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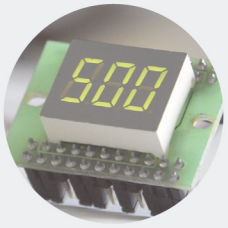


Projeto de implementação do processo Sales and Operations Planning (S&OP) - caso de estudo

DANIELA ALEXANDRA DE SOUSA LIMA
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Design of a Sales and Operations Planning (S&OP) Process – Case Study

Daniela Alexandra de Sousa Lima

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Daniela Alexandra de Sousa Lima, Nº 1120317, 1120317@isep.ipp.pt

Company: Sogrape Vinhos, S.A.

Supervisor: Professor Paulo Ávila, psa@isep.ipp.pt
Joint Supervisor: Professor João Bastos, jab@isep.ipp.pt
Supervisor Sogrape Vinhos, S.A.: Dr.ª Dália Moreira, dalia.moreira@sogrape.pt

Master in Systems and Industrial Planning
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Resumo

Apesar de o conceito de *Sales and Operations Planning* (S&OP) ter sido introduzido há já algumas décadas, este tem ganho um reconhecimento acrescido, uma vez que a incerteza dos mercados e a crescente complexidade das *supply chains* aumentam a necessidade de determinar ações futuras e criar um plano de vendas e operações comum. S&OP é um processo multifuncional que promove o desenvolvimento e a aceitação de um plano comum, permitindo o alinhamento entre a oferta e a procura, conecta o planeamento estratégico com as atividades diárias e, através da medição do desempenho, estimula a melhoria contínua.

Várias empresas internacionais têm implementado o S&OP e a execução deste processo na Sogrape Vinhos, S.A., uma das melhores empresas do mundo do setor vitivinícola, fomentaria a melhoria de uma *supply chain* flexível e eficiente. Assim, além do estudo do processo, foi também elaborado um projeto de implementação do S&OP nesta empresa.

Inicialmente, foi avaliada a situação atual da empresa e verificou-se que o processo de planeamento atual se assemelha a um processo rudimentar e não é realizada nenhuma reunião em que participem os departamentos de Marketing, Vendas, Produção e Planeamento. Relativamente aos principais objetivos da implementação deste processo na Sogrape, estes relacionam-se com alinhamento interno, redução de custos de produção e redução de níveis de inventário. Finalmente, foram definidos os parâmetros do processo S&OP adequados ao contexto da empresa e foram estudadas quais as melhorias possíveis de atingir através da utilização deste processo de planeamento.

Tendo em conta os resultados verificados em empresas que implementaram o processo, é expectável que a Sogrape obtenha resultados próximos. No entanto, de forma a suportar ainda mais estes resultados, foi feita uma análise às poupanças ao nível de produção e níveis de inventário, considerando dois cenários: cenário 1 – cenário mais otimista, que resulta do elevado nível de confiança na precisão das previsões de procura, e cenário 2 – cenário mais conservador, que tem como base um maior erro das previsões. Foi verificado que, com a implementação do S&OP, é possível obter poupanças significativas nestas áreas, considerando qualquer um dos cenários estudados.

Palavras-Chave: Procura, precisão de previsões de procura, *Sales and Operations Planning (S&OP)*, objetivos do S&OP, oferta, *supply chain*, indústria vitivinícola

Abstract

Even though the Sales and Operations Planning (S&OP) concept has been around for a while, it has gained increased recognition as uncertainty in markets and complex supply chains increase the need for determining future actions and creating a common sales and operations plan. S&OP is a cross-functional business process that supports the development and acceptance of a common plan, allowing the synchronization of supply and demand, links strategic planning with daily activities and, through performance measurement, pushes continuous improvement.

Several global companies have been implementing S&OP and the implementation of this process in Sogrape Vinhos, S.A., one of the world's best companies in the wine sector, would support the improvement of a flexible and efficient supply chain. Thus, besides the studying of the theoretical framework of the process itself, an implementation project of the S&OP process in Sogrape was also created.

There was initially assessed the current situation in the company and it was concluded that the current planning process is similar to a rudimental S&OP process and there is not held any meeting attended by the Marketing, Sales, Manufacturing and Planning departments. Concerning the main goals of the S&OP at this company, they are related with cross-functional alignment, reduction of costs in the Manufacturing sector and inventory levels reduction. Finally, there were defined the S&OP parameters suitable for the context of the company and studied which improvements could the company achieve using this planning process.

Given the empirical evidences regarding the S&OP process at other companies, it is expected that Sogrape can achieve close results. However, in order to support these results, there were analyzed the savings in regard to production and inventory levels, considering two scenarios: scenario 1 – a more optimistic scenario, resulting from a high level of confidence in demand forecasts accuracy, and scenario 2 – a more conservative scenario, which is based on a larger forecast error. It was concluded that, with the implementation of S&OP, significant savings can be achieved in these areas, considering any of the scenarios studied.

Keywords: Demand, demand forecast accuracy, Sales and Operations Planning (S&OP), S&OP goal, supply, supply chain, wine industry

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Nomenclature

APICS	*American Production and Inventory Control Society*
APS	*Advanced Planning and Scheduling*
CPFR	*Collaborative Planning, Forecasting, and Replenishment*
DRP	*Distributed Requirements Planning*
ERP	*Enterprise Resource Planning*
KPI	*Key Performance Indicator*
MRP	*Material Requirements Planning*
POS	*Point-of-Sale*
SCM	*Supply Chain Management*
SKU	*Stock Keeping Unit*
S&OP	*Sales and Operations Planning*
VMI	*Vendor Managed Inventories*

1. Introduction

1.1. Context

Companies have been facing increasingly competitive and uncertain markets along with a dynamic economic environment where market and customer demand are changing rapidly. Within this new environment, in which companies are faced with a constant need to develop and increase coordination between functions in order to respond rapidly and accurately to customer requests, the concept of Sales and Operations Planning has gained increased recognition (Feng, D'Amours, & Beauregard, 2008). This concept has been put forward as the area within Supply Chain Management (SCM) that presents the most exciting possibilities for the future (Grimson & Pyke, 2007) and was further identified as the number two area of focus within SCM for companies in 2008 (Viswanathan, 2008). S&OP is described as a cross-functional long-term planning process that links different business plans into one integrated set of plans with the main purpose of balancing supply and demand and linking the strategic plans to the operational plans of the firm (Thomé, Scavarda, Fernandez, & Scavarda, 2012).

The benefits of S&OP are many and Hinkel, Merkel and Kwasniok (2016) claim that a successful S&OP initiative can improve the accuracy of forecasts on the order of 20% to 50%, reduced inventories by 10 to 30%, a 5% to 15% reduction in manufacturing downtime and a 5% to 10% increase in on-time delivery. Furthermore, an effectively implemented

S&OP process can increase revenue from 2% to 8% and improve the success of new products launches by 20% (Hirneise, 2009).

However, the design of the processes in manufacturing planning and control must be linked to the context of the company, so it is necessary to design and structure the S&OP process in order to fit the studied company's experienced S&OP context. Nonetheless, Sheldon (2006) argues that it is applicable for all kinds of business. The author emphasizes that all businesses that manage demand and synchronize resources, with any type of manufacturing and inventory strategy, can improve their decision making and gain benefits from a mature S&OP process.

Nevertheless, given the increased complexity experienced by many companies and the current economic climate, a company's context may change rapidly and frequently which results in a need for planning processes that take this new complex and uncertain reality into account. Thus, it is no longer enough to rely on only one plan but instead companies are recommended to try to find and execute the best option out of many possible scenarios, through what-if analysis, that provide an increased understanding of the impact of each scenario on the business. Therefore, S&OP, with the necessary support of technology and analyzing methods, increases a firm's ability to adapt to unplanned events, which are becoming increasingly common in today's uncertain markets and complex supply chains.

1.2. Purpose

The purpose of this thesis is to create a model of S&OP implementation in Sogrape, given the company's context. Furthermore, the company has already carried out some studies regarding S&OP's benefits, as it is a project that has been planned for some years ago. Thus, this thesis aims at serving as a starting point for future work and to contribute to the optimization of this company's supply chain to achieve higher levels of efficiency and effectiveness.

1.3. Disposition of the thesis

The first chapter aims at giving an understanding of the relevance of the thesis topic, S&OP, both from an academic and corporate perspective. Moreover, it aims at discussing the purpose and context of the thesis.

The second chapter describes the background of the company in which the thesis was conducted, regarding its main markets, product families, order lead time, supplier base, manufacturing strategies as well as its finished goods status, and the identification of the problem that led to the elaboration of the thesis.

The third chapter presents the relevant literature, which includes definitions of the S&OP concept, goals, process structure, parameters, maturity model, main success factors, main issues of implementation as well as empirical evidences regarding the S&OP process.

The fourth chapter discusses Sograpе's current situation concerning its planning process, its S&OP goals and parameters and also presents expected Sograpе's planning process after S&OP implementation. Last, this chapter also analyzes the expected outcomes of the S&OP process in Sograpе.

The last chapter concludes upon the results from the thesis and the main theoretical and managerial implications and proposes themes for further research.

2. Corporate background and problem identification

2.1. Corporate background

2.1.1. About Sogrape

"Sociedade Comercial dos Vinhos de Mesa de Portugal", now Sogrape Vinhos, S.A., was founded in 1942 with the aim of promoting Portuguese wines worldwide, based on marketing quality wines, the importance of new brands and their presentation. Sogrape's vision, "to be the reference point for Portuguese wines of quality and traditional family values, focusing on the development of relevant brands for the consumer in priority markets", has been successfully accomplished, since the company owns highly reputable brands and offers a value proposition based on the quality of its wines. The traditional family values still remain, as Sogrape continues to be led by the founding family, currently on its third generation.

The greatest proof of Sogrape's success was to have been elected in 2015 and 2016 the world's best wine producer by the World Association of Writers and Journalists of Wine and Spirits (WAWWJ). The company's best-known product is undoubtedly Mateus Rosé, created in 1942 along with the foundation of the company itself, being recognized as the

most international of all Portuguese table wines. Despite the success of the product, Sogrape did not stop there and has been building a portfolio of quality wines which represent the main Portuguese wine regions – Dão, Vinhos Verdes, Bairrada, Douro and Alentejo (Figure 1).

Figure 1: Sogrape wine regions (Alves & Ferreira, 2016)

In 1987, Sogrape Vinhos entered the Port Wine sector by acquiring the prestigious A.A. Ferreira, S.A. (with the Ferreira brands for Porto Wine and Casa Ferreirinha for Douro wines) and, in 1996, the company purchased Forrester & C ª SA, owner of the Offley brand. In 2002, the company strengthened its position as a major international operator in the wine business by acquiring all the assets of Sandeman. Currently, the company owns a total of 18 estates, 15 wineries and nine bottling lines.

In spite of all the acquisitions in national territory, Sogrape looked beyond territorial borders and decided to produce in international wine regions, having acquired the Argentinian Finca Flichman, in 1997, the New Zealander Framingham, in 2007, the Chilean Viña Los Boldos, in 2008 and, more recently, the Spanish Bodegas LAN, in 2012.

Sogrape is essentially a brand owning company, having developed, throughout the years, brands that are relevant to consumers. In order to successfully implement these brands, the company has its own distributors, dedicated to the distribution and promotion of their brands

in priority markets, such as Portugal, United States of America, Angola, China, United Kingdom and Brazil, as illustrated in Figure 2.

Figure 2: Sogrape – production and distribution worldwide (Alves & Ferreira, 2016)

2.1.2. Sogrape product families

All the information regarding the performance of Sogrape's brands was collected from the 2016 Annual Report of Sogrape SGPS, S.A. (Sogrape, 2017).

Sogrape Group owns 25 product families, however in the scope of this thesis there will only be covered the brands produced in Portugal by Sogrape (Figure 3), since these are the brands that will be encompassed by the S&OP process.

Figure 3: Sogrape brands

This great diversity of brands makes Sogrape's portfolio unique and able to react to the different needs of an increasingly demanding and competitive international market. Nevertheless, some of the brands stand out due to their unique selling points, profitability,

growth potential and global character. Therefore, they are highlighted and are considered as priority brands by the company. These product families are Mateus, Gazela and Casa Ferreirinha in the Table wines category, and Sandeman in the Port wines category, and were responsible for 45% of Sograpе's sales in value in 2016, as illustrated in Figure 4.

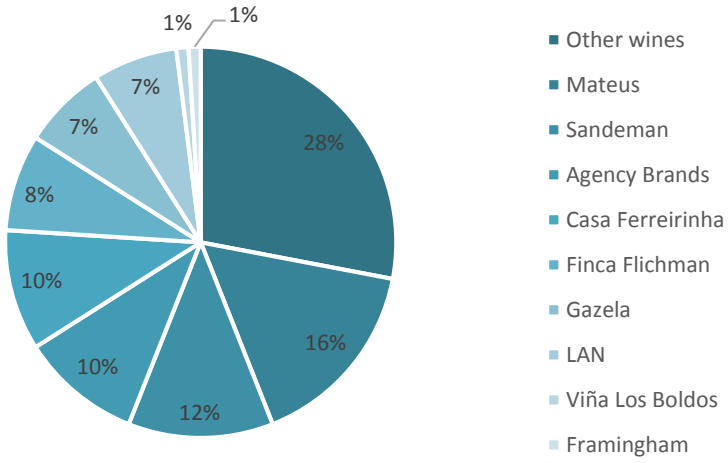

Figure 4: Sograpе sales in value per brand

Mateus, Sograpе's most iconic and oldest product family, still demonstrates great vitality, having recorded an increase in sales in value of 10%, in 2016, which is extraordinary for an almost 75-year-old brand.

Gazela sales in 2016 were the same as the previous year. However, this brand is passing through an image change, which is being positively embraced by the markets, and might be reflected in a growth in sales in 2017. The brand had also introduced two new products in the Portuguese market that may also help to increase sales.

Casa Ferreirinha recorded again very positive results in 2016, with sales in value growing by 18%, driven by the outstanding performance of high-end wines. The most notable recognition given to this brand took place in 2017, when Wine Enthusiast, one of the most acclaimed magazines of wine ratings and reviews, awarded Barca Velha 2008 with the maximum score - 100 points - being the first unfortified Portuguese wine to ever achieve this score.

Contrary to the results obtained by Sogrape's priority brands of table wines, Sandeman's global sales were down 5%, due to less positive results in important mature markets for the brand, such as Belgium and France, although the brand's performance in Portugal was quite positive. Moreover, the Port wine business has been facing a declining trend. Despite that, Sales of Sandeman Aged Tawnies were up 27% in 2016 and this brand had the distinction of having the most-award-winning Aged Tawnies in the world's biggest competitions.

2.1.3. Sogrape's markets

All the information regarding the performance of Sogrape's markets was collected from the 2016 Annual Report of Sogrape SGPS, S.A. (Sogrape, 2017)(Sogrape, 2017).

Sogrape operates in over 120 markets on the five continents and, in the same way that happens with product brands, there are some markets that were defined as priority markets due to their growth potential and their sales volumes. These priority markets are responsible for 56% of the total sales in value and they are Portugal (26%), USA (15%), Spain (8%) and UK (7%), as illustrated in Figure 5.

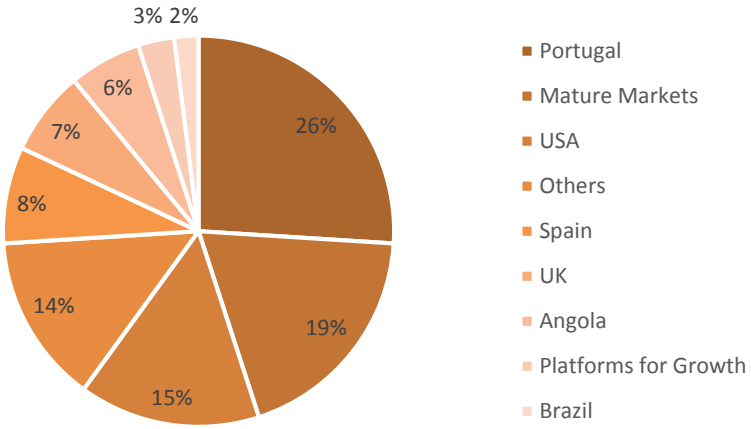

Figure 5: Sogrape sales in value per market

Portugal and Spain are considered core markets for Sogrape, representing 34% of Sogrape's turnover, with Portugal being the most important market for the company in terms of sales and production. In these markets, the priority is to achieve leadership positions. In Portugal, a growth in sales of 11% was recorded in 2016, mainly due to the positive performance of the priority brands Casa Ferreirinha and Mateus, which grew more that 15%, when measured in euros. Spain, which is the Group's third largest market, recorded an overall growth of 9%,

in euros, compared to 2015. The priority brands Mateus and Sandeman were up 14% in this market.

UK and USA are classified as big markets by Sogrape due to their growth potential and macroeconomic stability. In the United States, Sogrape's sales were down 4% compared to 2015, partially due to the reorganization of its portfolio. In 2016, Sogrape's business grew in the United Kingdom, to which the positive performance of Mateus, Casa Ferreirinha and Porto Ferreira contributed. In volume, sales were up around 14% compared to 2015.

