transcribed material either 1) by organizing the material and highlighting its structure, 2) by clarifying the material by eliminating unnecessary things from the large material, or 3) by the actual analysis that involves classification, interpretation, and ad hoc procedure. Method 2 was used the most in this study, but also method 3. The data were analyzed in two steps, so that only relevant items were selected from the spelled data. This was done with second option, summarizing the meaning, by condensing the first stage into a shorter, easier-to-read, verbal form for further analysis. The third point was used outside the interviews in ad hoc discussions with different people in the company and in different meetings before, during and after the interviews. In addition, other internal data of the company were analyzed before and after the interviews. Before the interview, the analysis of the data was the collection of basic information, but afterwards it was a deeper understanding and supplementation of the data and perspectives told from the interviews.

3.3 Quality

Validity and reliability considerations should be taken into account to assess the credibility of the study. Reliability refers to the extent to which data collection techniques or methods of analysis produce consistent findings, and validity is related to whether the findings are truly what they appear to be related to. It has been observed that there has been controversy over reliability criteria, especially in qualitative research, as research is difficult to distinguish from research, because in qualitative research, the research tool is the researcher himself. (Saunders et al., 2012)

Reliability means that interviewing the same person on two occasions gives the same result. Reliability is also the fact that two evaluators come to the same conclusion at the same time (Hirsjärvi, S. & Hurme, H., 2008). However, there is only one evaluator in this work, the author of the work himself. Saunders et al. (2012) argue that the reliability of qualitative research can be distorted by subject bias as well as observer bias and errors. The bias of the subject takes into account the interviewees who give false information,

and the bias and errors of the observer mean misinterpretations of the answers of the interviewees. However, in this work, the illusion of the topic does not occur, because the interviewees share their own views on the process in which they themselves are involved, as well as about their own work in general. They therefore have no reason to distort the information so it is unlikely that respondents would give a more negative picture of the subject, especially when the interviewer is also within the corporation. Attempts were made to minimize the observer's bias by reading the spelled material several times, as well as listening to the recorded interview several times to obtain an authentic context-specific context. In addition, additional questions were asked in the interviews in addition to the question set, if the need was seen.

The validity of a study can be divided into three different forms: construction validity, internal validity, and external validity (Saunders et al., 2012; Hirsjärvi, S. & Hurme, H., 2008). The validity of the construct determines whether the selected measurement instruments evaluate the items that were to be evaluated. Internal validity means when a causal relationship between two variables is demonstrated. External validity means the ability to generalize the observed results. For this reason, it is crucial to select the sample correctly so that it accurately represents the population desired by the researcher. In this study, the sample of interviews was limited to individuals involved in the S&OP process, from many different hierarchical levels and different divisions, including different business areas.

The interview form used in the study was tested before the interviews began by someone who is unfamiliar with the field and is not aware of the subject of the study. The purpose of this was to validate the quality of the questions, ie. to ensure that the wording and order of the questions are comprehensible, clear and relevant. The quality of the interview was ensured by sending questions to the interviewee in advance, about two days in advance, so that he or she has time to internalize the topic of the interview and prepare mentally for the interview. This has been shown to improve the quality of the interview (Hirsjärvi, S. & Hurme, H., 2008). Interviews always started with general questions first to get the interviewee familiar with the topic, followed by more detailed questions.

4 Case company analysis

This section answers the research objectives of what is the current process structure in the company. Case company's S&OP model will be briefly introduced and the differences between it and traditional model as well as differences to characteristics of PI in S&OP will be noted. This section will fulfil the research objective on what is the current S&OP structure in Case Company. This section thus explains how the S&OP process is operated currently in the company, what maturity stage is achieved in each criteria and moreover what is the current S&OP structure in the company.

4.1 S&OP process

Case company operates in the pulp and paper industry. Pulp and paper business is characterized by a high volume of bulk production, a small product mix and relatively inflexible processes. The general S&OP model and structure are comprehensively presented in the literature review. The traditional model covers five different phases, data collection, demand review, supply review, pre S&OP meeting, and executive S&OP (Kreuter et al., 2021; Gallego-Garcia & Garcia-Garcia, 2020; Kristensen & Jonsson, 2018). In the Case company model, the first step is considered to be automation, which is in line with Seeling et al (2021) study. Hence, in the case company, the S&OP model focuses on steps 2-5. Case Company has defined an S&OP model and it is presented in Figure 6. This defined model shows what the process should be and what the company is heading for. The state and maturity of the process is examined later in section 4.2.

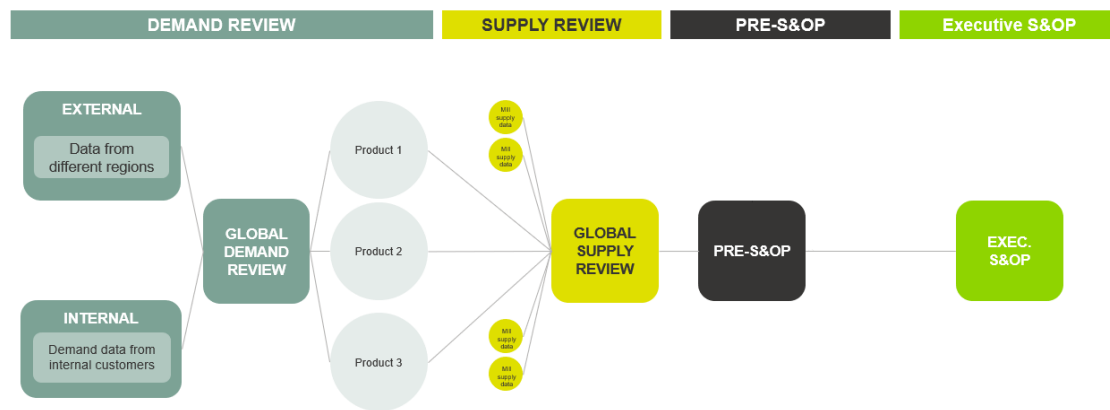


Figure 6 Case Company's S&OP process

The process begins with the definition of demand data and the creation of an unrestricted demand forecast, followed by an assessment of supply capacity. The baseline forecast is the first stage in preparing for the Demand Review. It is used to establish a consistent starting point for the Demand Review and to allow planners to begin with the most accurate forecast assumptions. This should be based on the final consensus demand from the previous cycle. This may also be viewed as the data gathering step in the classic S&OP approach.

Case Company's demand review is the first of four steps in the S&OP cycle. According to defined model, Demand Review is divided into three parts; external, internal and global. The global demand review is preceded by three distinct demand review sessions, one for assessing internal customers demand and two for reviewing demand from market customers. First one for APAC region and another for EMEA and Americas regions. Chairmans for the meetings are Vice Presidents of Sales for that region and internal sales. Internal customers refer to other subsidiaries to whom product is sold. Facilitator is set to be whose role is currently handled by the regional supply coordinator. Additional participants for these are sales directors, sales managers, sales controller and logistics representatives. Moreover, operational representation is included, which includes supply planning, and sales support. For Global Demand Review the chairman is SVP Sales and the facilitator is S&OP Manager. Additional attendees for these are regional and internal

sales leads and sales controller. However, Demand Review is not conducted as defined by the Company as set out later in Section 4.2.