Sogrape highlights Angola and Brazil as key Portuguese-Speaking Opportunities, given their cultural compatibilities and the dominance of Portuguese wines sold in these markets. In Angola, the business performed very well and sales were up 14% compared to 2015, when measured in euros. Although Brazil is experiencing its worst economic crisis in 20 years, Sogrape's sales in this market were up more than 60% compared to 2015, due to Sogrape's expanded portfolio and new customers brought on board.

In the Asia-Pacific region, classified by Sogrape as Platforms for Growth, as markets that are still relatively immature but have considerable development potential, sales of the priority brands Mateus, Sandeman, Gazela and Casa Ferreirinha were up around 30%. Sogrape's sales in the region were driven by its five primary markets: Japan, Australia, China, Macau and New Zealand. In Australia, sales were up more than 50%, largely due to Mateus' rising position in the market, where the brand has already assumed a leadership role in the rosé wine category. In China, Asia's biggest market and the fourth largest market in the world, Sogrape's sales were up around 16%.

2.1.4. Wine supply chain

The wine supply chain is comprised of several components, from the grape grower and dry materials suppliers, through the winery, distributors, wholesalers, retailers, until reaching the final consumer, as illustrated in Figure 6.

Figure 6: Wine supply chain (Alves & Ferreira, 2016)

When designing its supply chain, a company may pursue a pull or a push strategy, or a mix between them. In a pull strategy, customer demand drives the entire production process, beginning with a customer's order and with companies only producing enough product to fulfill it. In a push strategy, production is based on long term customer forecasts. However, most companies use a hybrid strategy, combining the best of both the push and pull strategies. They use a push-based system to stockpile the finished goods at its distribution centers to wait for orders that pull the goods in near customer stores. Another approach to the hybrid strategy may be to build up inventories of raw materials, instead of finished product, waiting to be used for future production, which is only scheduled when an order arrives.

Grapes, the primary supply for wine production, are harvested only once a year, during a short and specific timespan, meaning that during this period, wineries must produce the quantity of wine they will be selling throughout the year. Since the harvest cannot be done on demand, wineries have to keep large amounts of inventory to be able to meet customer demand and hence a pull strategy is not suitable for this situation. The inventory may be kept in the form of finished product or in the form of semi-finished product, being the finishing processes postponed to when a customer order is received. Nonetheless, wineries' customers, mainly distributors and retailers, follow a pull strategy, placing orders when market demand materializes, forcing wineries to follow a push-pull strategy.

Another particularity of the wine supply chain is the need that some types of wine have of ageing, a process that can take from a month to decades. This procedure may occur when the wines are in the form of semi-finished or finished goods. Although this process origins high levels of inventory, it gives the wine the characteristics it needs to achieve its character, according to the oenologist. As so, the quality of some wines that require this process is highly dependent on its consummation.

However, in order to provide good quality wines, even more important than this practice is the quality of the grapes. Obviously, grape growers are the most strategic suppliers for wineries and Sogrape buys to third-parties over 90% of the total volume of grapes it uses to produce the wine. It also relies on self-owned vineyards for more premium wines, since their production uses less technology and chemicals, being their quality even more dependent on the quality of the grapes.

The wine industry is heavily regulated, and the entire process of wine production is strictly controlled in all its stages, from the vineyard to the final consumer. Grapes need to grow in specific regions so that the wine can gain the denomination of origin. These regions are geographically delimitated and some of their features are related with the type of soil, the authorized and recommended grape varieties, the cultural and oenological practices, and the minimum natural alcohol content (Diário da República Electrónico, 1985). They comply with the established regulations, assuring the quality of the wines associated with those regions, and, to guarantee compliance with established standards, producers must submit samples of their wines to regional wine commissions (Diário da República Electrónico, 1985).

Exporting companies, such as Sogrape, also need to comply with the regulations of each market, which may require customized labels containing information about the importing country as well as adapted to the language of the destination country, increasing the complexity of the supply chain.

2.1.5. Sogrape's order lead time

Order lead time is the elapsed time from when a customer order is placed to when it is delivered. Sogrape has a standard order lead time of 21 days and all orders placed with a lead time inferior to that are considered urgent orders. The first day is used to register the order in the system and the last day is for assembling and making the product available for pickup. Thus, Sogrape is left with only 19 days to plan and source dry materials, schedule the production of the different Stock Keeping Unit (SKU) requested, bottle and assemble the wine and take all the requested quality control checks of not only raw materials but also finished goods. In Figure 7, it is possible to observe all the different activities that usually occur after receiving the order from the client.

Figure 7: Sograpе's order lead time (Alves & Ferreira, 2016)

2.1.6. Sograpе's supplier base

A great variety of dry materials is used to produce a bottle of wine, such as bottles, cork stoppers, labels, capsules and seals (Figure 8). Then it is necessary to pack the bottles, so cases and packaging extras are also included in the dry materials category that need to be sourced.

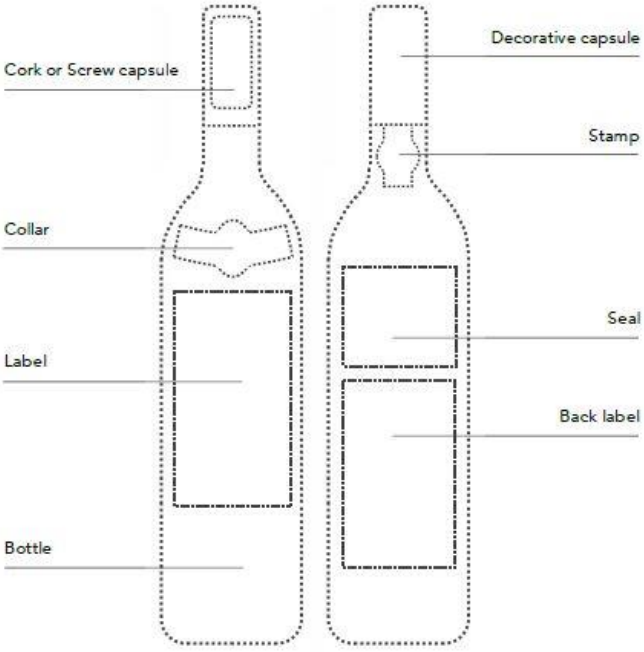

Figure 8: Dry materials used in the production of a bottle of wine (Alves & Ferreira, 2016)

Sograpе works with nearly 70 suppliers of raw materials, however, 80% of the dry materials are bought to around 10% of the suppliers, maintaining irregular relationships with most of

them for the supplying of specific and occasional materials. Sogrape purchases the different types of raw materials from various providers, avoiding situations of single-sourcing, i.e. relying in one supplier for each type of material, which could increase the risk of unavailability of materials if the supplier either fails or goes out of the business. This *modus operandi* also allows Sogrape to hold greater negotiating power as the company can always turn to another supplier if it is not satisfied with the conditions of the current one. However, most suppliers have interest in working with Sogrape, since the majority of them are Portuguese companies (around 70%) that recognize Sogrape as a leader in the wine industry.

2.1.7. Sogrape's manufacturing strategies

Choosing the best manufacturing strategy considers customer demand, the order-to-delivery lead time requested and the ability of the company's processes to fulfil these requirements. The three strategies presented below differ in terms of performance concerning the achievement of customers' needs and the amount of tied-up capital.

2.1.7.1. Make-to-Stock strategy

In a make-to-stock strategy (Figure 9), which can be regarded as a push-type production, Sogrape's products are manufactured for stock based on consumer demand forecasts. Since products are available in stock ready to be shipped, this strategy is the one that presents the lowest lead time of the three manufacturing strategies. On the other hand, it is also the one with the highest amount of tied-up capital, due to the existence of finished goods inventory, and with the maximal limiting product flexibility, as only predetermined types and volumes of products will be available in stock for customer orders. This manufacturing approach is mostly used in SKU of high volumes, such as Portuguese SKU as a main market. Furthermore, it is also used in SKU that are composed by wines of high value in order to produce greater quantities and reduce the need of more frequent bottling, and therefore less waste of these expensive wines.

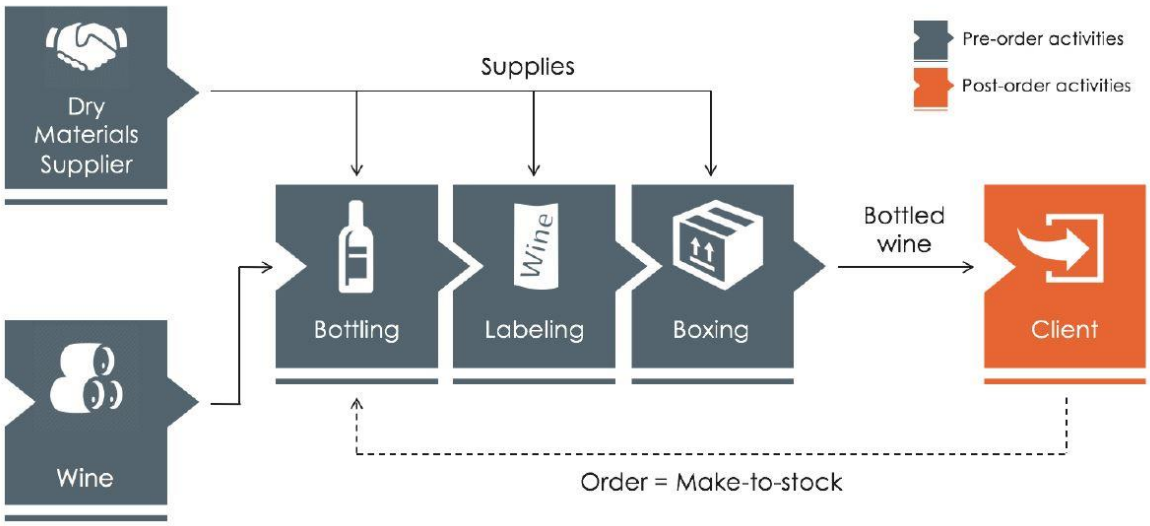

Figure 9: Make-to-stock strategy (Alves & Ferreira, 2016)

2.1.7.2. Assemble-to-Order strategy

Sograpе's assemble-to-order strategy (Figure 10) is characterized by assembling finished goods from standard semi-finished goods. Semi-finished goods are manufactured following a make-to-stock approach, since they are produced based on forecasts, while finished goods are assembled only after receiving a customer order, following make-to-order fundamentals.

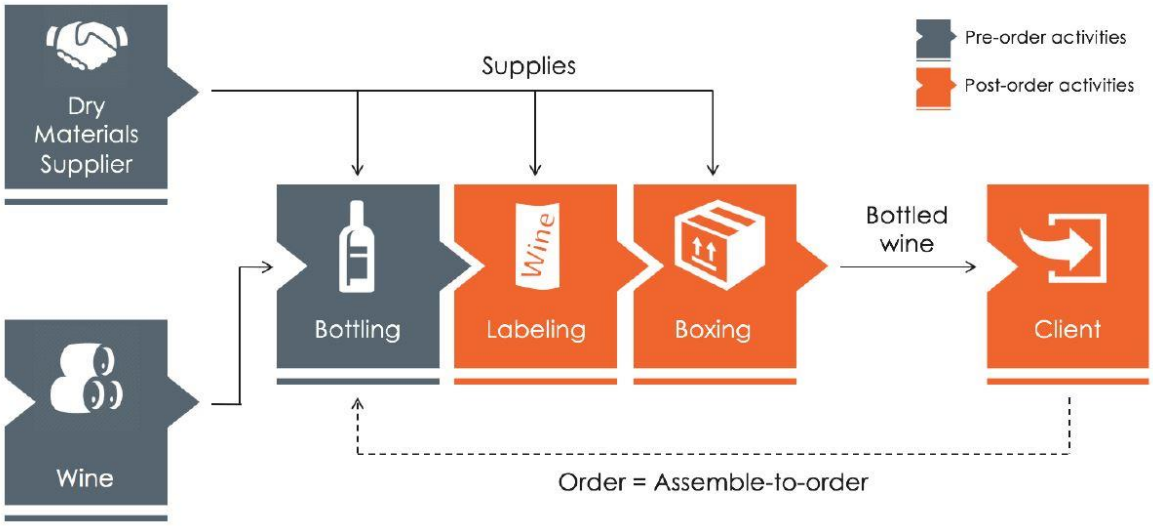

Figure 10: Assemble-to-order strategy (Alves & Ferreira, 2016)

This hybrid approach, illustrated in Figure 11, not only enables shorter lead times, as assembly time is significantly shorter than the entire manufacturing lead time, but also wider product flexibility, since the assembling, that includes labelling and packaging processes, is retarded until the customer order arrives, allowing the customization of the finished goods according to customer's requirements. In Sogrape, semi-finished goods are known for *garrafeira* and are only comprised of wine, bottle and stopper. Since Sogrape exports its products to more than 120 countries, this manufacturing approach turns out to be the most used one, as the wine can be stored and ready to be labelled and assembled with a country's required materials.

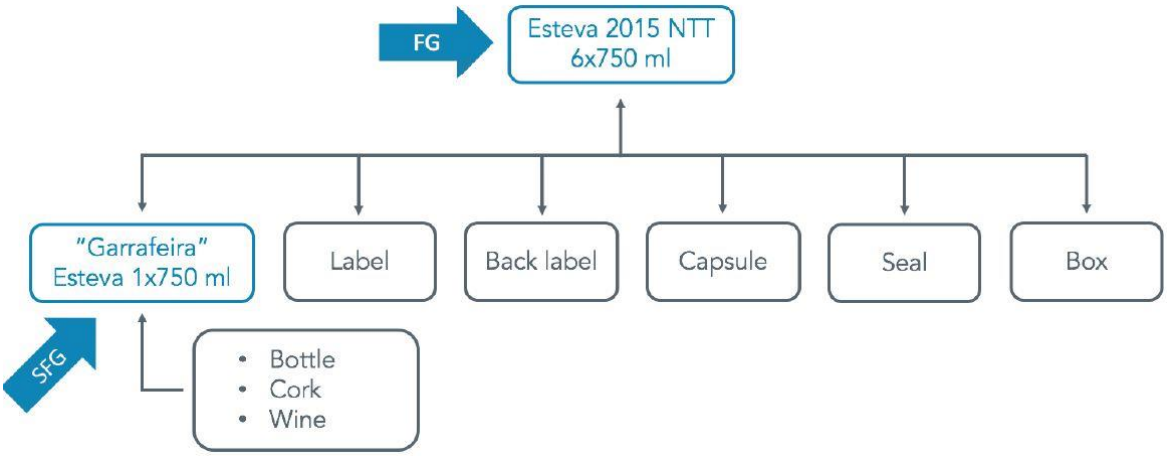

Figure 11: Semi-finished being transformed in finished good through the ATO method (Alves & Ferreira, 2016)

2.1.7.3. Make-to-Order strategy

Using a make-to-order strategy, shown in Figure 12, Sogrape's whole process of manufacturing (bottling, labelling and boxing) initiates only after a customer order is received. In this approach, neither semi-finished goods nor finished goods are stored, with the inventory being held in the form of raw materials (wine and dry materials). This method provides the greatest level of product flexibility, although it is also the one with the longest lead time. It is suitable for products that have an unpredictable demand, as the risk of overproduction or stock out is reduced.

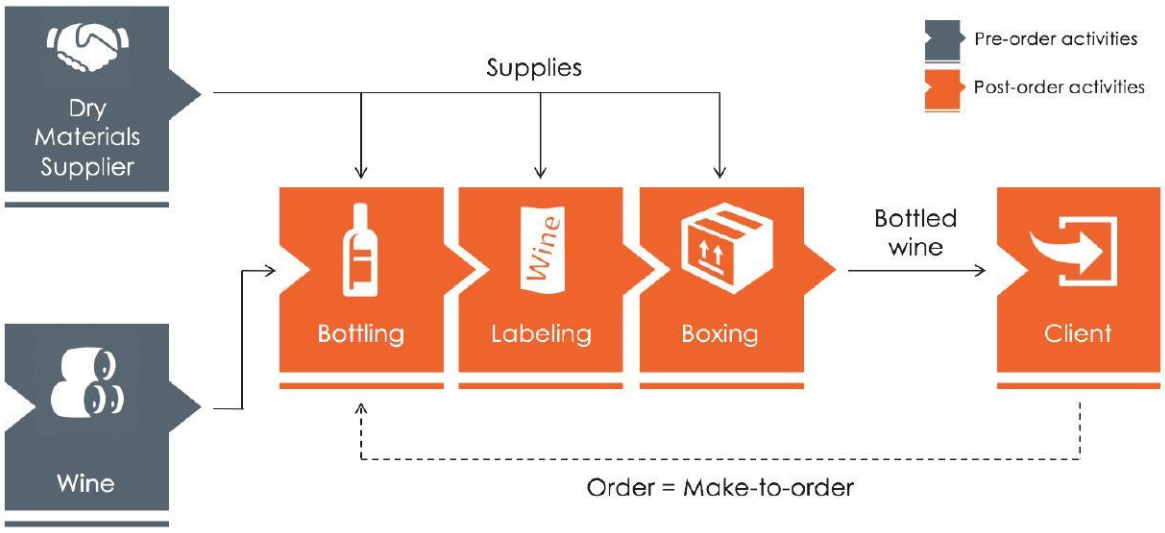

Figure 12: Meke-to-order strategy (Alves & Ferreira, 2016)

2.1.8. Sograpе's finished goods

Sograpе has available for sale a high variety of brands and types of wine. Around 2.700 SKU were identified and grouped by product family. This data is presented on Table 1, along with the number of brands within each product family.

Table 1: Number of finished-goods SKU

Product family	Number of brands	Number of SKU
Casa Ferreirinha	12	343
Ferreira	6	378
Gazela	5	119
Herdade do peso	9	125
Mateus	6	293
Offley	8	275
Quinta de Azevedo	1	17
Quinta dos Carvalhais	15	184
Sandeman	12	680
Legado	1	16
Outros	41	276
Total	**116**	**2.706**

The high number of SKU is due to the following factors:

- Market requirements

Each SKU that uses a customized raw material, such as a customized label due to market's demand, requires the creation of a specific SKU for that market, even if it only differs from the standard product in a single material. Table 2 shows all the different SKU for the same product due to market requirements. For example, Brazil has six different SKU for the same product, one for each distributor. Thus, the main reason for such high number of SKU is related to the internationalization of the company and the need to adapt to different legal and customers' requirements.

Table 2: Different SKUs for the same product due to market requirements

SKU	Market	Number of SKU
MATEUS ORIGINAL 6X750 ML	Brazil	6
	China	1
	Czech Republic	1
	Spain	1
	France	3
	Italy	1
	Luxembourg	1
	Netherlands	1
	Neutral	1
	Portugal	1
	Poland	1
	Ucrania	1
	Total	**19**

- Port wine styles

Regarding to Port wines (Ferreira, Offley and Sandeman), the high number of SKU relates to their characteristics, since these wines have many different styles and ageing periods.

- Product configuration

Another reason for the existence of so many products concerns the availability of different product configuration. For each unit size (187, 250, 375, 750, 1.000, 1.500, 3.000 or 5.000 milliliters) and packing regarding units per box (3, 6 or 12 units), there must be a different SKU. In Table 3 are illustrated all the different SKU for the same product, due to distinct unit size and packing.

Table 3: Different SKUs due to distinct unit size and packing

MATEUS ORIGINAL NEUTRAL 12X187 ML
MATEUS ORIGINAL NEUTRAL 12X250 ML
MATEUS ORIGINAL NEUTRAL 6X4X250 ML
MATEUS ORIGINAL NEUTRAL 12X375 ML
MATEUS ORIGINAL NEUTRAL 6X750 ML
MATEUS ORIGINAL NEUTRAL 12X750 ML
MATEUS ORIGINAL NEUTRAL 6X1000 ML
MATEUS ORIGINAL NEUTRAL 4X2X1000
MATEUS ORIGINAL NEUTRAL 6X1500 ML

2.2. Problem identification

Sograpeʼs departments, especially the Planning and Manufacturing departments, are aware of the low accuracy that the companyʼs demand plan tend to have, especially on a long-term horizon. Not having a sufficient planning process that aims to balance demand and supply in an adequate way, has thereby a high influence on the companyʼs activity performance. There are two situations that often arise in Sogrape, depending on the season:

- Demand exceeding supply, causing a risk of poorer delivery service to customers, including lower service level and longer delivery lead times (Jonsson & Mattsson, 2009);

- Capacity exceeding supply, causing a risk of increased stocks, which implies high levels of tied up capital as well as high storage costs. Furthermore, having more capacity than demand increases the unit production costs due to low utilization of machines and labor (Jonsson & Mattsson, 2009).

These situations are caused by the inexistence of an accurate demand plan, in which the Operations departments can rely on when estimating the needs of raw materials and developing the supply plan. Moreover, a planning process in which the demand plan is reviewed in a periodic basis (monthly, for example), making it more accurate and useful to the Operations departments, does not also take place in Sograpе.

As presented in chapter 2.1.4, grapes are harvested only once a year, thus Sograpе must produce, during that specific period, the quantity of wine it will be selling throughout the

year. A reliable demand plan would hence be useful to estimate the quantity of grapes/wine needed to satisfy the expected demand needs. Furthermore, this non-alignment between Sales/Marketing and Planning/Manufacturing causes a complete lack of knowledge by the Operations departments of the market needs in a timely manner, leading to a high number of urgencies to the raw materials suppliers and to the Manufacturing department, modifications to the supply plan and to a large percentage of indirect production (about 56%, as described in chapter 4.5.1). All this entropy within Sograpе's supply chain results in high costs for the company that could be mitigated through the implementation of the S&OP process.

Since there is no stated standardized approach within this company regarding its long-term planning processes, it is important to first investigate what its planning processes currently look like and investigate how they can be improved. Lapide (2005) emphasizes that, in order to know how to improve, it is important to know where you currently are. Therefore, a foundation for any further improvements is to understand the current performance and next, design Sograpе's S&OP parameters according to what is recommended in the literature. Grimson and Pyke (2007) further state that, in general, S&OP is easy to understand but can be very hard to implement, since S&OP requires corporations to change not only a business process but also company culture.

3. Theoretical Framework

3.1. Sales and Operations Planning definition

Sales and Operations Planning is defined by the American Production and Inventory Control (APICS) (Shedlawski, 2017) as:

A process to develop tactical plans that provide management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain. The process brings together all the plans for the business (sales, marketing, development, manufacturing, sourcing, and financial) into one integrated set of plans.

S&OP was introduced in the late 1970s by the business consultant Oliver Wight (Sheldon, 2006). The process started to evolve as organizations started to share S&OP experiences in organizations such as APICS (Sheldon, 2006). In 1987, the S&OP process was defined as a business process with the goal of balancing supply and demand (Sheldon, 2006). The traditional approach has however been extended in the literature over the years and S&OP is nowadays often described as including maximizing opportunity, minimizing risk, and making conscious trade-offs based on profitability (Cecere, Barrett, & Mooraj, 2009).

Over time, several authors made their contribution defining S&OP as a concept in different ways. Ventana Research (2006) defines S&OP as a set of planning and decision-making processes that aligns everyday operations with business goals, operational and financial planning; it is also described as a tool that enables executives to reach consensus on a single plan in which the critical resources are allocated to achieve company's aims. S&OP is by (Feng et al., 2008) described as a monthly-based tactical planning process, conducted by senior management, being its main goal to gather all the plans from the demand, supply and financial functional units, and bring about a unique set of plans to orchestrate and control performance, as well as support the business strategic plan. Finally, Thomé et al. (2012) state that S&OP can be viewed as a tool that unites different business plans into one integrated set of planes with the main purpose of balancing supply and demand and linking the strategic plans to the operational plans of the firm. This integration allows the company to balance the sales/marketing plans with the available production resources, resulting in an agreed-on plan that determines the manufacturing role in meeting the company strategy.

Since this tool creates a cross functional way of working that creates commitment, alignment and accountability behind one plan, Hawkes, Malhotra and Mueller (2009) stress that sales, marketing, operations and financial not only should know what the other departments are doing, but should discuss how to better integrate each of their strategies, capabilities, and goals, as presented in Figure 13.

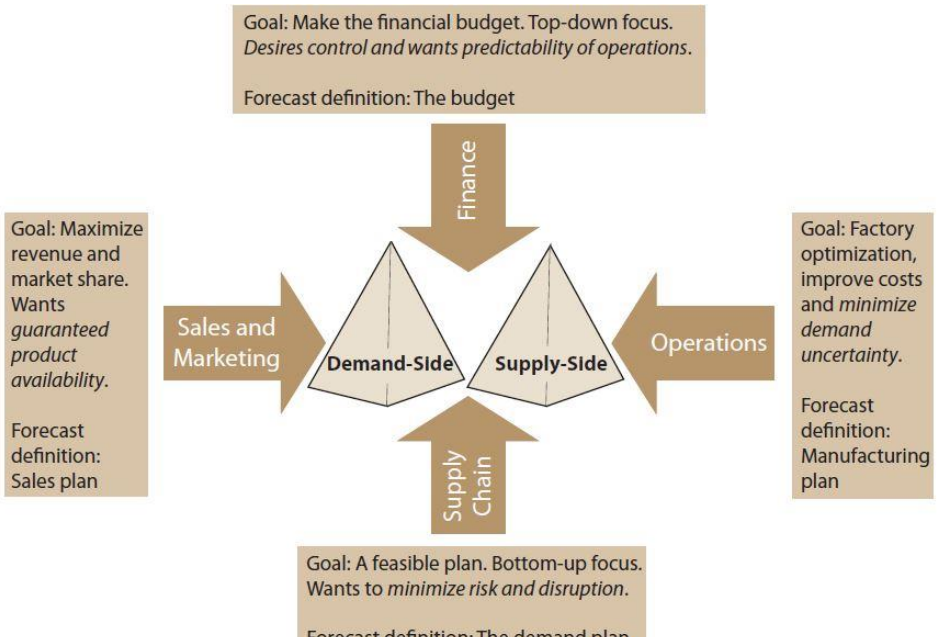

Figure 13: Alignment between departments under the S&OP process (Cecere et al., 2009)

In regard to how the S&OP process works, cross-functional executives from the departments mentioned above meet every month (or even more frequently) and, at the very least, align marketing and sales programs with operations production and capacity plans. If it happens to occur a situation of supply-demand mismatch, S&OP process could help to evaluate and decide which customers or products should get priority (Hawkes et al., 2009) or top-management could decide to constrain demand or add capacity to fulfill demand. The authors also stress that, if done correctly, S&OP helps to alleviate such shortfalls in the first place by proactively managing supply and demand. A few studies also demonstrate that companies that thoroughly implement the S&OP process have a superior operational performance against the ones that partially use it or that don't use it at all (Lapide, 2004a). Furthermore, Feng et al. (2008) conclude that a S&OP approach that integrates sales, production, distribution and procurement in the planning process provides a higher financial performance compared to a partially integrated S&OP model in which sales and production are carried out jointly while the distribution and procurement are planned separately and to a model in which these four cross-functional areas are decoupled.

Thome et al. (2012) synthetize the S&OP process into five main features:

i. It is a cross-functional and integrated tactical planning process;
ii. It integrates the business plans in a single plan;
iii. It comprehends a planning horizon of over 18 months;
iv. It links strategy and operations;
v. S&OP creates value and is related with the performance of the firm.

Concerning the positioning of S&OP among the levels of planning, Lapide (2011) argues that S&OP connects strategic to operational planning, as illustrated in Figure 14. The author defines it as a routine tactical planning process, that is guided by outputs from strategic planning (strategic goals and objectives) and that routes daily operations (such as schedules for various sales, marketing, and supply chain activities).

Figure 14: S&OP's position in the planning process (Lapide, 2011)

On the other hand, Olhager and Selldin (2007) state that S&OP should be included in the highest level of planning, since it may involve strategic decisions related to the expansion of productive capacity.

However, most authors agree to position S&OP at the tactical level of planning, since it is a periodic planning process that vertically connects the long-term strategic plans with the short-term operational plans (Feng et al., 2008).

3.2. Sales and Operations Planning goals

The main goals of the S&OP process, according to Thomé et al. (2012), are the balance of supply and demand, cross-functional alignment, integration of plans and their improvement. Lapide (2004a) also refers that the S&OP process results into meeting customer demands at the highest levels, maintaining reduced inventories and minimizing supply chain operating costs. Grimson and Pyke (2007) moreover put forward the profitability and stress that the main goal of S&OP is profit optimization through S&OP plan integration. Lastly, according to Hawkes et al. (2009), S&OP is aimed at increasing communication, better planning capacity in all parts of a supply chain and making the more advantageous decisions for the business and balancing customer service, inventory, and cost-to-serve (Figure 15).

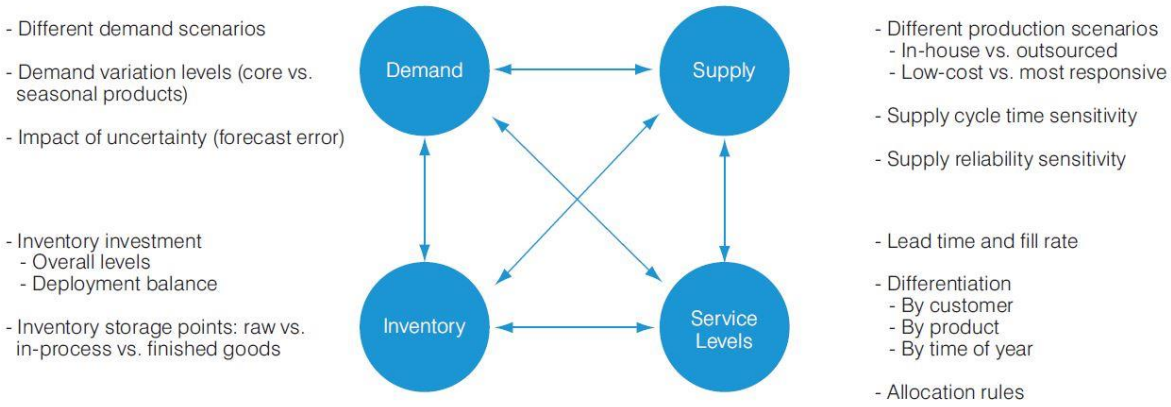

Figure 15: Balancing Customer Service, Inventory, and Cost-to-Serve (Hawkes et al., 2009)

However, amongst practitioners of S&OP there is confusion about defining what is the goal of S&OP and its connection to the achievement of overall business goals, according to Ventana Research (2006). Only 26 percent of the respondents in Ventana Research (2006) survey agreed with scholars on the relationship between S&OP and reaching business goals. Instead, the respondents described goals of a more tactical character, such as making better decisions and matching demand and supply (Ventana Research, 2006).

Moreover, each departments' goals often can hinder the achievement of overall objectives, causing constraint between company's objectives, instead of alignment (Grimson & Pyke, 2007).

Although there is a vast list of possible goals to justify the implementation of S&OP, the goal of S&OP can, and should, vary depending on each company's business goals, given that every company has its own strategies and business goals and the S&OP process could be used to achieve those goals. Additionally, the goals that each company wishes to extract from the S&OP process and the depth of those goals is also intrinsically related with the maturity of the process, presented in chapter 3.5.

3.3. Sales and Operations Planning structure

Sales and Operations planning is performed in a stepwise process with different departments involved. How the S&OP process should be structured and what steps it should consist of is described by many scholars. In this section, five steps that should be included in the S&OP process are described below, using Grimson and Pyke (2007) framework and some

contributions from other authors that were considered relevant. These steps are also illustrated in Figure 16.

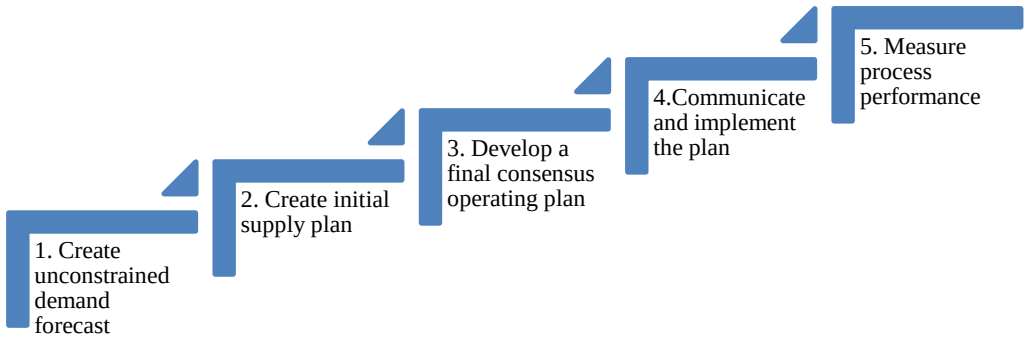

Figure 16: The five steps of the S&OP process

3.3.1. Create unconstrained demand forecast

The first step of the S&OP process consists in gathering unconstrained projected sales data that is used as an initial forecast. The unconstrained forecast, that is typically performed by the sales and marketing departments, should center on what customers want to buy, irrespective of the production limitations. At this stage, having the field intelligence contribution of the sales personnel that are closest to the customers is advantageous (Schneider, 2013). When drafting this forecast, all known marketing initiatives that could impact future demand, such as promotions, new products introduction and product obsolescence should be considered in a scenario-building approach (Lapide, 2004). Scenario and what-if analysis help the company to deal with uncertainty, to understand possible impacts of eventual changes in demand and how to manage them properly, allowing the company to act proactive. Bower (2005) also highlights that the presence of product management executives is crucial in order to have in consideration not only the product portfolio but also the product life cycle, claiming that ignoring it is one the most common threats to S&OP. After having all the inputs needed, it is built an unconstrained forecast using statistical analysis, i.e. quantitative forecasting methods, and/or management input. The expected outcome of this first step is an unconstrained demand plan, which is the basis of the S&OP process. After its development, it is important to communicate it to, amongst others, finance personnel who should compare it to the business plan (Schorr, 2007a). Bower (2005) also finds relevant to share the unconstrained demand plan with the company's board

forasmuch as it helps to understand what the company could sell if the supply had no restrictions.