Baseline-, statistical-, and sales forecasts, historical data, market insights, pricing, product portfolio information, and corporate strategy are inputs for Demand Reviews. Sales forecast is one of the major inputs for reaching at the unconstrained forecast in the demand review since it takes into account the most recent market information such as customer wants, industry data, and market trends. The demand review is intended to result in a single plan for unconstrained demand with assumptions and uncertainties over the S&OP horizon of months 3 to 18. This would be the best market perspective of demand, led by company business strategy and not constrained by supply restrictions. Scenario planning may be utilized in the Demand Review to predict alternative unconstrained demand expectations.

Hence, Supply Review include reviewing a global consensus unconstrained demand plan derived from the Demand Review. Additionally supply capability data, key capacity restrictions, stock levels, costs, current orders and wood supply need are assessed in Supply Review. Also, actions from last S&OP cycle are reviewed. Supply Review is one global meeting to which data is collected on a mill-by-mill basis, taking into consideration product families. Facilitator for Supply Review is S&OP Manager and chairman is SVP Supply Chain. Other participants are logistics manager, wood supply manager, supply chain controller, participants from production and internal customers participants. The supply review's desired results are limited supply plan, different scenarios and corresponding costs to rectify imbalances. The Supply Review meeting currently follows the S&OP model, covering relevant participants as well as the time horizon from 3 to 18 months. The meeting will look at production on the horizon and related constraints, mirroring the demand plan.

As a result of the supply phase, the managers of the different departments convene for a pre-S&OP meeting. In this regard, the company's procedure adheres to the traditional

S&OP approach. Facilitator for the meeting is S&OP Manager and responsible chairman is SVP Supply Chain. Participants for the meeting are leads of sales and production, sales and supply chain controller and logistics lead. The pre-S&OP meeting will aim to close lingering supply-related imbalances based on bottom-line financial confirmation of scenarios addressed in both demand and supply review sessions. Issues such as production and stock levels, raw material needs and financial performance is reviewed in the meeting. Meeting is held within the S&OP scope as defined. Thus, as a result, the output of the pre S&OP meeting for the Executive meeting should include the S&OP plan as well as unsolved issues and choices for escalation. The Executive meeting should result in a single accepted S&OP plan and activities for the following cycle. However, the Executive S&OP meeting is not yet functioning as it should in the organization. The company's maturity level is not there yet, and this will be covered further later in section 4.2.

More specifically the S&OP process in the process industry and the MTS production strategy are presented in sections 2.4 and 2.4.1. The characteristics of the process industry in S&OP are manifold, mostly linked to resource and capacity efficiency, such as specialized machinery, capital-intensity and the substantial consequences of equipment malfunction (Noroozi & Wikner, 2016). In line with Case Company process, PIs must incorporate risk- and scenario management and analyze scenarios in monetary terms (Noroozi and Wikner, 2017). PI organizations should operate their sales and operations planning according to the design environment, emphasizing the risks management associated with material supply, capacity supply, and demand (Dittfeld et al., 2021) in which demand side is generally based on forecasts (Noroozi & Wikner, 2016).

By comparison, Case Company's S&OP plan focuses on fulfilling demand with optimal overall supply decisions, maximizing production asset utilization and taking into account and delivery capabilities and raw material availability. The process of the company has been sought to be create as the literature defines it. However, according to the interviews and internal data, the S&OP process in the company is not yet mature enough to be considered ready S&OP process. The process is in the adaptation phase, where an

attempt is made to apply it to suit the industry field of the company and at the same time bring the SAP ERP operating system to support the design of the long time horizon of the process. In accordance with PI industry and MTS model presented in the literature, Case Company is also capital intensive, ie. the goods are pushed into a warehouse to be sold and the price determines whether they will be sold. The starting point is to sell everything that goes into stock. According to the literature reviewed in section 2.4, the traditional S&OP model works in the PI industry, but certain aspects must be taken into account. In accordance with interviews, Case Company's business model is predictable in its own way as production volumes are more or less fixed for years to come, and there is very little variation in annual customer contracts in new contract periods, that is demand is stable in that sense. However, business's specialties in sourcing wood raw material and in a rather volatile market pose challenges to forecasting. Hence, the S&OP process is utilized in each subsidiary, but they are at different stages, which is why relevant individuals from different business areas within the company were interviewed in this study.

4.2 S&OP maturity in Case Company

The S&OP maturity stages are discussed in Section 2.3.4. To get a comprehensive picture of the current S&OP structure of the case company and the maturity stage of the process, we compare the company model with the model presented in the literature review. Case Company's S&OP maturity can be estimated through the maturity models presented in the paper. In this section, the maturity model developed by Avila et al. (2016) is used to assess the maturity status of Case Company. The model has been taken as a benchmark for estimating the maturity of a company's process due to its simplicity and straightforwardness. The model takes into account the level of meetings, the alignment of the plans and the level of systems used. The Case Company focused maturity model is presented in Figure 7.

	Stage 1 Marginal Process	Stage 2 Rudimentary Process	Stage 3 Classic Process	Stage 4 Ideal Process
Meetings	Informal meetings Poor scheduling	Routine schedule Low attendance and participation	100% attendance and participation	Event-driven meetings
Plans alignment	Fragmented demand plans Supply plans not matched to demand plans	Demand plans coordinated Supply plans adapted to demand plans	Demand and supply strategies are in sync Collaboration with a small number of suppliers and customers	Internal and externally coordinated demand and supply strategies External cooperation with most suppliers and customers
Technologies used	Minimal technological support A overabundance of spreadsheets	Independent multifunctional APS system Independent demand planning system One-way limited systems	Demand and supply planning tools are combined Manually introduced external data into the procedure	Workbench for advanced S&OP Externally facing collaboration software that is linked to internal demand-supply planning systems

Figure 7 Case company S&OP maturity (Adapted from Avila et al., 2016)

The maturity of the company's S&OP meetings is rudimentary. The company has a routine schedule for meetings, but an executive S&OP meeting is not yet being held. According to the interviews, this meeting will be included in the process cycling once the system development is fully structured in the organization. It is also worth noting that the demand review meeting is not yet at the level it should be. It takes a more operational view of going through a 1-3 month time horizon, and only occasionally there are reviewed aspects from S&OP planning horizon. Thus, the focus should be in the long-term planning of demand on the company and harness the appropriate meeting practice, not forgetting, of course, the current short-term operational planning. As far as meetings are held, in terms of supply, demand, and pre-S&OP, participation percentage is high, and the right people are included in the meetings. In particular, supply review and pre S&OP are close to the maturity level of the classic process. Hypothesis is that once SAP

ERP is implemented, the quality, participation, and content of your meetings will also improve through better data transparency and more extensive information.

For the alignment of the plans, the maturity of the company is at the level of the rudimentary process. Although meetings are scheduled according to the cycle and participation is at a good level, the end result is not always a balanced plan. According to interviews, Case Company is *“focusing on too short period of time, and when the S&OP round is completed, neither of S&OP plans will take balance, nor will those sales, production or inventories”*. Demand planning is done through annual sales plans, but there is no rolling 18-month planning yet. Currently, demand planning is only up to 12 months. This may be due to the above-mentioned meetings and their quality. Currently, according to interviews, the case company’s S&OP process is more of a data sharing platform than a decision-making platform. Though, in the big picture, decisions are made to meet this demand plan because the intent is to get the entire fixed production volume sold.