3.3.2. Create initial supply plan

In the second step of the process, operations/supply chain teams collect data about internal capacity, such as inventory capacity and strategies, and manufacturing, logistics and supply chain capacities. Then, using the unconstrained, consensual demand forecast as an input, there should be analyzed the best alternative according to the business plan regarding profitability, revenue and customer service (Cecere et al., 2009). The authors also recommend identifying supply constraints, demand shortfalls and opportunities for capacity expansion, with the objective of appraising the supply-side's capability of achieving the demand plan. These inputs combined with the demand plan, are used in the creation the initial supply plan. As mentioned in the previous step, it is relevant to analyze the unconstrained demand plan in order to understand what could be sold if there were no restrictions. However, this doesn't mean that the ideal situation would be the demand plan not having any constraints; the demand plan can always be constrained but management should be given the possibility to find solutions to the gaps (Bower, 2005). The same gap between supply and demand may occur frequently when it's time to align supply and demand plans, and so it becomes important to evaluate the ability to satisfy the demand plan and to study the possibility of providing more resources next time (Bower, 2005). If there is a gap between supply and demand, the supply-side is expected to develop scenarios of how to mitigate them, which should consist of profitability estimation of the different supply alternatives, issues related with each alternative and the identification of the most adequate solution (Schorr, 2007b). The meeting aims at establishing valid supply plans for each scenario, that includes the volumes to be produced and delivered for each period during the planning horizon, as well as recommended actions to overcome identified gaps.

3.3.3. Develop a final consensus operating plan

In the third step of the process, the S&OP team, which includes representatives from sales, marketing, operations and finance, formally meets to develop the final demand and supply plan that sets the guidelines for the upcoming cycle. The final plan should balance the supply and demand plans, reaching the company's overall business and strategic goals. There should be presented the demand and supply plans and discussed the different scenarios and

inherent consequences, risks and opportunities (Cecere et al., 2009). As mentioned in the second step, eventual gaps between supply and demand may be identified and, in this third step, it is a top-management decision to constrain demand or add capacity to fulfill demand, based on the different scenarios that are presented. Schorr (2007b) highlights the importance of the attendance of financial representatives and the conversion of the developed plan into monetary terms, i.e. revenue, cash flow and costs, to see their impact on overall business goals as well as to help marry the operational plans established with the financial objectives of the company. The attendance of the other functional areas responsible for the development of the previous plans is equally essential to make any necessary clarifications. After considering all the different plans and its impacts concerning operational, sales and financial matters, there should be chosen and defined the final plan which should be the closest to the business goals. Thereafter, the company's top management should approve the agreed plan and settle actions that need to be taken. Thus, the participation of a senior executive that has enough authority to successfully grant implementation and execution of the planning decisions is crucial and efficaciously enhances the process.

3.3.4. Communicate and implement plan

The fourth step of the plan includes the publication and communication of the final agreed S&OP plan to all involved parties, such as operations, sales, marketing and finance, and its implementation. The marketing department should be aware of the quantities they agreed to sell, and the operations departments are compromised to make sure that the volumes established in the plan are produced and delivered on time.

3.3.5. Measure process performance

The performance of S&OP should be measured so it can be improved through learning over time (Lapide, 2004). As so, the fifth and final step of the S&OP process aims at measuring and control the effectiveness of the plans and the S&OP process itself, through Key Performance Indicators (KPI). These measures vary among industries but the main metrics that should be tracked over time include operational and commercial KPI that should be shared between all the departments involved in the process. For the operations department, measurements including inventory levels, obsolete inventory, capacity and resource utilization and production lead time, quality, costs and shortages are commonly used (Thomé et al., 2012). From the sales and marketing perspectives, metrics such as demand forecast

accuracy, sales growth, market share and, if there is a new product introduction, development costs and product development cycle time may be important (Thomé et al., 2012).

3.4. Sales and Operations Planning parameters

Given that each S&OP process should be suitable for each company, an universal framework would not result in a successful implementation of the process. As so, it is recommended the definition of a number of planning parameters and their characteristics, according to each type of industry, in order to facilitate the alignment of the plans and their departments and hence achieve an effective and efficient S&OP process. These parameters are the attendees, the meeting frequency, the planning horizon, the planning level, the planning units and the information systems utilization.

3.4.1. Attendees

Most authors agree on which departments should participate in S&OP meetings, stating that marketing, sales, production, logistics, purchasing and finance inputs are advantageous to the process. Other authors also view the supply chain participation, including both suppliers and customers, as beneficial (Grimson & Pyke, 2007). External inputs about future demand and supply from a company's customers and suppliers may significantly increase the accuracy of demand forecast and help on the production planning, providing information about the availability of raw materials. However, external participation in S&OP meetings should depend on the maturity stage of the process, since that, if the S&OP is at a stage in which perfect alignment within the different internal parties involved wasn't yet achieved, integrating external collaboration may cause some entropy in the process.

3.4.2. Meeting frequency

A key aspect of an S&OP process is that it is comprised of routine meetings, held on a periodic basis (Lapide, 2004). Most scholars recommend monthly-based meetings (Bower, 2005; Feng et al., 2008; Lapide, 2004) emphasizing that these regular meetings are essential to foment trust and confidence among the team (Thomé et al., 2012). Nevertheless, according to Grimson and Pyke (2007), many companies are moving toward more frequent meetings to have a more event-driven process in order to better react to situations that arise through the enhanced consideration of market dynamics and production environment.

3.4.3. Planning horizon

As presented in chapter 3.1, there are several S&OP definitions. However, practically all of them include the development of a plan, which should have a defined planning horizon, related to how far ahead planning is necessary to be able to adapt the capacity in production. APICS also dictates that a company's plans should cover a horizon sufficient to plan resources and to support the annual business planning process (Shedlawski, 2017). Bower (2005) believes that the time span of the plans should cover at least two years. According to Grimson and Pyke (2007), the length of the planning horizon usually varies from six months to three years. However, the differences in what is recommended may be due to the company's context: for industries with long production lead time and high seasonality, a longer planning horizon may be more convenient than for products with a short lead time. Furthermore, the planning timespan should also consider the time required for the development and introduction of new products.

3.4.4. Planning level

Given that S&OP is a long-term planning process, the level of detail of its plans' units must be relatively low. Therefore, most S&OP planning is done at the product family level, aggregating products with similar characteristics, e.g. seasonality, lead time and production and material resources needed for their production (Ávila & Cavaco, 2008). There are also some high detailed SKU-based S&OP processes and some that combine both product family and SKU for selected products (Thomé et al., 2012).

3.4.5. Planning units

Two essential plans in the S&OP process are the demand and supply plans, which are elaborated in units that are the most used in each department. Usually, demand plans consider volumes in monetary units and supply plans consider units of capacity requirements, such as machine-hours, number of employees and even entire workshops and assembly lines, or units for production volume, e.g. number of items, square meter or kilograms, depending on the type of industry. Hence, according to Feng et al. (2008), a frequent challenge when aligning different plans from the different functional areas is the inconsistency of the data unit used. The author recommends the definition of a common set of units in order to create standard measures across the supply chain to be used by the models.

3.4.6. Information systems utilization

Lapide (2004b) states that, without technology, S&OP is cumbersome and unable to support the scale needed to achieve all its benefits. Nonetheless, there seems to be different opinions regarding the level of investment in information systems to support the process. Grimson and Pyke (2007) advocate that at the initial stages, simple spreadsheets can be used as S&OP scoreboards with the bulk of effort focused on strengthening the S&OP process rather than investing in complex and sophisticated information systems. However, Lapide (2004b) highlights that the process requires a higher level of automation and computational sophistication than what can be achieved with manual processes merely supported by spreadsheets. A study about companies' investment in information systems technology corroborates the author's statements, revealing that companies have spent over $12 billion in supply chain planning application software in the beginning of the 2000s (Lapide, 2004b). The three types of software applications that support the S&OP process, according to Lapide (2004b) are the following:

1. Demand-Side Planning Systems

These system components allow users to generate statistical forecasts based on some variables, such as Marketing and Sales plans. The Demand Collaborator system captures, assembles and processes the market intelligence gleaned from field sales and marketing personnel, as well as from customers that share their demand forecasting information. The outcome is a developed demand plan and an unconstrained baseline forecast that are used as the demand-side inputs to the S&OP process.

2. Supply-Side Planning Systems

These systems components help users generating the inventory, production and procurement plans that optimally meet the unconstrained demand forecasts. Inventory Management and Distributed Requirements Planning (DRP) systems support users in elaborating the expected inventory replenishment needs of finished goods warehouses. In constrained supply scenarios, Multi-facility Advanced Planning and Scheduling (APS) systems are used to develop supply plans, taking into consideration limitations in plant and distribution capacity along with any short-supply of material and other resources. Inventory Optimizer systems support users setting inventory levels that balance customer service targets with material, sub-assembly and finished goods inventories. Finally, Supply Collaborator systems assist in

processing supply capabilities from purchasing personnel and suppliers, including contract manufacturers. The outcome is a developed supply plan that is used as the supply-side inputs to the S&OP process.

3. S&OP Workbench

This system component generates dashboards to display various metrics that compare the planned supply with the unconstrained demand plan, such as production capacity shortages and expected unfulfilled customer demand. It also allows S&OP participants to quickly conduct what-if analysis of potential changes to both supply and demand plans. The dashboard functionality also allows the display of KPI that measure and control the effectiveness of the plans and the S&OP process itself. As shown in Figure 17, both demand and supply planning systems need to be integrated and synchronized in order to immediately reflect in the overall supply-demand scenario any change in either the demand or the supply plans.

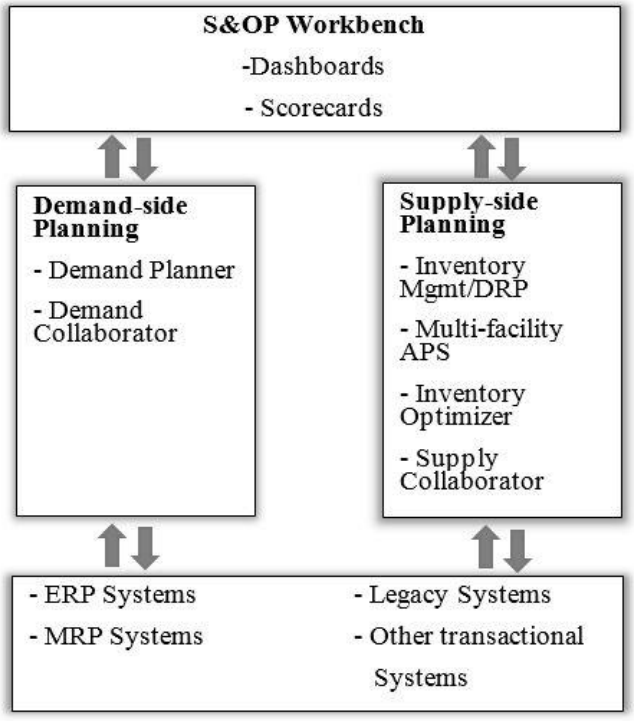

Figure 17: Integrated supply-demand planning technology architecture Lapide (2004b)

Figure 17 also depicts how the components not only need to be integrated among themselves but also with other transactional-oriented business systems such as Enterprise Resource Planning (ERP) and Material Requirements Planning (MRP).

The level of technology complexity and the need of all the components described can also be considered proportional to the maturity stage in which an S&OP process is positioned, as can be verified in the next chapter, Sales and Operations Planning maturity model.

3.5. Sales and Operations Planning maturity model

A maturity model can be defined as a staircase that describes how companies manage a certain area of their business. The purpose of these models is to diagnose what stage the company is currently in, recognize where gaps exist compared to the next stage and best-practices, and then point the way up to the next level, using the identified gaps as an input in the improvement process but always keeping a cost/benefit analysis of the process and technology changes needed to improve (Lapide, 2005).

Different maturity models were developed by many scholars. The choice in this thesis has been to use Lapide's (2005) "A four-stage S&OP process maturity model". One rationale for this is that, instead of Grimson and Pyke's (2007) model "Five-Stage Maturity Framework" in which the classification of the S&OP process is made using five dimensions, in Lapide's (2005) model there is developed a more stage-based evaluation of the S&OP process. "A four-stage S&OP process maturity model" model is further considered one of the most academic and reviewed as it has been published in The Journal of Business Forecasting. Another reason for this choice is that Lapide tapped into his experience to develop this model, using the approach of a practitioner. It resulted it a model easy to understand and to apply to real companies.

This maturity model consists of four stages, with the first one being the least advanced process and the last step being the most advanced process and practically unachievable, becoming the benchmark to which companies strive so achieve and against which compare progress. The four stages are (i) marginal process, (ii) rudimentary process, (iii) classic process and (iv) ideal process and each stage is described regarding (a) meetings held, (b) plans alignment and (c) technologies used. Table 4 illustrates Lapide's (2005) maturity framework, including the four stages, the three dimensions and the main characteristics of each stage concerning the three dimensions.

	Stage 1 Marginal Process	Stage 2 Rudimentary Process	Stage 3 Classic Process	Stage 4 Ideal Process
Meetings	- Informal meetings; - Sporadic scheduling.	- Routine Schedule; - Spotty attendance and participation.	- 100% attendance and participation.	- Event-driven meetings.
Plans alignment	- Disjoint demand plans; - Supply plans not aligned to demand plans.	- Demand plans reconciled; - Supply plans aligned to demand plans.	- Demand and supply plans jointly aligned; - External collaboration with limited number of suppliers and customers.	- Demand and supply plans aligned internally and externally; - External collaboration with most suppliers and customers.
Technologies used	- Minimal technology-enablement; - Multitude of spreadsheets.	- Standalone multi-facility APS system; - Standalone demand planning system; - Systems interfaced in a one-way basis.	- Demand planning packages and supply planning applications integrated; - External information manually brought into the process.	- Advanced S&OP workbench; - External-facing collaborative software integrated to internal demand-supply planning.

Table 4: A four-stage S&OP process maturity model (Lapide, 2005)

3.5.1. Stage 1: Marginal process

In companies with this type of S&P process, meetings that should be routinely held among cross-functional participation tend to be less formal and take place on a sporadic basis. Even if they are scheduled, they are not taken seriously by attendees and this is also caused by the little support given by executive management. At the Marginal process stage, multiple demand and supply plans are independently developed by the demand and supply-side departments and there is little attempt to develop a consensus demand plan and a consensus supply plan. Regarding IT, since plans are disjoint, each department and user can just use a spreadsheet to develop their isolated plans, making spreadsheet technology sufficient.

Companies with a Stage 1 process need to begin to move to Stage 2 by implementing a more formal process that everyone agrees to support and participate in, and in which some attempt is made to consolidate and harmonize the multiple spreadsheets generated.

3.5.2. Stage 2: Rudimentary process

In a Stage 2 S&OP process, formal meetings are scheduled and routinely held. However, they are not fully attended, by choice of participants, and not fully integrated. Also, some participants that attend the meetings tend to not prepare them and to not interact well with other attendees to collaboratively develop consensus plans. There are still developed multiple demand plans but, in this stage, they are shared with each other and the supply-side organizations use the demand plans to develop supply plans in accordance to the demand ones. Since the supply and demand plans are separately developed, each department uses their own software technology. Demand-side departments independently use their software applications, whose outputs are then transmitted to the system used by supply-side, to develop supply plans that are established according to the demand plans transmitted. However, these supply plans are typically not shared with the demand-side.

To move from Stage 2 to Stage 3 it is essential that executives ensure that S&OP meetings are seriously taken and that people actually want to be part of them, being well-recognized for their participation. It is also recommended to adjust demand and supply plans during the meetings to move closer to consensus-based integrated planning.

3.5.3. Stage 3: Classic process

Companies in which S&OP process is at Stage 3, have routinely held meetings which are attended by cross-departmental participants to align supply and demand plans. During the meetings, both plans are adjusted, i.e., neither are fixed and both are open for discussion. In more advanced Stage 3 processes, information from some customers about their future demand needs and from a few critical-component suppliers about scarce materials is manually brought into the S&OP process. The demand-side and supply-side software applications are integrated, making it possible to jointly develop the final plan and to automatically reflect and incorporate into the system any change made to both plans.

What needs to be done to move from Stage 3 to Stage 4 is to have more frequent S&OP meetings and to strengthen the existing relationships with suppliers and customers as well as continue to create new collaborative relationships with other suppliers and customers that are company's partners.

3.5.4. Stage 4: Ideal process

According to the author, the highest level of the S&OP process can never fully be achieved by any company but should be used as a benchmark for guiding the continual improvement of the process. Meetings are event-driven as they are scheduled only when it is needed to change any of the existing plans or when a supply-demand imbalance is detected. In order to make this possible, the process is supported by systems that are constantly tracking supply and demand in real-time and warn everyone linked to the S&OP process of the need to immediately meet. At this stage, it is used an advanced S&OP Workbench system to support the meetings, allowing users to instantaneously evaluate any modifications in supply or demand plans, by quickly see the implications of any changes. At this stage, S&OP plans are aligned not only internally but also externally since collaborative information is drawn from most customers and suppliers, enabled by the utilization of integrated planning systems.

3.6. Sales and Operations Planning success factors

In this chapter there are identified and described some factors that prove to be central in a successful implementation of S&OP, according to Lapide (2004a). These factors are routine and periodic meetings, structured meeting agenda, pre-work to support meeting input, cross-

functional and empowered participation, balance between supply and demand planning, measurement of the process and external inputs.