For the model under consideration, the maturity of a firm for using technology is a combination of the features of phases 1, 2, and 3. For this reason, the maturity is considered to be stage 2. With regard to the use of the systems, it should be noted that the new system, which supports S&OP, is in the middle of the implementation phase at the time of research, so the benefits of its use are not yet realized. Based on the interviews, the current systems can operate successfully with the S&OP process, but they are quite clumsy for the transparent planning of the long time horizon. Thus there can be considered to be shortcomings in the use of the system for the S&OP. Also, as mentioned above, due to the lack of system support, the company has different spreadsheets in place that are updated and modified more ad hoc than uniformly and transparently for the entire organization.

Thus overall, Case Company S&OP maturity is rudimentary. It should be noted that the implementation of SAP ERP is expected to have a positive impact on the maturity of the S&OP process. According to interviews the new system will support meetings with real-

time and transparent information, will help align plans, and help get “one set numbers” at the end of the cycle. The new system will also increase the level of maturity of the technology used, as SAP ERP is a tool that supports the S&OP process. The hypothesis, then, is that with the implementation of the SAP ERP system, the case company process will evolve to the classic level.

4.3 System development

This section describes the future system developments of the case company. The subject of the presentation is SAP ERP based on a research question, but the future new ERP system will also be briefly presented. SAP SE is large German IT-provider that might be best known from ERP systems such as R3 or 2015 released S4/HANA. SAP IBP is a product to support S&OP planning. SAP IBP has Excel based user-interface and it consists of six modules: Demand, Inventory, Sales & Operations Planning, Demand Driven Replenishment, Response & Supply and SAP Supply Chain Control tower. According to interview, SAP IBP, even though it operates on HANA platform, does not require latest version of SAP S4/HANA ERP system, but to operate most successfully company should have HANA platform. Otherwise, SAP IBP will not be able to use all possible functions to process large amounts of data. However, as mentioned, SAP IBP does not need a HANA platform to operate, and is a workable tool in itself to support the S&OP process.

According to the interview, IBP reads SAP data based on transactions. IBP significantly brings additional capabilities to identify changes in the market, product portfolio, and the ability to work more flexibly on scenario work, which supports the implementation of the process. Scenarios are user-specific “alternative realities” of a plan. In other words, they are copies of the forecasts or plans in IBP, that a planner creates in order to see how changes to the data affect the overall plan. Scenarios can be used along-with simulations to determine what the best path forward is, without interfering with the current planning, and answer what-if questions quickly. IBP comes with the ability to view forecasts in monetary terms, which has not been possible in the previous system, but this has been done with various additional excels.

According to interviews the implementation of a system usually depends on whether the company wants to redesign its processes to IT systems or whether the IT system is changed to match the company's existing processes and at what level the changes are needed. IBP is quite flexible in this sense. In the case of Case Company, the S&OP process has been created as a common model for the entire company. SAP IBP could be tailored to suit these processes.

5 Results

Chapter 2 provides a review of the relevant literature, which comprehensively addresses the characteristics of the topic and the most important aspects of the research. Chapter 3 presents the steps of implementing the study so that anyone can repeat it and get the same result. Chapter 4 presents the company's defined S&OP approach while meeting the research objective; what is the current S&OP structure in the case company. The section contains material from the company's internal databases as well as from the interviews conducted.

The aim of this chapter is to break down the analysis of the interviews and databases and to answer the research question: How will the S&OP process and systems that support it change Supply Planning job descriptions, and operational work? Moreover, this chapter answers the rest of the research objectives; how can the current organization best to support the process and system development and how this affect on whole supply chain structure. First, the findings from the interviews as well as the internal databases are presented and put together according to the research questions and objectives. Following the analysis, suggestions for improvement are presented to the company within the framework of the research question and objectives. Based on these, suggestions for improvement to most major issues are presented in Section 5.2.

5.1 Findings and analysis

As stated earlier, there are drawbacks in the operation of the case company's S&OP process that are highlighted. Things to be improved are related to the research question and research objectives and these points are discussed in this section. In connection with the research question, there are areas for improvement in the tasks of the Supply Planning team, and their distribution between people. This is affected by the current process, the upcoming SAP ERP system implementation, and the development of the process in general. Improvements related to the research goals focus on the challenges identified in the interviews, the meeting practices in the process, and the overall operation of the

process which is presented in Chapter 4. In this chapter the current process is based on the S&OP model of the process industry and the characteristics of the business in general. First, the observed results are presented, followed by suggestions for improvement in the company's process.

5.1.1 Supply Planning team structure and amendment

The title for everyone on the team is Supply Coordinator, and the supervisor is Manager, Supply Planning which acts also as S&OP Manager. In the Supply Planning team, the coordinators are responsible for the supply in regions, mills and ports. Responsibilities include production planning, logistics planning, inventory balancing, supply and demand planning and collaboration with sales and other supply chain teams, such as logistics and sales support. Team has separately regional coordinators whose responsibility is overall supply and demand in APAC, EMEA and Americas regions and mill coordinators. The work of the mill coordinators is operational, and they are more related a production and logistics planning regarding with several mills. Overall, the tasks of the Supply Planning team are operational, and thus detached from the S&OP process. However, it has been noted (Gallego-Garcia & Garcia-Garcia, 2020) that the S&OP process also covers the operational reactive part, which operates in line with the agreed S&OP plan. Roles in the team is administrative regarding the adjusting sales and production forecasts.

To gather knowledge about possible amendments on tasks, related to research question, interviews for case company personnel and other subsidiaries of corporation was conducted. According to them, suggestions for Supply Planning team responsibilities can be made, which also interact with other parts of the organization as implementation of SAP ERP and the development of the maturity of the S&OP process also have an impact elsewhere in the supply chain organization. According to internal data, shortcomings have emerged in organizational roles and their definitions. There are responsibilities in the company-defined model that no one currently owns. Demand Planner is configured for many different stages of the process, but according to interviews and internal data, no one owns that role. Now the persons from Supply Planning team does both roles, supply

and demand planner to some respect. In the current model, the regional coordinator of the Supply Planning team works closely with the region's sales, sales coordinators, and sales support. So, to make the process more successful, the role needs to be clearly defined in the right place in the organization. Suggestions for role defining is reviewed in section 5.2.

The interviews also revealed the emphasis on the definition of operational work with the implementation of SAP ERP. Implementing the S&OP process also requires operational work in terms of data entry and updating, and responsibilities for these must be well defined. Interviews revealed that, especially today, there are many different operative tasks within supply chain for which the right actor has not been defined, and often it is ultimately the responsibility of the Supply Planning team. So, clearly allocating tasks can improve the overall day-to-day work also for the S&OP process. Hence, according to the interviews, the role of sales has been emphasized more than before due to new system implementation. This extends to both data input and S&OP process participation. System utilizes statistical prediction as well as different scenarios. Accordingly, sales have the best and most real-time information on the accuracy of sales forecasts based on customer market data, allowing them to edit forecasts accordingly themselves in real time. Sales' emphasized responsibility also allows scenarios to be made better for different stages of the process.

The clear definition of tasks and roles also extends to the activities of the S&OP team insofar as the team must be clearly defined; who is part of the team and at what point they contribute. The current process for the S&OP team is reactive in terms of maturity Danese et al. (2018) and the rudimentary by Avila et al. (2016) model both presented in section 2.3.4. Thus, defining clearly an global S&OP team is crucial for increasing maturity. Ideal S&OP team is multidisciplinary, with managers or important players representing each function (Kristensen and Jonsson, 2018). The S&OP team should consist of the sales, marketing, finance and operational departments of the organization, such as production and supply chain (Avila et al., 2019). Also, raw material procurement personnel and

logistics should be involved. According to other subsidiaries S&OP team can consist only managerial level people but also including planners. Thus, taking into account case company structure, planners should be involved in S&OP team contributing to supply and demand reviews. The involvement of personnel must be taken into account at an early stage, as this is a prerequisite for changing the process and carrying it out, as the committed S&OP team will reduce obstacles in the later stages of the process (Danese et al., 2018). Similarly, according to Pedroso et al. (2016) it is advised that the involvement of the S&OP team and top management adequately assist the process implementation, especially in circumstances where organized discipline is necessary, changes are not widely accepted, or are particularly complicated.

5.1.2 Meetings

As discussed in Section 4.2, the maturity of a company for meetings is rudimentary. Supply Review and pre S&OP meetings can be considered to be in the advanced stage, while Demand Review as well as Executive S&OP are in the rudimentary degree. Given the characteristics and behavior of the business environment of the case company, the development of the Demand Review and Executive meeting must be considered. According to Danese et al. (2018), if attendance at meetings is not at the appropriate level, the S&OP process is not fully supported, and the process will eventually become ineffective. The business is really sales and supply-driven, as supply is steady and fairly predictable in terms of production plant capacity. Demand and supply are thus balanced by the allocation of sales and logistics. Suggestions for improvements found here are presented in section 5.2

The company's meetings were discussed in Chapter 4. According to it and the interviews, it is noticed that the Demand Review is carried out with too little time horizon compared to the S&OP process. Scope of the Demand Review is 1-4 months, which makes it more of an S&OE (Sales & Operations Execution) meeting and the emphasis is on looking at how demand in that region will behave in the coming months. However, it should be noted that such an operational S&OE meeting is important for the company's

operational work. However, the scope of the meetings should be changed according to the process. Participants in these meetings are following the right model, with an emphasis on sales representation and sales directors in the role of chairpersons. The structure of the meeting must also be developed in accordance with the S&OP model. Currently, according to interviews, sales figures are only reviewed in conjunction with the market review, but the meeting should be more structured and cover the essentials. All the data should be already checked and updated to the system before meeting, unlike now. In the current model, the forecasts and the changes to them are announced at the meeting, and then modified. It is also noted that the Global Demand Review is an important part that should be before Supply Review as it has the ability to go through a region specific as well as product specific demand plan. At this point, it is possible to allocate the sales plan by region, as the volume varies between regions and products. This meeting should include SVP Sales and Customership as well as regional sales directors, and S&OP manager. Further suggestions are made in section 5.2.2.

The case at Supply Review is one global meeting that discusses factory-specific supply and the constraints on them based on the demand forecast from the last step. According to interviews, Supply Review is close to classical maturity in participants and structure. However, in the future, supply planners could serve as part of the S&OP team and act as facilitators in supply review. Now, Supply Review data collection is the responsibility of S&OP Manager. As stated, the meeting is the right kind, but continuous improvement is needed here as the process develops as a whole. Moreover, as noted, the pre S&OP meeting is also close to the level of classical maturity, both in terms of scheduling and participants. However, in order for the organization to better support the process, the supply planner could participate in the Supply Review and compile material from his or her own region of responsibility for the meeting. This is also used in another subsidiary and has been found to work. In this case, the demand planner would report to the supply planner who will act as their speech men. Today, S&OP Manager compiles the material and acts as a facilitator for the meeting. However, this is also a working concept, as long

as it works in the company and does not overburden the person with the role of S&OP Manager.

One of the biggest shortcomings in the process was the lack of an Executive Meeting in the monthly cycle. Successful completion of the process involves the operation of each step. According to the interviews, this last step is not being implemented at all. At this stage, decisions should be made on the problems and issues raised as a result of the previous step, either by accepting the proposals from pre S&OP meeting or by choosing a different direction (Wallace & Stahl, 2008; Seeling et al., 2021; Avila et al., 2019). This is important even if there are no changes every month. Commitment of senior management is important and if they are not involved in the process there are most likely no commitment either in further organization. Further suggestions are made in section 5.2.2.

5.1.3 Observed challenges of S&OP process

In order for the organization to be better able to support the S&OP process and operate more successfully, it is important to identify the challenges and stumbling blocks experienced by significant members of the process. The most common challenges of the S&OP process have been discussed extensively in the literature and are presented in Section 2.5. Similarities can be found with the challenges observed in the literature and in the interviews. To fulfill on of the research aims on as how the current organization can best to support the process and system development, the challenges identified in the interviews about the process are presented in the Figure 9. It should be noted that some of the interviewees experienced more than one challenge, therefore the final number is greater than 14. It should also be noted that some of the observed challenges can be compartmentalized in the same caste and analyzed as a whole. This is taken into account in this paragraph. A suggestions for improvement in the identified challenges is presented in a later section 5.2, which will aim to help the current organization support the process.

Observed challenges in S&OP		Quantity
1	Too short S&OP scope horizon	3
2	Information communication	2
3	Different ways of working between the region and the teams	1
4	Volatile market	1
5	No decisions that creates balancing at the end of S&OP cycle	2
6	There is a lack of clarity in the process / lack of understanding	2
7	Lack of commitment from upper management	3
8	All meetings is not properly operated, no Executive S&OP	1
9	People involment and suitable organization	2
10	Confusion in forecasts, no clear boundaries	1
11	Cooperation of Sales and Supply chain	1
12	Accuracy on information	1
13	Lack of commitment for longer periods	1

Figure 8 Observed challenges in Case Company's S&OP process

As it can be seen from Figure 9, both the “too short S&OP scope horizon” and the “lack of commitment from upper management” have both appeared in three separate interviews. Thus, they can be considered most crucial individual stumbling points in the process. These both are clearly in correlation with meeting structure. Too short planning horizon were also emphasized on Demand Review. S&OP cycle should deliver a balanced S&OP plan at the end, or otherwise the benefits from process are not met. Lack of upper management commitment is a possible consequence of not holding an Executive Meeting. As a result, knowledge does not rise high enough in the organization. In contrast, according to interviews and Kristensen and Jonsson (2018), process should be top-down managed, no other way which it is now. Process need commitment from every level, especially from upper executives, to be able to succeed.