3.6.1. Routine and periodic meetings

S&OP process is composed of routine meetings performed on a periodic basis. In the 1990's, these meetings used to be held on a quarterly basis. However, a major number of companies are currently holding them monthly. The holding of these meetings and the attendance of all parties concerned is utterly crucial to an efficient operation of the S&OP.

3.6.2. Structured meeting agenda

A S&OP meeting should follow a formalized amount of time (e.g., two or four hours) and not only include a review of the attainment of the preceding plans but also a root-cause analysis of eventual plan discrepancies. These meetings should lead to an alignment of demand-side plans with the supply-side ones, resulting in a sealed plan that should be distributed around the company departments, conducive to cultivate a "single number" plan.

3.6.3. Pre-work to support meeting inputs

A lot of homework must be carried out previous to an S&OP meeting, including all known factors that could impact future demand, such as the introduction of new products and promotions, as well as supply capacities and limitations. One of the pre-works that has more importance is the arrangement of the baseline demand forecast, as it forms the working-draft from which S&OP meetings members develop final plans. Thus, it should be established using statistical forecasting methods and integrate all known impacts to future demand. This groundwork allows the maximum use of the meeting time, since the executives bring all the information rehearsed and ready to be presented and translated to the rest of the team.

3.6.4. Cross-functional and empowered participation

Cross-functional participation of demand-side and supply-side managers, along with finance personnel, during the S&OP meetings shall be an active participation, with each member having a role to play that contributes to the process, representing their functional area's perspective to the fullest extent. The author also highlights the relevance of the empowerment of the members to make decisions on the operational and forecasting plans,

as well as final decisions to achieve a plan closure, since the option of going back to get executive-level approvals is not available.

3.6.5. Balance between supply and demand planning

Most S&OP processes tend to fail due to the lack of this balance. The major issue is that S&OP meetings are driven over an inflexible given set of marketing and sales plan. Therefore, in these meetings, the supply-side tend to develop a supply plan adjusted to meet a pre-specified demand plan, causing very little modifications to the sales and marketing plans. One of the problems identified by the author associated with this approach to S&OP regards the lack of contribution from Marketing and Sales in the gatherings, since these functional areas only expound the demand forecast plan and expect the supply-side to adapt to it, leading to an absence of interest by the demand-side on these meetings, causing a non-active participation or even a participation. Grimson and Pyke (2007) have also verified that the operations team carries the burden of meeting the required targets, while the sales team is rarely required to adjust sales plans. To solve this problem and others related to a compelled adjustment of a supply plan to a stringent demand one, S&OP meetings must go through a revision of both plans (demand and supply).

3.6.6. Measurement of the process

The aftereffects of the S&OP process should be measured so it can be improved. Most current S&OP processes tend to evaluate demand forecast accuracy, which is probably the most important metric to track. However, other metrics such as variance of baseline forecasts and budgets, as well as adherence to sales, marketing and operations plans, should also be an indicator of the S&OP process performance.

3.6.7. External inputs

The S&OP processes essentially use internal supply-demand data, such as customer orders, shipments, on-hand inventories and plant capacities as inputs. However, information about future supply and demand from the company's customers and suppliers may be enhanced by external information, such as Vendor Managed Inventories (VMI), Collaborative Planning, Forecasting, and Replenishment (CPFR) for the supply side, and the sharing of downstream data like Point-of-Sale (POS) information, for the customer side.

3.7. Sales and Operations Planning implementation main issues

S&OP is easy to understand but can be very hard to implement, since it requires corporations to change not only a business process, but also company culture (Grimson & Pyke, 2007; Tuomikangas & Kaipia, 2014).

At its core, S&OP seeks to reconcile all demand and supply plans remaining synchronized with the overall business plan. Furthermore, it also aims at having sales and operations realizing and embracing their interdependencies (Wallace & Stahl, 2008). Implementing S&OP has been stated as a challenge for companies as it demands managers with very different incentives and goals to work together towards a common goal, requiring a cultural shift from incentive schemes traditionally centered on the functional unit to incentives centered on a common goal (Grimson & Pyke, 2007). This formal collaboration is manifested in S&OP meetings designed to develop overall integration and plan consensus. However, these cross-functional S&OP meetings' effectiveness can be reduced without true collaboration. Information exchange is not enough, true collaboration is the goal and Thomé et al. (2012) state that a successful S&OP initiative can foster higher levels of effective collaboration. It allows different areas to converse, learn and work across the silos that have characterized organizational structures. Nonetheless, collaboration does not mean the absence of conflict; conflict between sales and operations is inherent given their different scope of responsibilities (Shapiro, 1977). These groups see the world differently and are often at odds largely because they have different goals and they are motivated to achieve them in different ways (Shapiro, 1977). Sales representatives are often motivated to grow revenue and be responsive to customers, entailing preferences for wide product variety (Oliva & Watson, 2011). On the other hand, manufacturing managers are typically incented and evaluated according to production efficiency measures, entailing preferences for narrow product scope and discrete inventory levels (Oliva & Watson, 2011; Shapiro, 1977). Thus, both groups are pre-disposed to think and speak different languages as they have fundamentally different cultures (Konijnendijk, 1993; Shapiro, 1977). A common goal of S&OP is to offer a forum that encourages sharing of different points of view, which may result in disagreements, however, disputes can be resolved amicably and can even be constructive. This level of collaboration is viewed as the linchpin that connects team and contextual influences to the desirable outcome of S&OP performance.

Furthermore, a study carried out by Ventana Research (2006) concluded that companies which use S&OP to adjust their finance, sales, marketing, and executive management plans are more likely to succeed. Although the same study also points out finance as one of the most important factors to achieve increased profitability, only 42% of companies involve finance in their S&OP. However, the companies involving finance report much better results regarding gains in revenue (90%), profit (70%), customer satisfaction (76%), and forecast accuracy (56%). Finance executives should thus be highly involved in S&OP to ensure the matching of the operation plans with the financial objectives of the company (Lapide, 2004). Cecere et al. (2009) state that the greatest cultural difference to overcome is the role of finance, especially how the financial budget should be used when developing the plan. The budget should not constrain the plan but be used as an input to which the plans should be compared to in order to evaluate implications (Cecere et al., 2009).

Moreover, it is key to understand that S&OP must be a well-structured process, that implies a big change in a company's business processes and business culture, which must be adapted to achieve a full integration of the different functions in the process (Grimson & Pyke, 2007; Lapide, 2005). However, given the complexity and cross-functional nature of the S&OP process, this is a challenge for most companies. Top management support is thus critical for setting the vision, helping to overcome obstacles, and fostering a culture that is supportive of supply chain alignment. Top-management must be involved in the S&OP process to change the company's mindset, so that all the participants in the process are aligned and working towards the same goal, as well as to empower the S&OP team. S&OP requires leadership, managers cannot easily change production volumes, number of employees, or process type, but they can create an organization that facilitates integration (Grimson & Pyke, 2007). Furthermore, making the process as transparent as possible allowing the functions to easily understand the added value and the benefits of the process also helps changing the mindset and motivate the participants to be a part of it.

It is hence essential to transform the mentality of the company and achieve a uniform way of thinking and acting towards a successful S&OP process.

3.8. Empirical evidences regarding the S&OP process

According to a study from Bain & Company, entitled "Good Sales and Operations Planning is no longer good enough" (Hinkel et al., 2016), companies that have effectively

implemented the S&OP process have seen improvements in the accuracy of forecasts on the order of 20% to 50%, a 10% to 30% reduction in inventory levels, a 5% to 15% reduction in manufacturing downtime and a 5% to 10% increase in on-time delivery. Furthermore, a successful S&OP initiative can increase revenue from 2% to 8% and improve the success of new products launches by 20% (Hirneise, 2009). An effective use of S&OP drives dramatic improvements in key business performance metrics, supporting the growth of the top line of the business while reducing operating costs and reducing inventory required (Prokopets, 2013), as illustrated in Figure 18.

Figure 18: Business benefits of S&OP (Prokopets, 2013)

Moreover, according to the 2015 survey "The S&OP Pulse Check" (Supply Chain Trend, 2015), the implementation of the S&OP process results in better communication and collaboration between functions and more data driven and factual decision making (Figure 19).

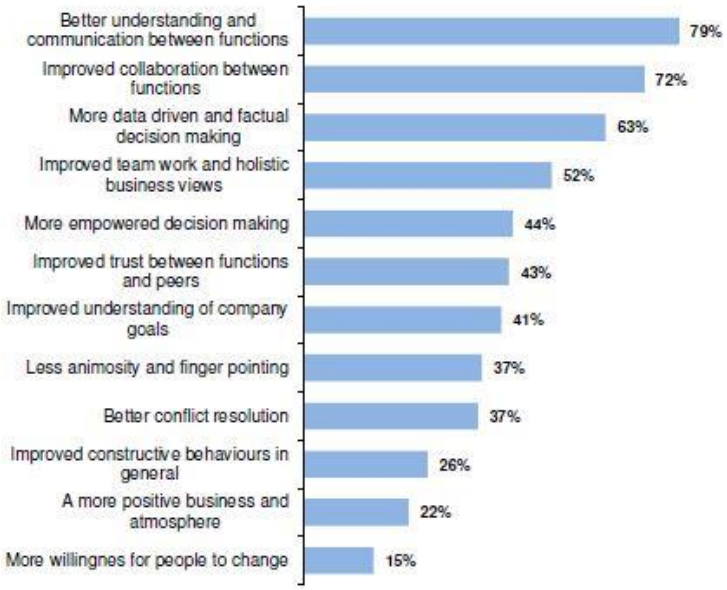

Figure 19: The main cultural changes driven by S&OP (Supply Chain Trend, 2015)

4. Case study

4.1. Sograpе’s current planning process maturity

Before developing and implementing S&OP process itself, it is imperative to understand the degree of maturity a company have on this theme. In order to get this knowledge, Lapide's (2005) maturity model, described in chapter 3.5, was used to characterize the planning process in Sograpе regarding the meetings held, the alignment of the different plans alignment and the technologies used. Furthermore, although KPI are not used as a dimension to describe a planning process according to Lapide's (2005) model, it is considered by the author of the thesis as a relevant indicator of the company’s planning process. Therefore, the KPI currently used to measure Sograpе’s activity performance are also presented in this chapter.

After assessed Sograpе’s current planning process maturity and described S&OP’s goals and parameters at the company, it is evaluated Sograpе’s planning process maturity after S&OP’s implementation (chapter 4.4).

The methods used to gather the information needed to characterize the company’s current planning process, were mainly observations and informal discussions. The fact that this thesis’ author was an intern in the company, helped in collecting the information, since she was integrated in the company’s context.

4.1.1. Meetings

No formal S&OP process was identified in Sogrape and there are no meetings to which the Sales, Marketing, Planning and Manufacturing departments attend, resulting in a Stage 0 position in the Meetings dimension.

The only meeting in Sogrape in which the demand plans are reviewed is the monthly-based meeting between Sogrape Vinhos and Sogrape Distribuição, which is Sogrape Vinhos's Portuguese distributor, attended by Sogrape Vinhos's Planning department and Sogrape Distribuição's Sales department. At these meetings, sales deviations by product in the month prior to the meeting and Year-to-Date (YTD) sales deviations are analyzed. If there are identified any significant sales deviations, the sales forecast of the following four months is revised in order to mitigate further deviations. Sales department also notifies Planning department of possible sales opportunities so that this department may subsequently evaluate the possibility of achieving it, in terms of availability of raw materials for the dates and quantities required, and also evaluate with the Manufacturing department the availability of the production lines. Although these meetings are held with the aim of reviewing the Portuguese market's sales plans, there are no such meetings for the external markets, causing the emergence of urgent and unplanned sales opportunities, as they have not been previously disclosed.

The monthly-based Supply Chain meeting is also held, to which the Planning, Manufacturing, Logistics and Customer Service departments attend. At these meetings, KPI of each area, promotional actions and future projects are presented and analyzed. However, this meeting does not aim the same goal as the S&OP meetings, since there is no contribution from the Sales and Marketing departments, so no alignment between supply and demand plans is done.

4.1.2. Plans alignment

The data collected indicated that the Marketing/Sales departments usually coordinate sales plans with the Planning department, which coordinates them with the Manufacturing department. This *modus operandi* results in no interaction between the Manufacturing and the Marketing/Sales department, and thus leads to a complete lack of understanding of the Manufacturing area by the Marketing/Sales departments, and vice versa.

The demand plan that is used in Sogrape for the planning process, which is also the annual budget, is developed once a year, for the following year. In the month of September of each year, several departments begin to collaborate in the elaboration of the budget for the following year, in which is added by each market/area manager the forecasts of sales of each product for each client, thus forming a demand plan, usually based on previous year's sales history. The annual sales budget is therefore an Excel file, with the identification of the market, customer, product and quantity per month, in physical cases and nine liters cases. This file is managed by the Planning department and the quantities indicated in it are manually entered into the software (SAP). These quantities become visible to the Production sector in order to schedule the production plan, and to generate material purchase needs by Material Requirement Planning (MRP), with a three-months horizon. However, this forecast is rarely reviewed during the year by area managers, being only rectified on a monthly-basis by the Portuguese market Sales department as described in point 4.1.1, so it is common to often arise business opportunities that become urgent as they have not been previously disclosed to the other departments that should be involved (Planning and Manufacturing sectors, for example). The only situations where the demand plan of the external markets is reviewed is when it is necessary to purchase some raw material in a small quantity in order to fulfill an order, and the Planning department questions Sales about the sales prospects, so that a larger quantity of that material can be bought and thus Sogrape can get a better price. Moreover, the Planning department also asks Sales to review the demand plan for production optimization purposes. For example, when it is necessary to produce a SKU that requires a minimum volume of wine, the Manufacturing departments usually asks Planning department for sales prospects for that SKU, so that a larger quantity can be produced, and thus lower production costs can be achieved.

Although some level of planning is done in Sogrape, the general perception is that planning is done at a short-term and that efforts are focused on reacting quickly to changes instead of predicting them. Nevertheless, the described above annual sales budget could be used as the demand plan for the S&OP process and, if reviewed every month and presented to the other departments at S&OP meetings, it could be of great value in predicting the following months' demand and reacting to them.

Thus, the demand plans (Excel files) are shared with the supply-side departments, in this case with the Planning department, who inserts them into SAP, so that the Manufacturing

department can later create the supply plan also using SAP. This way, supply plans become aligned to demand plans. Sograpе is then considered being a Stage 2 on the scale in the Plans alignment dimension.

4.1.3. Technologies used

In Sograpе, Manufacturing, Planning, Marketing and Sales areas have its own, and distinct, software technology and process. The Manufacturing and Planning sectors use SAP software to schedule productions on each production line and to determine the needs of raw materials, while Marketing and Sales areas develop the demand plans through Excel-based files. Demand-side departments' Excel files are shared with the Planning department, which transmit them to the system used by the supply-side, SAP, to develop supply plans that are established also in SAP, according to the demand plans transmitted. However, these supply plans are typically not shared with the demand-side, since they do not usually use SAP. This results in no visibility of the production dates and thus in the need of questioning the Planning department about them.

Moreover, the Planning department also creates multiple spreadsheets when needs to evaluate a what-if scenario, which could be easily evaluated and estimated by an S&OP software.

Since demand-side departments use their software applications, even though it is Excel, and then transmit the outputs to the supply-side to develop supply plans according to the demand plans transmitted, and given the existence of multiple spreadsheets, Sograpе is considered being a Stage 1,5 on the scale in the Technologies used dimension.

The following Table summarizes Sograpе's current planning process, according to Lapide's (2005) maturity model (Table 5).

Table 5: Sograpе's current planning process maturity

Parameter	Characteristics	Stage
Meetings	- No formal S&OP meetings to which the S&OP departments attend.	Stage 0
Plans alignment	- Demand and supply plans shared with the Planning department; - Supply plans aligned to demand plans.	Stage 2
Technologies used	- Each department uses their own software technology (demand-side: Excel; supply-side: SAP); - Multiple spreadsheets.	Stage 1,5

According to this maturity model, Sograpе's planning process is hence classified as a Stage 1 – Marginal process.

Although the utilization of this maturity model clarifies the company's planning process, it is considered that a flowchart illustrating the flow of the company's current planning process would also be interesting and helpful. Therefore, Figure 20 illustrates Sograpе's current planning process. In blue are the tasks which the Manufacturing department is responsible for; in green are the tasks which the Planning department is responsible for; and in red are the tasks which the Sales department is responsible for.