Further, “information communication”, “no decisions that creates balancing at the end of S&OP cycle”, “lack of clarity and understanding in the process” and “people involvement and suitable organization” have all appeared in two interviews. The incidence in these is also at a significant level and needs to be taken into account. Information

communication refers to visibility and communication to right people within and outside process. Lack of understanding is lack of understanding of the process, both in upper and lower level employees. Thus, creates lack of commitment and knowledge of possible benefits. Moreover, “different ways of working between regions and teams”, “volatile market”, “all meetings are not properly operated, no Executive S&OP”, “confusion in forecasts, no clear boundaries”, “cooperation of Sales and Supply chain”, “accuracy on information” and “lack of commitment for longer periods” all appeared once. Although these have appeared in only one interview, many of these relate to the same category as previous challenges. These categories are presented and analyzed below. It should be noted that the interviews were conducted at many different levels in the organization in order to gain the best knowledge of the process. The challenges encountered above can be compartmentalized into different categories based on their nature and similarity. Challenges is divided to three different categories; 1) commitment, organization and information; 2) S&OP cycling decisions related challenges; and 3) others.

Category 1 is the largest category. The category includes challenges related to the commitment of the organization as well as the flow of information. Knowledge and commitment go hand in hand, and a lack of information can lead to non-commitment. The category includes challenges 2, 6, 7, 9, 12, and 13 from Figure 9, which account for 52% of all observed challenges. It can therefore be considered that the process of a case company is significantly challenged by the flow of information and commitment to the process. In particular, the commitment and role of senior management has been emphasized. This is also in line with the literature. Jonsson et al. (2021) states that companies tend to have low commitment to process operation. The involvement and unrestricted attention of the organization’s top management, or lack thereof, is seen as a major challenge. Consequently, Kristensen and Jonsson (2018) addresses that lack of top management support increases the possibility of failure in S&OP process. Although they are busy, the involvement of upper management is vital to the success and continuity of the S&OP process, because if top management is not committed to the process, it will not last.

Thus, addressing the consequences of lack of upper management commitment, recognizing this is important for the company and the sustainability of the process.

Other people commitment and organization related issues are also crucial for organization. According to Tuomikangas and Kaipia (2014), commitment of employees to the process and the work tasks it creates develops transparency within the company. Moreover, according to Pedroso et al. (2016), participants commitment is seen as an enabler for the process. This should already be addressed in the pilot phase of implementation, when the responsibilities and meanings of the participants should be defined. According to interviews and Wallace and Stahl (2008), people and organization is seen as challenge for S&OP process, as they are the operators in the process. Moreover, if organization does not support the process, it will not succeed. The involvement of participants is therefore seen as important for the success of the process and thus challenge in this area is crucial issue for the organization and needs to be focused on.

The category also includes information-related challenges related to information communication, the quality of information available in the process, and probably as a result of the two, a lack of understanding in the process. The importance of information has been emphasized in the literature. According to Wallace and Stahl (2008) employees demand and need the necessary information about the process and the future to fully understand it so that they are willing to make the necessary changes. Seeling et al. (2021) highlight the lack of a complete understanding of the process as a result of which the full benefits are not experienced. In accordance, Jonsson et al. (2021) states that companies that are lacking great vision about the process and its outputs will not experience full benefits. The flow and transparency of information is thus considered important to enable the implementation of the process. Moreover, Danese et al. (2018) outline that flow of information between different departments is considered as benefit of S&OP. Thus, this should be a benefit, not a challenge.

In addition, Ambrose and Rutherford (2016) states that group cooperation in the S&OP process shows significant direct connection to S&OP efficiency. However, Hulthen et al. (2016) identify that challenges in S&OP efficiency issues most frequently at the middle stages of process maturity, in which case company is. These include creating cross-functional trade-offs measurements, meetings efficiency measures and information gathering and communication. In order to improve the efficiency of S&OP, it is important to identify the problems in the above points.

Category 2 includes challenges 1, 5, 8 and 10 which accounts 33% for all observed challenges. This category includes challenges related to decision-making and structure of the process. Observed challenges are too short S&OP scope horizon, no decisions that creates balancing at the end of S&OP cycle, meetings are not properly operated, confusion in forecasts and no clear boundaries on them. Too short S&OP scope were emphasized in 3 interviews and thus needs special attention. Interviewees experience that defined scope is not met, at least not in continuous level, in forecasts and decision making. Current process falls down more to operative time horizon and only occasionally acts in long-term planning horizon. This aligns with second challenge. According to interview, no S&OP horizon decision is made at the moment which is heavily in line with third challenge; meetings are not properly operated. This could be that due to not having an Executive S&OP, pre S&OP meeting is the primary stage for decision making in the current model. However, according to interviews, it is perceived to be more like info sharing meeting than decision making meeting.

Thus, company need more clear structure in process on what to do in each step and what is their purpose. Confusion in forecasts and no clear boundaries on them relates to financial aspects of S&OP cycle. According to interview, the current S&OP is a bit like a billing forecast. It is emphasized that company should keep a separate record of what quantities are currently planned and what volumes are confirmed sales for which we have a confirmed order in place. Further, what is the expected delivery schedule, when will the interest be provided, and what is the billing period, i.e. when will the items be

actually invoiced. Currently there are observed confusion about these in the S&OP process.

Category 3 includes challenges 3, 4 and 11. The category includes other problems identified that are not included in the first two categories. These challenges are individual, but still important to identify in order to make the process more successful overall. Volatile market is more like a common industry related challenge than specifically S&OP problem. After all, the S&OP process is trying to meet precisely such a challenge so that the company can plan in longer the time horizon. However, the volatile market is a typical case for a company's business environment, but the biggest fluctuation occurs in the operational 1-4 month time horizon. Also, according to the interviews, there is a certain cyclicity in the market that can be more easily taken into account, but there are also differences between regions. The interview takes into account different ways of working, both between the Supply Planning team's regional coordinates and more broadly between the responsibilities of different teams. Different ways of working between regions and teams highlights that there should be more uniformity within a process and teams' operational work. Cooperation of Sales and Supply chain is also seen as challenge. According to interview, maintaining credibility is emphasized. The industry is strongly focused on sales, so the role of sales also needs to be emphasized in providing process inputs and making updates so that rest of the organization is able to function efficiently themselves. Thus, the role of sales is emphasized as stated earlier this paper.

It should be noted that none of the problems identified were related to the use, implementation or deficiencies of the systems. This is noteworthy because the implementation phase for the new system tool is currently underway. This could potentially lead to new perceived challenges in the future as the use of the new tool also begins in the case company.

5.2 Suggest for improvement

This section outlines suggestions for improvement on the issues raised in the previous section. Suggestions for improvement are in line with the research objectives. The proposals aim to raise awareness of how the current organization is better able to support the S&OP process and how the process can be more beneficial to the company.

5.2.1 Structure and roles

According to interviews, two different scenarios relating demand and supply planner role defining can be found. In the first scenario, the demand planner should be closer to sales than it is now. This is also the case in other subsidiaries and has been found to be effective. With this, the Supply Planning team would only have supply planners and allows the regional coordinators in the Supply Planning team to have more responsibility for the supply of the region. Thus, it is suggested that the role of supply planner be used by regional coordinators in Supply Planning team and the role of demand planner by sales coordinators. Demand is forecasted sales in case company business and demand plan should capture what could be sold, not produced. Hence, the demand planner can function better when closer to the sales organization. This definition of the roles also better serves the future plans of the case company, in which case the role of data processing and data analytics in the work of planners is emphasized due to the system developments mentioned earlier in 4.3. When demand planner is close to sales, the role owner could act as a demand planner in the S&OP process. In this regard, emphasis is placed on further research due to organizational differences in business areas. Now demand and supply planning are both done in the Supply Planning team.