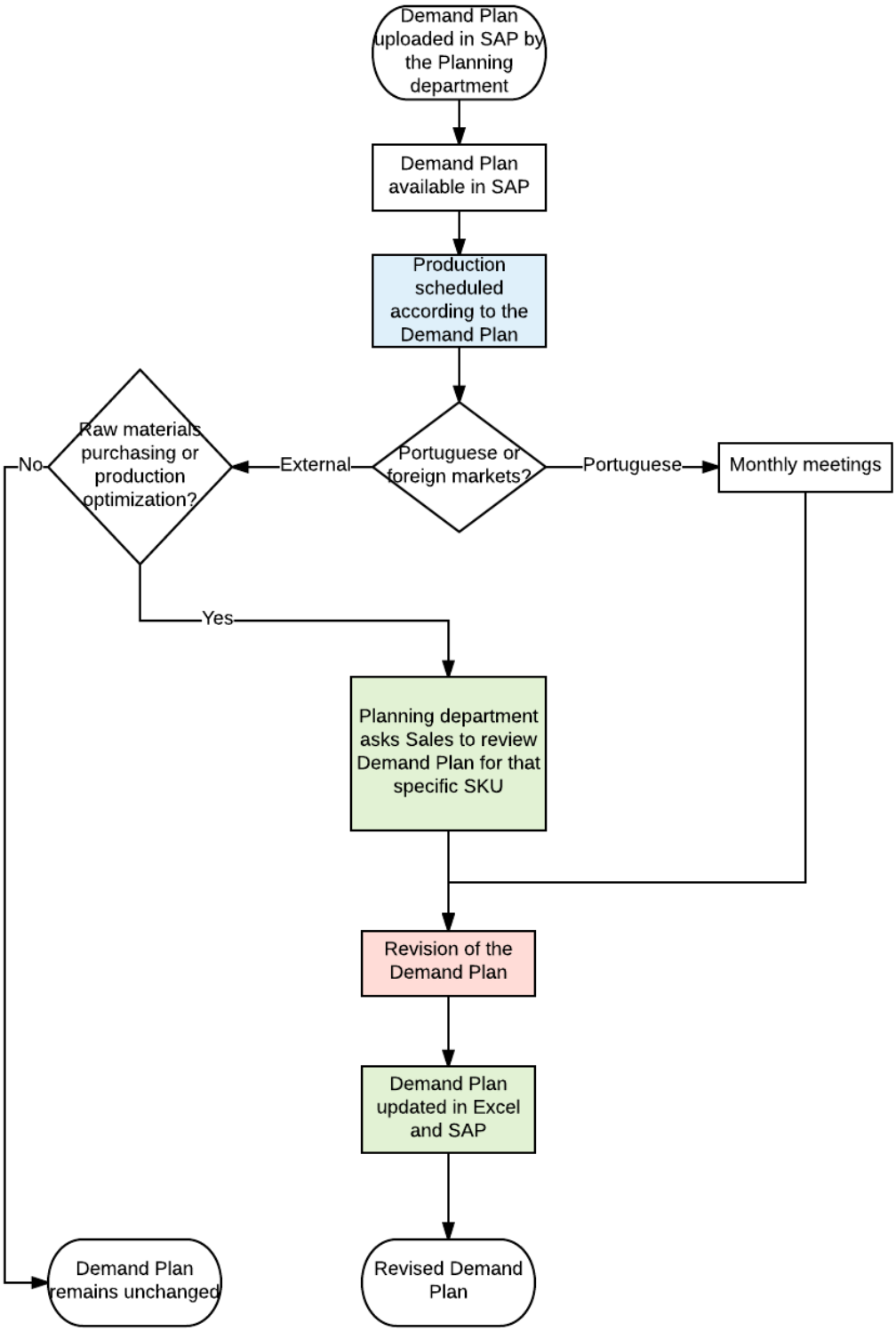

Figure 20: Sograpе's current planning process flow

4.1.4. KPI for monitoring Sograpе's planning process

Supply chain management is a key strategic issue in today's global, ever-changing and competitive world. This reality also applies to wine industry companies, and thus to Sograpе, which makes it critical for these companies to have a continuous improvement approach to the supply chain management, not only to assure competitiveness but also profitability. To be able to properly do it, it is mandatory to measure the performance through unambiguous key performance indicators.

According to the literature, the establishment of KPI must be one of the first steps of the S&OP process, since they help determine how success will be measured, ensuring that the business will be driven by data and facts, not opinions and guesswork (Hirneise, 2009). It is advocated by scholars, as described in chapter 3.3.5, that performance management is key for the successful implementation and operationalization of the S&OP and that these must be monitored in every cycle and include operational and process specific KPI.

Regarding operational KPI, Sograpе already has several KPI monitored in a diary, weekly or monthly basis, that are presented and discussed within the respective department (Table 6).

Table 6: KPIs currently monitored in Sograpе (Planning and Customer Service departments)

KPI	Department	Frequency
Raw materials coverage (days)	Planning	Monthly
Perfect orders[1]	Planning	Monthly
Garrafeira and finished-good coverage (days)	Planning	Monthly
Service level (%)	Customer Service	Monthly
Expected lead time *vs* real lead time (days)	Customer Service	Monthly
Urgent orders (orders)	Customer Service	Monthly
Modifications to orders (numbers)	Customer Service	Monthly

[1] Perfect orders are defined as the percentage of orders delivered to the right place, with the right product, at the right time, in the right condition and in the right quantity.

4.2. Sales and Operations Planning goals in Sogrape

The implementation of the S&OP process in Sogrape is a project that has been planned for some years ago. The utilization of this tool has several goals, both at a tactical and strategic level, as discussed in chapter 3.2. The implementation of the Sales and Operations Planning in Sogrape would have the following main goals:

4.2.1. Tactical level

- Balance between demand and supply to guarantee production capacity and material availability in order to satisfy the commercial requests;
- Cross-Functional alignment between S&OP departments – Marketing, Sales, Manufacturing and Planning;
- Achievement of a more stable, and on target, customer response lead time;
- Become more proactive, taking capacity decisions based on the production plan
- instead of based on real orders;
- Inventory levels reduction regarding finished goods, semi-finished goods and raw materials;
- Cost reduction in purchasing raw materials, as it would be possible to purchase larger quantities of materials, based in accurate and updated demand forecasts;
- Waste and cost reduction in the Manufacturing sector, with regard to time and wine, since this tool would provide to the Manufacturing department an overview of the long-term needs, making it possible to adopt a make-to-stock strategy based on the agreed demand plan, reducing setup times and wine waste in the change between products, and it would also optimize the productive resources.

4.2.2. Strategic level

- Profit optimization;
- Better perception of strategic decisions that need to be taken; for example, the S&OP process would allow the evaluation of the current productive capacity in satisfying demand or whether it is necessary to consider the expansion of the productive capacity.

All the companies in which the S&OP process is being carried out, are recommended to implement a formal goal and, taking Sogrape's context and all the objectives described

above into consideration, the company is recommended to implement a goal in line with the following suggestion:

Sograpе's S&OP process aims at balancing demand with supply chain capabilities in order to decide upon one final consensus plan that optimizes Sograpе's overall business goals and strategies to drive capacity management and provide directions for operations and commercials.

It is important to mention that this process would not cause any changes in the way that demand and supply plans are developed. It means that the Marketing and Sales departments would continue to create their demand plans in the same way they do it currently, i.e. asking the clients for demand forecasts and based on the sales history. However, S&OP meetings would contribute to a greater sharing between departments, as in these meetings there would be communicated all known marketing initiatives that could impact future demand. Concerning Manufacturing planning, S&OP would also not introduce changes and Production planning would continue to be done within a two-week horizon (i.e., week n+2). However, with the S&OP process, this planning process would be done based on an accurate demand plan, so that the supply can be almost perfectly aligned with the demand. In the Manufacturing department point of view, S&OP would also allow the analysis of the best alternative according to the business plan regarding profitability, revenue and customer service and the establishment of valid supply plans for each scenario, that includes the volumes to be produced and delivered for each period during the planning horizon.

4.3. Sales and Operations Planning parameters in Sograpе

4.3.1. Attendees

The departments whose inputs would be advantageous to the S&OP process in Sograpе are Marketing (Brand Managers), Sales (Area Managers), Manufacturing and Planning departments. However, in the third step of Sograpе's S&OP process, the attendance of financial representatives to evaluate the impact of the final plan on overall business goals would be particularly relevant, as discussed in chapter 3.3.3. All these sectors representatives' must be empowered to make decisions during the meetings. Furthermore, according to a survey conducted by Ventana Research (2006), the sponsorship of Chief Executive Officer or Chief Financial Officer help companies achieve the most performance gains. In Sograpе's case, it is considered that the attendance of the top-managers of the two

main areas involved (Sales/Marketing and Manufacturing/Planning), i.e., Chief Marketing Officer and Chief Operating Officer, would bring benefits to the process.

Regarding which representatives of each department should attend S&OP meetings, the recommendation is the following:

- Marketing: managers of the priority brands (Mateus, Gazela, Sandeman and Casa Ferreirinha);
- Sales: managers of the priority markets (Portugal, Spain, United States of America and United Kingdom);
- Manufacturing: table wines' manufacturing manager, Port wines' manufacturing manager, manufacturing manager and manufacturing director;
- Planning: raw materials manager, planning manager and planning director.

Since Sogrape would be initiating its S&OP process, it would not be opportune to already involve suppliers and customers in the meetings. Although their contribution is highly appreciated and beneficial as previously mentioned, internal alignment would be the priority. Nonetheless, when Sogrape reaches a stage where internal alignment had already been achieved and the attendance of external parties would be advantageous to the process, the 10% of suppliers to whom Sogrape buys about 80% of the raw materials (as referred in chapter 2.1.6), should also be invited to participate in the process.

4.3.2. Meeting frequency

The most appropriate meeting frequency would be monthly, as these periodic meetings would contribute to a more consistent implementation of the process as well as to foster trust among the team. Thus, it would be a monthly-based planning process with the plans being updated every month. In a more advanced stage, changing the meeting frequency to event-driven meetings that allow a better reaction to situations that arise should be considered.

4.3.3. Planning horizon

The planning horizon should encompass the following rolling twelve months. This timespan would be sufficient for Sogrape to adapt the capacity in production to eventual changes in demand and to plan resources and support the annual business planning process. Although the plan for the following twelve months should be prepared and aligned, the focus of the S&OP meetings should be on the following three months' plan. Three months should be the

period in which the demand forecasts are more certain, given the high probability of changes on the later months of the plan.

4.3.4. Planning level

As previously referred, Sogrape has a wide range of products and is constantly introducing new products, new pack sizes, new variants and brand extensions, at a superior rhythm than it is discontinuing other products, resulting in a steadily growing portfolio. Therefore, the planning detail level must be low and, although it can be done at the product brand level, it would not be the ideal situation for Sogrape as some brands comprise premium products that cannot be managed together and with such low detail. For example, within the Casa Ferreirinha product family, the product CF Barca Velha Tinto, which is a premium product, cannot be planned in the same way as the CF Papa Figos, which is an ordinary SKU.

To develop the demand plan, the appropriate situation for Sogrape would be to group the SKU by market, so that the Area Managers indicate the SKU and respective quantities for each client in the market they manage (Figure 21).

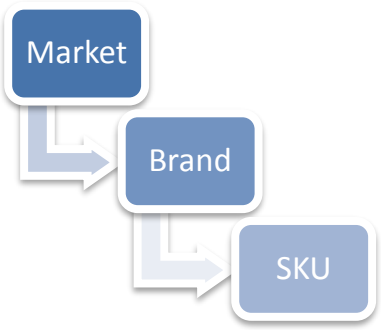

Figure 21: Planning level for demand-side departments

However, Manufacturing and Planning department use the SKU unit to estimate and purchase raw materials and to schedule production. Hence, from the point of view of these departments, the visibility of the demand plan by market would not have great advantages, whilst the visibility per SKU would be the most appropriate (Figure 22).

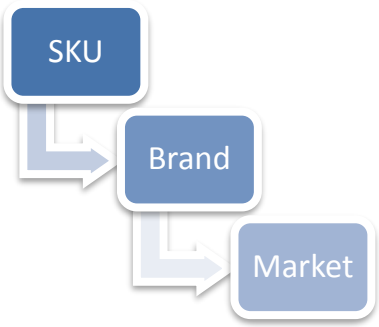

Figure 22: Planning level for supply-side departments

Thus, the software used by the company for the S&OP process should have the ability to present the plans according to the criteria chosen by the user. To create the supply plan, the suitable situation for the Manufacturing department would be the aggregation, by the software, of the products with similar production and material resources needed for their production, since it would allow an overview of the quantity of the materials and also of the production capacity.

4.3.5. Planning units

According to the recommendations in the literature, a company should establish a common unit in order to create standard measures across the supply chain to be used by the models (Ávila & Cavaco, 2008; Feng et al., 2008).

In Sogrape, a common measure is not set but there are two units that are the most used by the company. Marketing and Sales departments use nine liters cases as a measure since they work with sales volumes and, using this measure, they are allowed to calculate sales volumes. If they used physical cases as a unit and wanted to calculate sales volumes, they would have to convert all the SKU quantities to nine-liters cases, as they could not add physical cases with different capacities (for example, adding six-bottles cases with twelve-bottles cases would be inconsistent). Furthermore, nine-liters cases is a universal measure in the wine industry, that corresponds to a twelve-bottles cases with 750 milliliters each, so, when communicating with clients, a universal/standard measure is used. Planning and Manufacturing areas work with the physical unit since for the Planning department, for example, nine-liters case as measure would not be useful to calculate raw materials needs. This department must use physical case as unit, six-bottles case with 750 milliliters each as an example, so that they can estimate the raw materials' quantity needed and their

characteristics (the back-label characteristics depend on the bottle's capacity, for instance). Sograpе's Production lines also work with physical cases as a unit and not liters, so the production is also planned in physical cases.

Hence, the utilization of these two units makes sense within each department and it would not be fair to force departments to use other units that would not be suitable for their work scope. Even though it is recommended the utilization of the same unit by all the collaborators, in the context of this company the ideal would be that the software used converted all plans in the unit chosen by the user.

4.3.6. Information systems utilization

Regarding information systems utilization, in this thesis it is shared Lapide's (2004b) opinion, since it is considered that the S&OP process requires a higher level of automation and computational sophistication manual processes merely supported by spreadsheets. The author further states that, without technology, S&OP unable to support the scale needed to achieve all its benefits. Hence, a software would be the best tool to implement and develop Sograpе's S&OP process, as it would allow the gathering of data from all the departments into one central resource for a unified view, eliminating the existence of distinct and non-compatible files between departments, saving time and achieving clarity. Moreover, most of S&OP software solutions available in the Portuguese market have the following features:

- ✓ Match between demand and supply to achieve a profitable operational plan;
- ✓ Reports on key performance indicators that the company needs to address;
- ✓ Run what-if scenarios to quantify their impact on production, inventory, and backlog, such as:
  - What would be the impact if a plant was closed or a new sales territory was added;
  - What would be the effect of an economic downturn;
  - What would be the impact of a revenue growth by 20%.
- ✓ If the company is facing a demand growth, the software identifies where it will likely face capacity constraints, when and where it will need to add capacity and how to optimize for that over time;
- ✓ Design alternatives and explore the service, performance, costs and risks associated with change and then anticipate plans to prepare for it;

- ✓ Year-end projections being continuously updated to help the company focus on fiscal year performance;
- ✓ Incorporation of attributes such as production facilities, individual lines, capacities, distribution facilities, suppliers, retailers, demand volumes and frequency, sourcing and inventory policies, and transportation modes, among other components.

Some of S&OP software firms with solutions available in Portugal are presented in Table 7.

Table 7: S&OP software available in Portugal

Software	Demo available?
Logility - Sales and Operations Planning	No
Demand Solutions - Sales & Operations Planning	Yes
Llamasoft - Supply Chain Guru	Yes
AIMMS - S&OP Navigator	Yes
LTP – Supply Chain Planning	Yes
SAP - Sales and Operations Planning	Yes

Although there are multiple alternatives in the software market, the one presented in higher detail below is the SAP – Sales and Operations Planning software, since this tool would be the most suitable for Sogrape. The reason for this choice is because most departments of the company uses the SAP software and it is through this software that all the company's activity is managed. SAP's current version in Sogrape is v7.0, however, given the natural evolution of the software, it is expected that the company will move to SAP HANA.

SAP HANA is a software that can be deployed on-premise or in the cloud and has available the S&OP module, which makes it the most appropriate software to Sogrape's S&OP. The S&OP process would therefore be completely interconnected with Sogrape's software and would automatically obtain all the data needed, eliminating the need of introducing it manually. Furthermore, this software enables secure and automated data integration with SAP systems and, since SAP is always up-to-date, the process would always be updated automatically. This software receives information from the Data Services, such as ERP, Excel and BW, and generates Excel-based Planning Views, illustrated in Appendix A, and it also generates Analytics, Social Collaboration and Administration data that is accessible through web and mobile (Figure 23).