With the change, the supply coordinator only has the role of supply planner, which also allows for better S&OP meetings operation. For example, Demand Review, facilitated by supply planner, is not only too short a time horizon but also a combined version with supply constraints and demand review, which is against the purpose of demand review meeting. The increased role of regional people in managing the region's supply also

contributes to the current operating model, in which they, especially in the EMEA region, work in operational terms as logistics planners in close cooperation with sales. The role thus enables better short- and long-term operation. It is also suggested that everyone in the Supply Planning team is supply planners as before, but the regional coordinators are responsible for the bigger picture and contribute to the stages of the S&OP process. To allow for a larger picture, it is proposed that the mill responsibilities be transferred from the regional coordinators to mill coordinators. In this way, regional coordinators can increase responsibility for foreign stocks for all products, both in terms of supply review and logistical stock transfers. Mill people will therefore report on a product-by-product basis to the regional coordinators if necessary.

In the alternative second scenario, the regional coordinators of the Supply Planning team own the roles of demand planners, in addition to supply planners, and the other people in the team own the roles of supply planner. This is supported by the fact that even today this role is strongly on top of the regional coordinators, and they act as facilitators in the current Demand Review meetings. This scenario is closest to the current model. The problem is operational work insofar as the mill coordinators are responsible for the supply of their own mill, it may be flawed to look at the supply objectively. In other words, they may be thinking that there are problems with availability, when there isn't. With this scenario, the input and updating of operational as well as longer horizon demand forecasts will also be retained by the people in the Supply Planning team. The facilitation of Demand Review will also remain in the same individuals, so there will be no change in the big picture in that respect.

In general, in both scenarios, the work of the mill coordinators does not change at all in operational terms. With the implementation of ERP, it is expected that the work of supply planners will change to a more administrative model, which will reduce the amount of planning as it is intended for the system to do the planning for them. Other changes will be made to the organization with the implementation of SAP ERP, which will enable better scenario modeling and the utilization of various forecasts, such as statistical

forecasting. Entering and editing sales forecasts has previously been the responsibility of the Supply Planning team's regional coordinators, but based on the interviews, responsibility should be transferred to sales. In first scenario, operational work will also change so that the update of sales forecasts will be transferred to sales, or the responsibility of sales coordinators close to sales, away from the regional coordinators. With the implementation of ERP, the sales or demand planner makes updates on demand, as is done in other subsidiaries. This will lead to more transparent and accurate data utilization since the knowledge of demand is on the sales. Moreover, this will involve sales to the process more. Updating and applying supply data remains on the Supply planner. SAP ERP also brings in other administrative work, such as maintaining master data. Responsibilities to perform this task need to be properly defined because master data is the basis for everything and if the foundation is not in order the structure will break down.

5.2.2 Meetings

As mentioned earlier, the role of demand planner has been suggested to be owned by sales coordinator. In the past, this has been with the supply coordinator. Although the demand planner should oversee Demand Review and thus conduct the demand plan, sales should be approached for feedback and adjustments. According to interviews, the role of sales is more emphasized than before. Forecasting demand for the S&OP horizon requires a longer view of sales than before. Although the case company has annual contracts with customers, about 90% of customers remain year to year, so sales should be more strongly contributed. Ownership of this meeting is with the sales directors (Kreuter et al., 2021). Moreover, participants for these meetings should be clearly defined.

The analysis of the interviews also found that the Demand Review is structurally incorrect. The structure of the meeting must be developed in accordance with the S&OP model. To make the meetings more effective, it is really important to follow a clear schedule that the company has already set. In addition, the S&OP team must also agree on a clear schedule for the time before the meeting, to make sure all figures are in the

system before the meeting. In the proposed model, salespeople and demand planners should go through the numbers before the meeting so that it can be much more effective and substantively relevant. This thus increases the efficiency, appropriateness, and transparency of the meeting.

Demand Review in its current form is too operational for the S&OP horizon. Thus, it is proposed that the current meeting policy be maintained but designated as an S&OE meeting which can be held weekly, and the list of participants be limited to those responsible for operational work only, such as sales, Supply Planning team, logistics and sales support. Purpose for this meeting is simply make sure that S&OP plan is followed operationally. Similarly, a comprehensive Demand Review meeting on the S&OP horizon should be created to cover the needs of the process. According to Kreuter et al (2021), Demand Review should be sales-driven, so the meeting should be owned by the sales organization, by the sales directors. The meeting should include the regional sales managers as well as sales coordinators, demand planner, sales controller and logistics. The meeting should be facilitated by a demand planner and chaired by the regional sales director, who will also make the final decisions at the meeting.

The implementation of an executive meeting can be done similarly as the implementation of the entire process, gradually. Initially, training rounds should be held for a few months to familiarize senior management with the agenda. This meeting should be attended by S&OP manager and upper executives such as the CEO, Senior Vice Presidents of sales, supply chain, finance, logistics, HR, procurement and production. Usually, managers from other areas, such as supply chain, mills, and finance from previous stages, are also involved to add value to the meeting (Ambrose & Rutherford, 2016). As with other meetings, adherence to structure is important to ensure effectiveness. According to the interviews, Case Business's SAP ERP implementation is expected to bring reinforced content to Executive meetings, especially in terms of financial scenario modeling.

According to Avila et al. (2019) and Seeling et al. (2021b), at the end of the cycle the result must be a balanced plan from a supply and demand perspective that also meets the company's business and strategic goals. Risks, different scenarios and consequences need to be considered. Regarding pre-S&OP meeting, the following question should be in thoughts of participants in the meeting: which elements of the pre-SOP assessment can improve the financial simulation, allowing for trade-offs and scenario analysis? This is the responsibility of the meeting participants as well as the accuracy of the data. The commitment of the participants and whether the data is solid determines at what level the financial simulation is successful at this stage. Furthermore, it also partly determines what kind of decisions about the S&OP cycle are made. At present, they do not exist, as stated earlier.

It has also been found in interviews that according to the business, the S&OP process can be run differently than in the literature. The stability of demand in the case company's business environment over a long period of time gives cause for perspective change. According to the interviews, a different model for implementing the process is proposed. In the new operating model, which has been found to operate in another subsidiary, the monthly process would cover a time horizon of 3-9 months, but the quarterly time horizon is 3-18 months. The proposal is based on the fact that, in the long run, there will not be as many changes in the case company's business on a monthly basis, but the changes will focus specifically on the 9-month time span. However, a review of the entire time horizon is relevant, so it would therefore be operated on a quarterly basis.

5.2.3 Improvements for observed challenges

The interviews identified challenges related to the S&OP process in the current model, and they are divided into three different categories according to their similarity. The categories are: 1) commitment, organization and information; 2) challenges related to S&OP cycling; and 3) others. For these categories, suggestions for improvement are made so that the organization can better function in the process and identify its challenges and gaps.

Category 1 includes challenges related to the commitment of the organization as well as the flow of information. According to literature, people's engagement can be fostered through an incentive (Ambrose & Rutherford, 2016) as well as creating the right kind of S&OP supportive culture for the organization (Tuomikangas & Kaipia, 2014). Consequently, according to Ambrose and Rutherford (2016), characteristics within the organization that foster social cohesiveness and autonomy have a direct impact on the overall success of S&OP. Thus, it is suggested that in the case company, an incentive system is created for the S&OP team in terms of process completion, efficiency and success. An appropriate monitoring model and KPIs should be developed to monitor the progress of the process. In accordance, Ambrose and Rutherford (2016) contend that in the S&OP environment, contextual influences of information and policy quality, as well as common incentives, have both direct and indirect relationships with S&OP effectiveness results.

Organization and information flow were perceived as problems in the current processes. According to Tuomikangas and Kaipia (2014) most important part of the S&OP process is the creation of a suitable culture and environment. Creating an appropriate culture inspires employees to commit to the process, its schedules, and other work tasks that involve it. The commitment of employees to the process and the work tasks it creates develops transparency within the company. Further, Gallego-Garcia and Garcia-Garcia (2020) highlight in their study that lack of transparency and visibility between supply chain teams causes challenges in operating S&OP. Therefore, it is proposed that the company focus on clarity of data and communication to various stakeholders. As a result, transparency in the process will also increase and those involved in operational work will also be more aware of long-term decisions. After all, operational work is the implementation of an S&OP plan in the short term.

Another aspect that got highlighted during interviews was how can company make sure the information within the process is solid? This is affected by many things, including the system, its users, and the meeting structure in the bigger picture. SAP ERP

implementation will help here with scenario modeling and various forecasts such as statistical and baseline. However, the accuracy and activity of the data input is highlighted here, which is the responsibility of the system users. Therefore, the responsibilities must be precisely defined, and it must be agreed who will enter which data. In this paper, it has been suggested that a sales, demand planner, or sales coordinator enters and maintains demand figures into the system. Correspondingly, Supply Planner is responsible for production figures and other supply-related figures. In addition to the validity of the data, the process also emphasizes the contribution of the participants around the data. According to Danese et al. (2018), if attendance at meetings is not at the appropriate level, the S&OP process is not fully supported, and the process will eventually become ineffective.

Category 2 included observed challenges as too short S&OP scope horizon, no decisions that creates balancing at the end of S&OP cycle, meetings are not properly operated, confusion in forecasts and no clear boundaries on them. Decision-making on the S&OP horizon requires determined decision-making ability from the company's management. Decisions will be made at this company at the pre-S&OP meeting, but not all members of the company's management team who are members of the Executive meeting are present. According to the interview, decision-making in the process is more of a risk-taking. Therefore, it is recommended that the company 1) start conducting an executive meeting and 2) determine who has the last word, i.e., who will stamp the decisions. According to interviews, in other subsidiaries, this is the CEO, the director of the Supply Chain, or the collective decision of the upper management team. However, the decision must be made at the end of the cycle and must be in line with the S&OP scope in order to serve the process. This plan will serve as a basis and guideline for the upcoming cycle, and all decisions should be based on this plan. However, as stated earlier in this paper, according to interview, the S&OP scope can be modified on a monthly basis to cover a time horizon of 3-9 months. Therefore, the decisions on this horizon are in line with the S&OP scope. Still, this does not change the fact that everyone must commit to

addressing the process on this horizon as well. However, it should be noted that the longer time horizon must be viewed regularly, for example quarterly.

However, according to the interview, it can be sensed that there is kind of a lack of a commitment to any longer perspectives because so much can happen in the long term and then upper management don't want to decide. According to Kristensen and Jonsson (2018), involving top management and presenting the process should be the first steps in the implementation phase. Thus, the case company is lagging behind in this respect. This is something that company should overcome. In the future, scenario modeling will enable the modeling of the view and thus at the end one will have to put a stamp on the decision that this is what the company needs to commit to and not fear.

Category 3 included independent challenges regarding volatile market, different working habits between teams and divisions and cooperation between sales and supply chain. As presented, volatile market is more an industry specific issue than S&OP process issue. Challenge in cooperation between sales and supply chain is common problem. According to Ambrose and Rutherford (2016), S&OP's challenges arise from the interfaces between sales and supply chain and production. According to interview, the industry is strongly focused on sales, so the role of sales, besides upper management, also needs to be emphasized in providing process inputs and making updates. There were also perceived challenge with different working habits between teams. According to Hulthen et al. (2016) study, promoting comparability and transparency requires standardization. Thus, it is proposed that especially within teams such as Supply Planning, work tasks are standardized as much as possible. According to the interview, there should be more uniformity. For example, regional coordination of Supply Planning could be harmonized, which will also make it easier to remove waste. This challenge is also related to the work between teams and the clear definition of work tasks that has been emphasized in this work.

6 Conclusion

This paper has been conducted as qualitative case study. The aim of the study was to find out how the current organization is able to support the implementation of the S&OP process and system development. To answer this, following research question has been created; How will the S&OP process and the systems that support it change Supply Planning job descriptions, and operational work? Moreover, research aims to define the current job structure and job descriptions in the Supply Planning team and how the process changes organizational structures. These objectives will be fulfilled by gathered empirical interview data and through the collection of internal company information. In order to answer the research question, a comprehensive literature review is conducted, and empirical information is collected by interviewing relevant persons (N = 14) within the company. The study also utilizes quantitative and qualitative data from the company's internal systems. The methodology of the study is presented in Chapter 3.

Paper was conducted as following: Chapter 2 provides a review of the relevant literature, which comprehensively addresses the characteristics of the topic and the most important aspects of the research. Chapter 3 presents the steps of implementing the study so that anyone can repeat it and get the same result. Chapter 4 presents the company's defined S&OP approach while meeting the research objective; what is the current S&OP structure in the case company. The section contains material from the company's internal databases as well as from the interviews conducted. Chapter 5 aims to break down the analysis of the interviews and information presented In Chapter 4. In Chapter 5.1, the findings from the interviews as well as the internal databases are presented and put together according to the research questions and objectives. Following the analysis, suggestions for improvement are presented to the company in Chapter 5.2 within the framework of the research question and objectives.

The research findings are related to roles, the structure of the process, its overall operating and the bottlenecks observed in the process (see Chapter 5.1). In addition, clear evidence was found of the current improvement points in the process, the identification

of which is a step for developing the process and removing bottlenecks. Accordingly, the purpose of this work was to produce information for the company to support decision-making and to study how the current organization can support the process development. In order for the work to contribute to the stated purpose, influenced by findings, further action points and suggestions for improvement are presented (see Chapter 5.2). The proposals are based on research results, interviews and researched literature related to the topic and aim to raise awareness of how the current organization is better able to support the S&OP process and how the process can be more beneficial to the company.

The findings are really diverse, but they are all connected in the big picture. The first and clearest finding in this study is that the maturity of the company's process, as well as the system development, are still in a rudimentary stage (see Figure 7). The maturity of the process serves as a clear starting point for the findings as an organization with lower maturity tends to have more problems and deficiencies in the process. Improvement actions presented should increase Case Company's maturity.