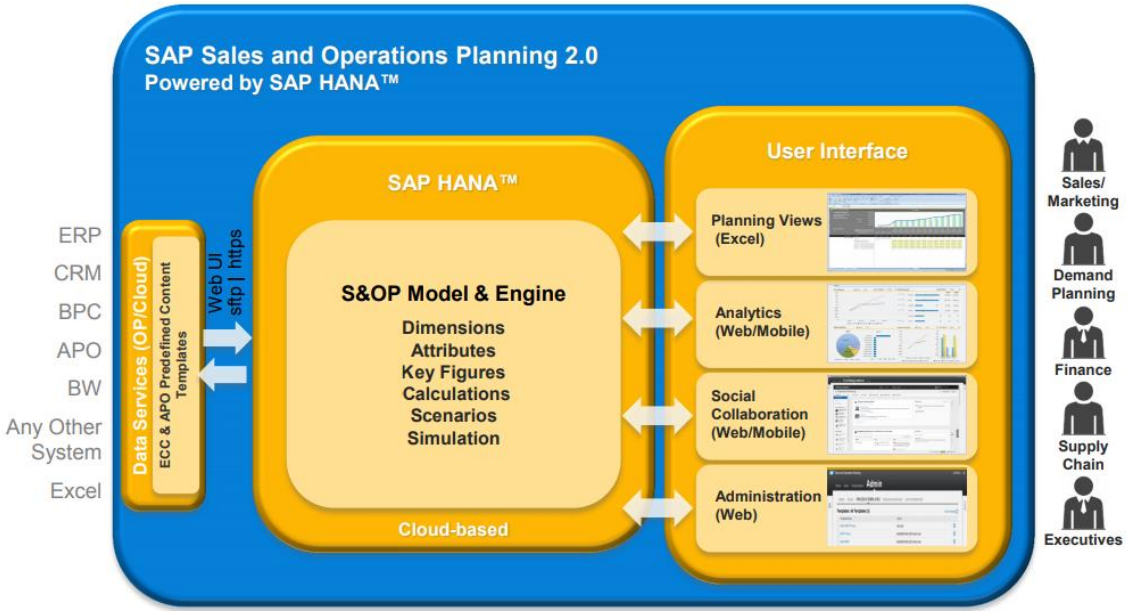

Figure 23: SAP Sales and Operations Planning integration with SAP HANA Markin et al. (2013)

This tool has the following features:

- Planning and real-time analysis with a unified model of demand, supply chain and financial data;
- Instant and interactive simulation and scenario/what-if analysis, using the S&OP data model to support demand-supply balancing decisions;
- Embedded, context-aware social collaboration that enables rapid planning and decision-making across the organization.

The tool's homepage displays in which step of the S&OP process the company is at and also a dashboard presenting the most relevant data about the company's activity (please refer to Appendix B).

All the information about SAP Sales and Operations Planning software was collected from a SAP's workshop regarding the S&OP software developed by Markin et al. (2013).

4.4. Sograpе's Sales and Operations Planning process maturity

As referred in chapter 4.1, the current chapter aims at assessing Sograpе's planning process maturity after S&OP's implementation, and after describing S&OP's goals and parameters at the company. Following the same reasoning as chapter 4.1, Sograpе's planning process after S&OP's implementation was also characterized according to Lapide's (2005) maturity model, concerning its three dimensions: meetings, plans alignment and technologies used.

Furthermore, examples of KPI to measure S&OP's process performance in Sograpе are also presented.

4.4.1. Meetings

Through the implementation of S&OP's process in Sograpе, meetings would be routinely held (monthly) and attended by cross-departmental participants (Marketing, Sales, Manufacturing and Planning departments) to align supply and demand plans. Given that during the meetings, neither plans are fixed, and both are open for discussion and adjustments, Sograpе's top management should also attend the meetings in order to decide to constrain demand or add capacity to fulfill demand.

Concerning external participation, in a more advanced process that could be later achieved by Sograpе, information from some customers about their future demand needs and from critical-component suppliers about scarce materials should also be brought into the S&OP process.

The presented characterization of the Meeting dimension corresponds to a Stage 3.

4.4.2. Plans alignment

The software suggested in chapter 4.3.6 would allow the complete integration of demand and supply plans through a real-time unified model of demand, supply chain and demand.

Since the tool integrates and synchronizes both demand and supply plans, it would immediately reflect in the overall supply-demand scenario any change in either the demand or the supply plans. Hence it would also support the meetings, allowing users to instantaneously evaluate any modifications in supply or demand plans, by quickly see the implications of any changes. However, the plans aligned would only be the internal ones, since that, as described in chapter 4.3.1, external collaboration into the S&OP process would not be recommended at an initial stage.

Given that demand supply plans would be aligned internally but not externally, Sograpе would be considered being a Stage 3 on the scale in the Plans alignment dimension.

4.4.3. Technologies used

As suggested in chapter 4.3.6, SAP – Sales and Operations Planning would be the most suitable software for Sograpе's S&OP process. This software can be used to perform instant and interactive simulation and scenario/what-if analysis, using the S&OP data model to support demand-supply balancing decisions.

Moreover, SAP's S&OP software also generates dashboards to display various metrics that compare the planned supply with the unconstrained demand plan. Furthermore, the dashboard functionality also displays KPI that measure and control the effectiveness of the plans and of the S&OP process itself.

Using this software, internal integration would be totally fulfilled. However, in order to achieve a Stage 4 regarding the Technologies used dimension, external software should be integrated to internal demand-supply software. As described in chapter 4.3.1, this collaboration with external parties would not be appropriate for Sograpе's initial S&OP process, resulting in a Stage 3 level on the scale in the Technologies used dimension.

After implementing the S&OP process in Sograpе, the Meetings, Plans alignment and Technologies used dimensions would assume a higher position on the scale of Lapide's (2005) maturity model (Table 8), demonstrating great improvements in Sograpе's planning process. A flow chart illustrating the flow of the company's planning process using S&OP was also created (Figure 24). In blue are the tasks which the Manufacturing department is responsible for and in red are the tasks which the Sales department is responsible for.

Table 8: Sograpе's planning process maturity after S&OP's implementation

Parameter	Characteristics	Stage
Meetings	- Routinely held meetings; - 100% attendance and participation; - Executive support; - Operational and S&OP's KPI tracking.	Stage 3
Plans alignment	- Internal supply and demand plans jointly aligned through S&OP software.	Stage 3
Technologies used	- Advanced S&OP dashboard; - Demand and supply planning applications integrated in one software.	Stage 3

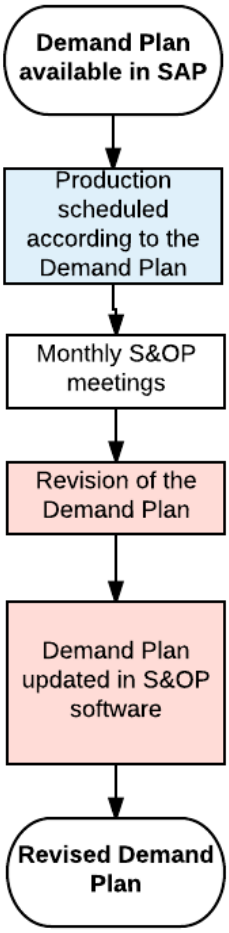

Figure 24: Sograpе's planning process flow after S&OP's implementation

According to this maturity model, Sograpе's S&OP process would be classified as a solid Stage 3 – Classic Process level. The author recommends companies with a Stage 3 S&OP process to increase the frequency of S&OP meetings and to increase the number of collaborative relationships with suppliers and customers (Lapide, 2005). The last maturity stage of Lapide's (2005) maturity model is Stage 4 – Ideal Process. However, the author emphasizes that this stage is practically unachievable, hence it becomes the ideal to which companies strive to achieve as well as it is the benchmark for guiding the continual improvement of the process (Lapide, 2005). Sograpе's S&OP process being a Stage 3 process would thus be a great achievement and it would be expected to bring great value to the company's planning process and general activity.

4.4.4. KPI for monitoring Sales and Operations Planning in Sograpе

Regarding operational KPI, Sograpе already tracks several, as presented in chapter 4.1.4. However, those KPI could also be discussed in S&OP meetings, since they are also useful

for evaluating S&OP's process impacts on the supply chain. Concerning S&OP process specific KPI, these must be measured on every S&OP cycle to enhance the continuous improvement aspect of the process and the ones proposed to Sograpе's S&OP process are presented in Table 9.

Table 9: Suggested KPIs for Sograpе's S&OP process

KPI	Formula	Description
Planning cycle time	Regularity of the S&OP process	Tracks the regularity of the S&OP process and it should match what has been defined as standard periodicity.
Yearly forecast variability (total sales and per SKU) (%)	$Coef.var. = \frac{std.deviation\ of\ monthly\ sales}{average\ monthly\ sales}$	Indicates how volatile the demand for each SKU (and for the total sales) is, on an annual basis.
Annual forecast bias (%)	$1 - \frac{cumulative\ forecasted\ sales}{cumulative\ actual\ sales}$	Tracks the deviation between cumulative forecasts and cumulative actual sales.
Monthly adherence to the supply plan (%)	$\frac{actual\ production}{planned\ production}$	Measures the fulfillment, in percentage, of the agreed supply plan.
Monthly adherence to demand plan (%)	$\frac{actual\ sales}{forecasted\ sales}$	Measures the fulfillment, in percentage, of the agreed demand plan.
Monthly forecast error (%)	$\frac{\lvert actual\ sales - forecasted\ sales \rvert}{actual\ sales} * 100$	Measures the error, in percentage, of the forecasts compared with the actual sales.

Although the suggested KPI must be analyzed and presented by their responsible, the software used for the S&OP process should also be able to calculate them. Targets must be settled for each key performance indicator and each range of their values must correspond to a performance level, so that the efficiency level can be perceived very easily and, therefore, how much is to be improved.

4.5. Expected outcomes of the Sales and Operations Planning in Sogrape

The values presented in this chapter are fictional due to their confidentiality. Nevertheless, as they are proportional to the real numbers, the obtained results are valid for the true situation of the company.

Since some of the main objectives of S&OP implementation in Sogrape, described in chapter 3.8, are related with the reduction of costs in the Manufacturing sector and with inventory levels reduction, there were analyzed the potential savings resulting from the S&OP process in regard to these two main goals.

For each analysis two scenarios were created:

- Scenario 1 – a more optimistic scenario, resulting from a high level of confidence in demand forecasts accuracy; it allows greater aggressiveness regarding levels of attainment.

- Scenario 2 – a more conservative scenario, which is based on a larger forecast error; in this scenario, the definition of the targets and of the levels of attainment was more conservative.

4.5.1. Reduction of costs in the Manufacturing sector

As referred to in chapter 4.2, S&OP would provide an overview of the long-term needs to the Manufacturing department, making it possible to adopt a make-to-stock strategy based on the agreed demand plan, reducing setup times and wine waste in the change between products, and it would also optimize the productive resources.

Since that, in Sogrape, there is currently no demand plan that can be considered reliable to use in the development of the production plan, products are in most cases in *garrafeira*, only comprised of wine, bottle and stopper, in order to be available to any market, and after receiving a client order, they are assembled to finished goods. This *modus operandi* causes higher costs and a greater loss of time because it is faster and cheaper to directly produce finished goods, than it is to bottle the wine to be in *garrafeira* and later have to assemble it, involving more labor.

The development of a reliable long-term demand plan, promoted by the S&OP process, which, according to the academia, enhances the accuracy of forecasts in the order of 20% to 50% (Hinkel et al., 2016), allows the maximization of direct productions in which the product is automatically bottled, labelled and packed into finished-good, ready to go out to the market.

To analyze the outcomes of the maximization of direct productions in Sogrape, the following topics were taken into account:

- Two production centers (table wine and Port wine) and *garrafeira* products that could be directly produced;
- Constant annual bottling volume (it was considered the bottling volume from 2016), in the 5 years of analysis;
- Savings' estimation results from the difference in costs between direct productions and indirect productions (bottling for garrafeira + later assembling).

Two scenarios have been created for the analysis of savings:

- Scenario 1: considers that is possible to directly produce 80% of the annual bottling volume. This target is achieved after five years with the following annual evolution:

Table 10: Reduction of costs in the Manufacturing sector - scenario 1

	Year 1	Year 2	Year 3	Year 4	Year 5
% direct production	50%	60%	70%	75%	80%

- Scenario 2: considers that is possible to directly produce 70% of the annual bottling volume. This target is achieved after five years with the following annual evolution:

Table 11: Reduction of costs in the Manufacturing sector - scenario 2

	Year 1	Year 2	Year 3	Year 4	Year 5
% direct production	45%	55%	60%	65%	70%

4.5.1.1. Data collecting and processing

Firstly, through SAP, 2016's bottling volume was consulted and which products' productions followed the direct and indirect approach. Of the productions that were not totally direct, there were selected those that could follow the direct method (excluding small volumes, 1.500 milliliters products which cannot be directly produced, and the most premium products in each product family). From this analysis, it was verified that about 87% of the total volume could be directly produced. However, in 2016, the percentage of direct production was only around 44% (Table 12).

Table 12: 2016 bottling volume

	2016 bottling volume (in bottles)
Bottling for *garrafeira*	4.639.779
Direct production	3.600.585
Total production	8.240.364
% direct production	44%

Afterwards, also using SAP, the costs of indirect production (bottling for *garrafeira* + later assembling) *vs.*direct production for the same product were consulted, which was considered the reference value. As shown in Table 13, the cost of the indirect method is 115,13 €/1.000 cases, while the cost of the direct method is 52,42 €/1.000 cases, resulting in a difference of about 62,72 €/1.000 cases (0.0105 €/bottle) between the two methods.

Table 13: Costs of different production methods

Product	**Production method**	**Valor (€/1.000 caixas)**
Esteva 2016 6x750 ml	Bottling for *garrafeira*	52,56 €
	Assembling	62,57 €
	Total indirect production	**115,13 €**
	Direct production	52,42 €
	Total direct production	**52,42 €**
	IP *vs.* DP cost	**62,72 €**

4.5.1.2. Results

- Scenario 1

The outcomes of the first scenario, considering a saving per bottle of 0,0105 €, are presented in Table 14 and illustrated in Figure 25.

Table 14: Reduction of costs in the Manufacturing sector - scenario 1 results

Scenario 1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Direct production (%)	44%	50%	60%	70%	75%	80%
Savings (€)	-	7.241 €	18.726 €	20.210 €	35.952 €	41.695 €

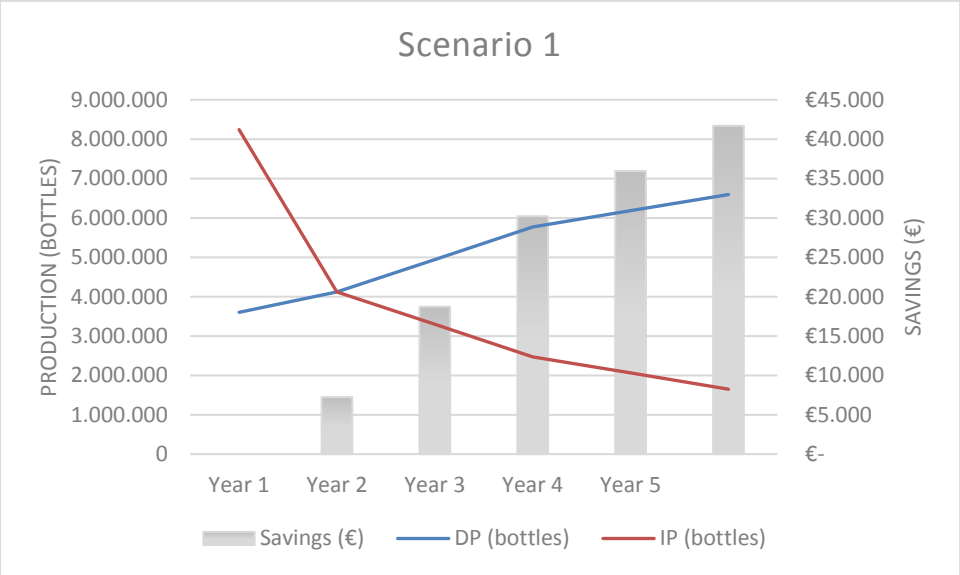

Figure 25: Reduction of costs in the Manufacturing sector - scenario 1 results

- Scenario 2

The outcomes of the second scenario, considering a saving per bottle of 0,0105 €, are presented in Table 15 and illustrated in Figure 26.

Table 15: Reduction of costs in the Manufacturing sector - scenario 2 results

Scenario 2	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Direct production (%)	44%	45%	55%	60%	65%	70%
Savings (€)	-	1.499 €	12.984 €	18.726 €	24.468 €	30.210 €

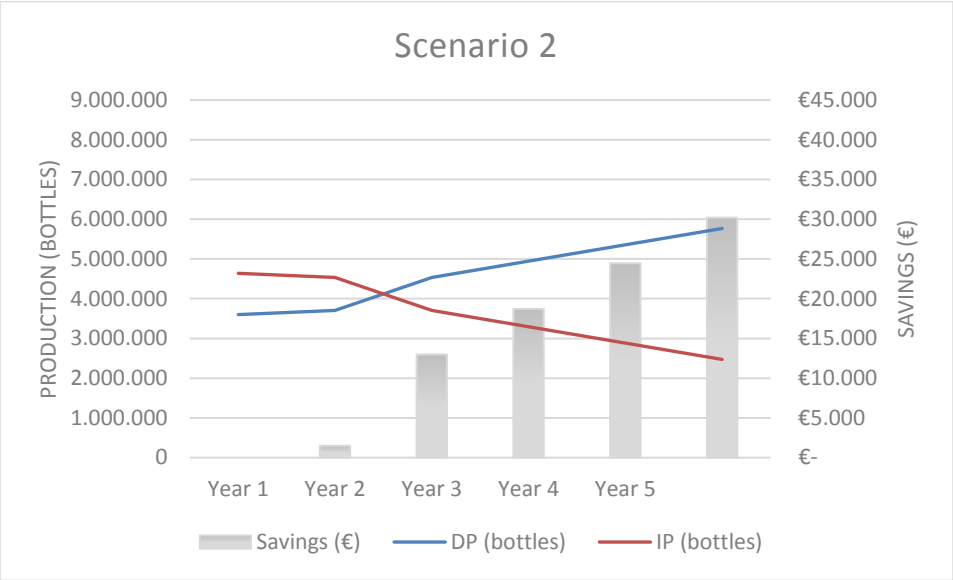

Figure 26: Reduction of costs in the Manufacturing sector - scenario 2 results

4.5.2. Reduction of finished goods, *garrafeira* and raw materials' inventory levels

According to the academia, companies that have effectively implemented the S&OP process have faced reductions in inventory levels on the order of 10% to 30% (chapter 3.8). In this analysis, for the two scenarios presented below, the targets defined were:

- Scenario 1: considers that is possible to reduce inventory levels of around 20%;
- Scenario 2: considers that is possible to reduce inventory levels of around 10%.

For both scenarios and for both stocks (of product and raw materials), the achievement of these targets would have the following annual evolution, for a period of attainment of five years:

Table 16: Reduction of finished goods, garrafeira and raw materials' inventory levels - annual evolution

	Year 1	Year 2	Year 3	Year 4	Year 5
Annual evolution (%)	10%	25%	55%	70%	100%

4.5.2.1. Finished goods and *garrafeira* stock

4.5.2.1.1. Data collecting and processing

In order to study the impact of S&OP in finished goods and *garrafeira* stock, SAP was used to obtain the average stock value in 2016 of *garrafeira* and finished goods (Table 17).

Table 17: Product average stock value in 2016

Type of product	Average stock value (€)
Garrafeira	4.096.478 €
Finished goods	6.240.857 €
Total	**10.337.336 €**

As indicated in Table 17, the average stock value in 2016 was 10.337.336 €. However, about 65% of this value corresponds to the cost of wine, which should not be considered. Thus, the stock value that must be considered is 35% of that value, i.e., 3.618.067 €.

4.5.2.1.2. Results

- Scenario 1

The results of the first scenario, considering a target value of 723.613 € (Table 18), which corresponds to a decrease in the order of 20% of the average stock value (3.618.067 €), were presented in Table 19.

Table 18: Finished goods and garrafeira stock - scenario 1 target value

	Target value (%)	Target value (€)
Scenario 1	20%	723.613 €

Table 19: Finished goods and garrafeira stock – scenario 1 results

Scenario 1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Annual evolution (%)	-	10%	25%	55%	70%	100%
Product stock (€)	3.618.067 €	3.545.706 €	3.437.165 €	3.220.080 €	3.111.538 €	2.894.454 €
Savings (€)	-	72.362 €	180.904 €	397.988 €	506.530 €	723.614 €

- Scenario 2

The results of the second scenario, considering a target value of 361.807 € (Table 20), which corresponds to a decrease in the order of 10% of the average stock value (3.618.067 €), were presented in Table 21**Erro! A origem da referência não foi encontrada.**.

Table 20: Finished goods and garrafeira stock - scenario 2 target value

	Target value (%)	Target value (€)
Scenario 2	10%	361.807 €

Table 21: Finished goods and garrafeira stock - scenario 2 results

Scenario 2	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Annual evolution (%)	-	10%	25%	55%	70%	100%
Product stock (€)	4.824.090 €	4.775.849 €	4.703.488 €	4.558.765 €	4.486.404 €	4.341.681 €
Savings (€)	-	48.241 €	120.602 €	265.325 €	337.686 €	482.409 €

4.5.2.2. Raw materials stock

4.5.2.2.1. Data collecting and processing

The raw materials stock of the two production centers was obtained from the raw materials coverage KPI, updated at the end of 2016's last month (Table 22).

Table 22: Raw materials average stock value in 2016

Type of raw material	Average stock value (€)
Capsules	129.101 €
Back lables	137.243 €
Packing	318.181 €
Stickers	27.027 €
Extra-packing	42.177 €
Bottles	286.057 €
Collars	11.669 €
Stoppers	278.964 €
Labels	111.605 €
Stamps	37.776 €
Total	**1.379.803 €**

4.5.2.2.2. Results

- Scenario 1

The results of the second scenario, considering a target value of 275.961 € (Table 23), which corresponds to a decrease in the order of 20% of the average stock value (1.379.803 €), were presented in Table 24.

Table 23: Raw materials stock - scenario 1 target value

	Target value (%)	Target value (€)
Scenario 1	20%	275.961 €

Table 24: Raw materials stock - scenario 1 results

Scenario 1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Annual evolution (%)	-	10%	25%	55%	70%	100%
Raw materials stock (€)	1.379.803 €	1.352.207 €	1.310.813 €	1.228.025 €	1.186.631 €	1.103.843 €
Savings (€)	-	27.596 €	68.990 €	151.778 €	193.172 €	275.960 €

- Scenario 2

The results of the second scenario, considering a target value of 137.980 € (Table 25), which corresponds to a decrease in the order of 10% of the average stock value (1.379.803 €), were presented in Table 26.

Table 25: Raw materials stock - scenario 2 target value

	Target value (%)	Target value (€)
Scenario 2	10%	137.980 €

Table 26: Raw materials stock - scenario 2 results

Scenario 2	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Annual evolution (%)	-	10%	25%	55%	70%	100%
Raw materials stock (€)	1.379.803 €	1.366.005 €	1.345.308 €	1.309.914 €	1.283.216 €	1.241.822 €
Savings (€)	-	13.798 €	34.495 €	75.890 €	96.587 €	137.981 €

4.5.2.3. Total stock

By adding up the possible savings to be achieved by reducing stock levels, both of product and of raw materials, it is possible to estimate the total savings, as presented in Table 27 and Figure 27 for the first scenario, and in Table 28 and Figure 28 for the second scenario.

- Scenario 1

Table 27: Total stock - scenario 1 results

Scenario 1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total stock (€)	4.997.870 €	4.897.913 €	4.747.977 €	4.448.105 €	4.289.168 €	3.998.297 €
Savings (€)	-	99.958 €	249.894 €	549.766 €	699.702 €	999.574 €

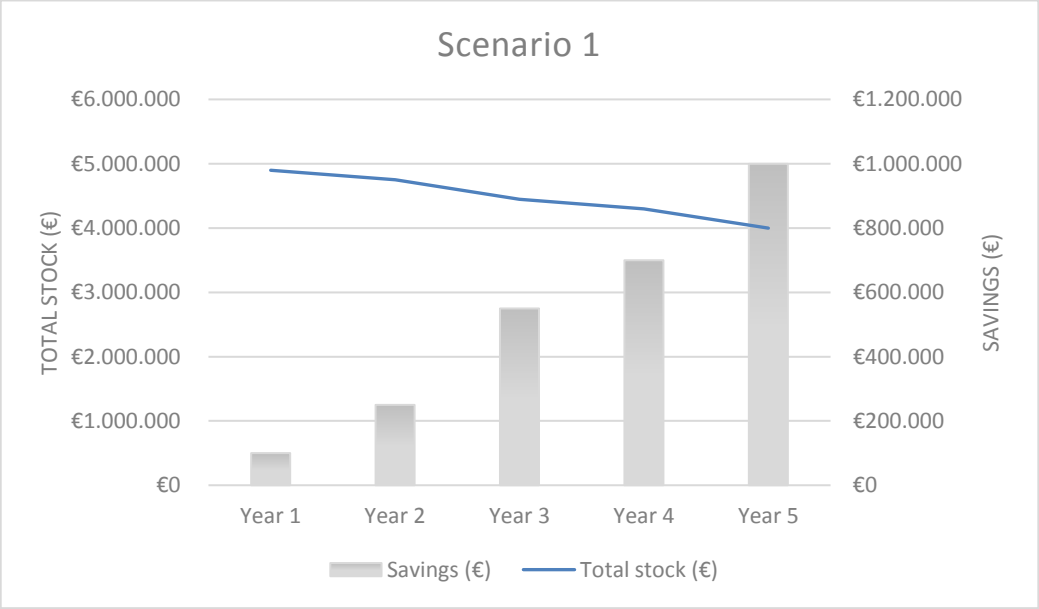

Figure 27: Total stock - scenario 1 results

- Scenario 2

Table 28: Total stock - scenario 2 results

Scenario 2	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Total stock (€)	4.997.870 €	4.947.892 €	4.872.924 €	4.722.988 €	4.648.019 €	4.498.083 €
Savings (€)	-	49.979 €	124.946 €	274.883 €	349.851 €	499.787 €

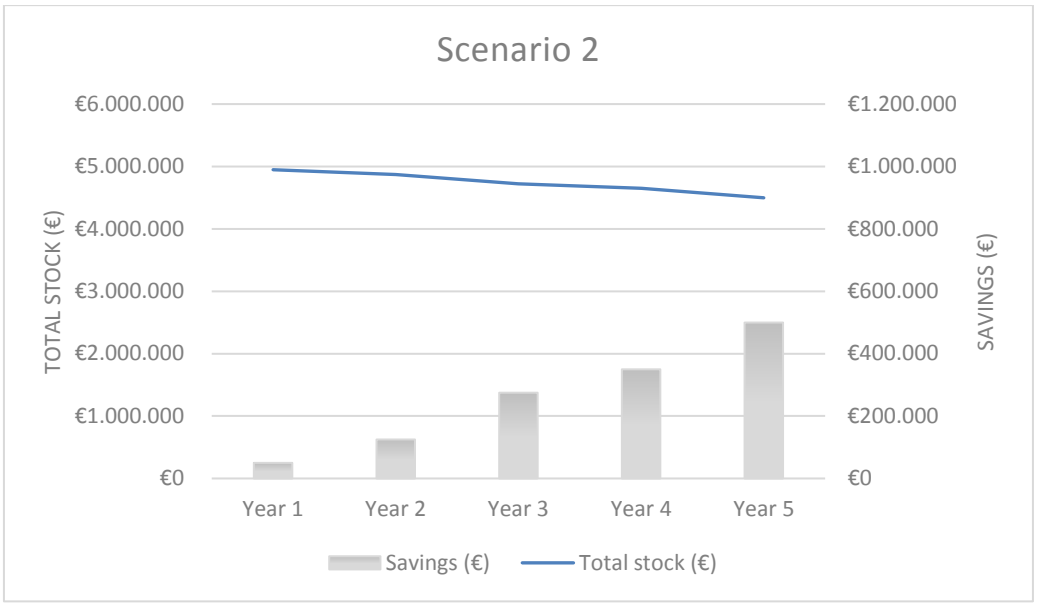

Figure 28: Total stock - scenario 2 results

5. Conclusions

S&OP is commonly agreed upon as an increasingly important planning process as today's complex environment increase the need for determining future actions and collaboration in the creation of sales and operations plans. Furthermore, benefits connected to S&OP range from improved accuracy of forecasts and reduced inventory levels to increased revenue and improvement of the success of new products launches. Consequently, S&OP has been put forward as the area within Supply Chain Management that presents the most exciting possibilities for the future.

Sogrape is a family owned company that operates in a global industry, with more than 70% of the sales resulting from exports. In order to successfully compete on the global marketplace, it is key for Sogrape to see the supply chain as a source of competitive advantage, that must be optimized to achieve higher levels of efficiency and effectiveness and ultimately attain higher profitability.

With this background, the thesis had a purpose of assessing the company's current planning process, creating a model of S&OP's implementation with parameters adequate to the company's context, such as attendees, meeting frequency, planning horizon and information systems utilization and, finally, evaluate the expected outcomes of the implementation of this initiative in the company.

As the results' studies carried out under this thesis's scope could prove, the implementation of this process in Sogrape would provide very significant savings. Considering a more optimistic scenario, it would be possible to achieve savings in the last year of study of about 1.041.269 € and, even considering a more conservative scenario, the savings would continue to be substantial, about 529.997 €.

In addition to the measurable savings, there are soft benefits resulting from the implementation of this project, of a more complex quantification, such as increased visibility and quality of information, faster and better decision making, improved teamwork and improved internal communication and alignment.

The theoretical contribution of this thesis lies foremost within the development of the general S&OP process implementation model, which provides guidelines on steps that are important to consider when implementing an S&OP process. Furthermore, theoretical verifications and proposals have been discussed and suggested, such as the importance of the S&OP goal in S&OP implementation as well as of the utilization of an S&OP software, since the success of the process is heavily dependent upon available supporting tools. As the implementation of the S&OP process in Sogrape is a project that has been planned for some years ago, this thesis may also serve as a starting point for future work. However, since the model of S&OP implementation was created for the company's context, the results from this study are suggested to only be valid in this context and would need further studies to be able to generalize to other settings, which may be considered a delimitation of this thesis.

Concerning future research, the next step would be to schedule the implementation of the process in the company. After the process is implemented, the assessment of the performance of the process and identification of appropriate next improvement steps using S&OP maturity models, as the one presented in this thesis, is an interesting topic of further study. Moreover, future research could use those next improvement steps as a starting point for which improvement projects that should be initiated and in which order. This would create a general S&OP improvement model that could be used for case studies in other companies.

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Appendices

Appendix A. Excel-based Planning Views and Analytics, Social Collaboration and Administration data generated by SAP S&OP software

Figure 29: Excel-based Planning Views and Analytics, Social Collaboration and Administration data generated by SAP S&OP software

Appendix B. SAP S&OP software dashboard

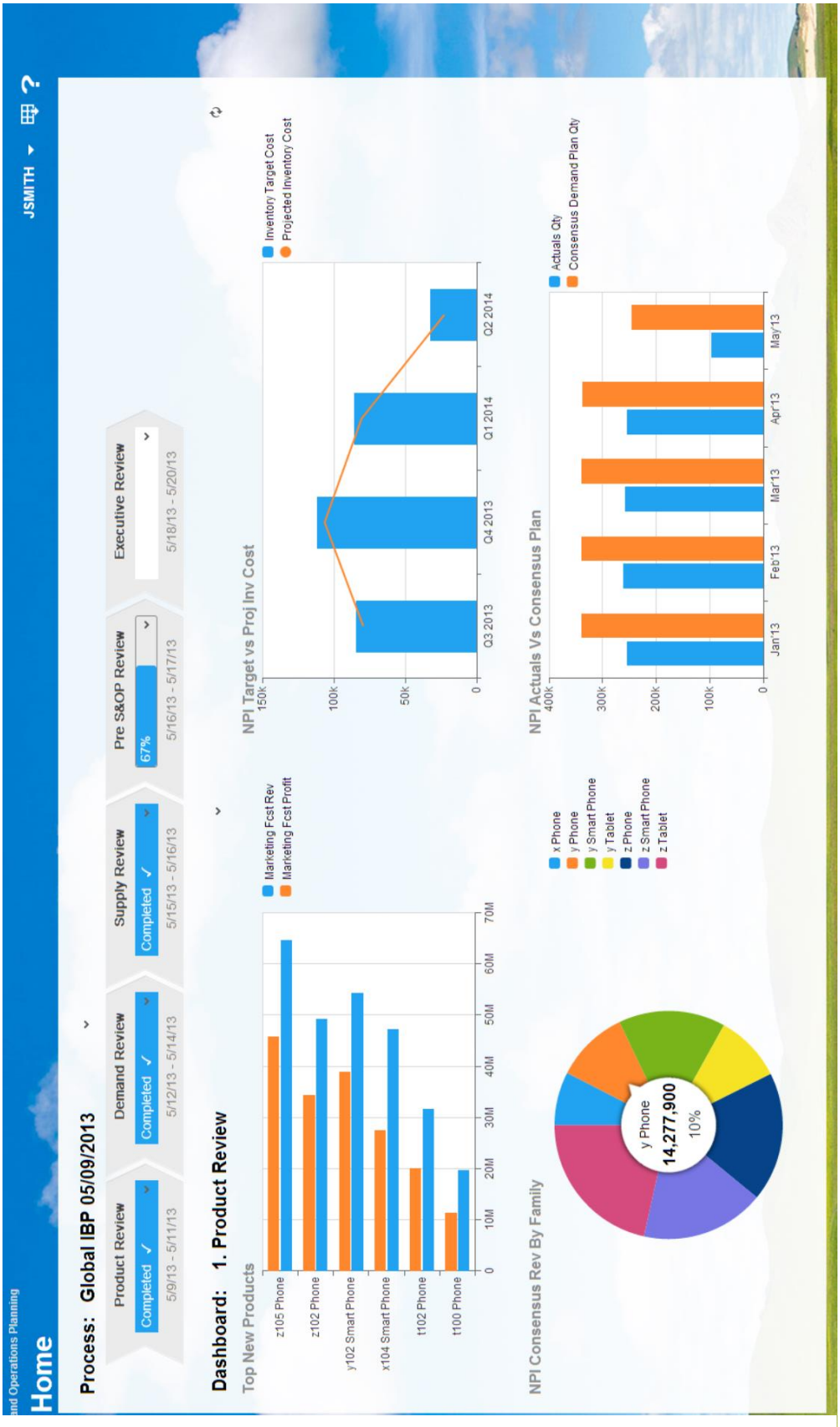

Figure 30: SAP S&OP software dashboard