The findings related directly to the research question are as follows. The definition of the tasks of the supply organization and job descriptions of the process is in progress. The definition is still in progress partly because the system development brings the tool to support the process, but there is still no correct information about who does operating work with it and who are key users. In accordance, in the company's model, there are role of Demand Planner defined and assigned as resource, but no one in the organization owns this role. Demand Planner should act as facilitator of demand review and be responsible of demand figures. Hence, it is suggested that sales coordinator or sales planner owns the role because the role should be close to sales. Hence, regarding the structure of the roles, it is suggested that the role of Supply Planner is used by regional coordinators in the Supply Planning team and the role of Demand Planner by sales coordinators or sales planner. In addition, it is proposed that all members of the Supply Planning team are as before, but the regional coordinators are responsible for the bigger picture and participate in the steps of the S&OP process to enable efficient operation of the

process. Entering and modifying sales forecasts has previously been the responsibility of the regional coordinators of the Supply Planning team, but based on the interviews, the responsibility should be transferred to demand planner. Thus, demand planner enters and maintains demand figures into the system and correspondingly, Supply Planner is responsible for production and other supply-related figures.

Findings related to research objectives are as follows. As well as the process, S&OP meetings are rudimentary in terms of maturity. Demand Review does not meet S&OP's time horizon, agenda and working model, and the list of participants is not at the right level. The Executive Meeting has not yet been launched as part of the cycle, which allows challenges to emerge. Supply review and Pre S&OP meeting are more advanced and in line with defined process. Consequently, regarding the Demand Review meeting, it is proposed that the current meeting policy be maintained but designated as an S&OE meeting which can be held weekly or bi-weekly, and the list of participants be limited to those responsible for operational work only, such as from sales, Supply Planning team, logistics and sales support. Similarly, a comprehensive Demand Review meeting on the S&OP horizon should be created to cover the needs of the process. The meeting should include the regional sales director and managers as well as sales coordinators, demand planner, sales controller and logistics. The meeting should be facilitated by a demand planner and chaired by the regional sales director, who will also make the final decisions at the meeting. For the last step of the cycle, Executive meeting, the implementation should be done similarly as the implementation of the entire process; gradually. Initially, training rounds should be held for a few months to familiarize senior management with the agenda after which it should be quickly included in the normal rotation. Noteworthy, meeting schedules for entire process are defined correctly already.

The perceived challenges are divided into three different categories; 1) commitment, organization and information, which account for 52% of all perceived challenges; 2) challenges related to the decisions of the S&OP cycle is 33% of all detected challenges; and 3) others. Noteworthy, both "too short S&OP scope horizon" and "lack of senior

management commitment" have both appeared in three separate interviews and thus can be considered the most important single factors in the process. Upper-level commitment is emphasized in the literature (e.g. Kristensen and Jonsson, 2018), interviews and also in the perceived challenges. The importance of information flow and information sharing has also been emphasized in many different literatures, which is in line with this finding. According to literature (eg. Ambrose & Rutherford, 2016; Tuomikangas & Kaipia, 2014), people's engagement to process can be fostered through an incentive as well as creating the right kind of supportive culture for the organization that foster social cohesiveness. Thus, it is suggested that in the Case Company, an incentive system is created for the S&OP team in terms of process completion, efficiency and success. Moreover, incentive system can help the organization become more involved in S&OP, which improves the supporting organization.

Noteworthy, observed challenges include also "no decisions that creates balancing at the end of S&OP cycle" and "meetings are not properly operated". Therefore, it is suggested that company 1) start conducting an executive meeting and 2) determine who has the last word, i.e., who will stamp the decisions. Moreover, to respond to perceived challenges about the S&OP scope and decisions within the scope, according to the interviews, a different model and time horizon for implementing the process is proposed for evaluation. In the new operating model, which has been found to operate in another subsidiary, the monthly process would cover a time horizon of 3-9 months, but the quarterly time horizon is 3-18 months. All in all, the suggestions for improvement are all connected in certain level, because a problem with one thing also creates a bottleneck in another place and therefore solving one thing can solve multiple issues.

To conclude, with suggestions for improvements, this study answers to research question "How will the S&OP process and the systems that support it change Supply Planning job descriptions, and operational work?" Supply Planning job descriptions may not change at all or very little, as focus will be in demand side of organization. The impact for Supply Planning should only be reducing the current demand side work such as

facilitating current monthly demand review and other demand related tasks. In addition, it has been suggested that tasks within the team are modified to support the process. In the big picture, however, this does not change the team's work tasks in operational form. Moreover, because system development is in progress, the impacts on supply planning team is yet unclear. Hence, the research question remains to be partly unanswered in that regard and thus highlight the need for further studies.

Through challenges identified and other main points in process found, further action points for improvements are presented. With these, this study answers the research goal "How the current organization can the best support the process and system implementation." Increasing the current organization's support for the process takes place through development proposals, which are; transfer of the role of Demand Planner to sales coordinator or sales planner, launch of Demand Review, launch of Executive S&OP and identification of challenges. The challenges have also resulted in a proposal for an incentive system for the S&OP team, as well as a proposal to shorten the cycle in the monthly cycle to a review period of 3-9 months and quarterly to 3-18 months.

The work brought additional information to case company about the current process and related system development, and the work also presents multiple clear steps to improve the process and further developments. Moreover, identifying the current challenges of the process was important so that the company knows its current state and realizes how to move forward in the maturity of the process according to the continuous improvement mindset. All in all, the study succeeded in answering the research question and the research objectives. In addition, the research has a positive weight in terms of developing the process in the case company. In accordance, during the research, positive things were also found, such as the fact that the company operates in the process as is characteristic of it, Pre S&OP and Supply Review are already sufficient in terms of maturity, and the right people have been allocated to carry out the process. A new system tool is being implemented, which indicates the company's desire to develop operations and support the S&OP process.

However, at the time of writing the research, the development of the process and the development of the system was still in progress and there was a lack of proper knowledge of how it will affect work tasks and parts of the process concretely. This posed challenges for the analysis of the interview responses. The impact of the S&OP process and the system development is thus still unclear, due to the stage of maturity of both. The perceived benefits and disadvantages can only be experienced when the process has reached a sufficient level of maturity and functionality. As a result of the research, further research proposals were also created. Regarding the pulp and paper industry, it could be explored how the S&OP process can be more widely combined overall in the forestry business regarding concrete logistical work, such as transportation and storage across the borders of the business areas. In addition, further research is needed on the development of the S&OP process when the next level of maturity has been reached, and in connection with this, further research on the results achieved by the case company in terms of the process and the use of the system tools.

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Appendices

Appendix 1. Interview

For all

What is your role in the S&OP process and how does it support this process?

Are you attending a supply review meeting?

Are you attending a demand review meeting?

How are sales and production forecasts currently handled?

What are the biggest challenges in making forecasts?

What should be improved in forecasting?

What are the challenges of the current S&OP?

Who is responsible for entering data (forecasts, other data)? Automated?

How is data collection performed in SAP ERP for S&OP cycling?

How does the development of SAP ERP support S&OP in terms of your role?

How has the S&OP process changed your work and delivery planning?

How do you think the SAP ERP implementation and S&OP process will change roles in delivery planning?

Supply Chain only

How could the pulp and paper business S&OP processes be combined?

Finance & Sales only

What is the participation of the finance in the S&OP process?