

Sales & Operations Planning in a Global Business

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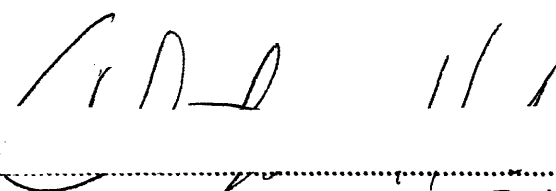
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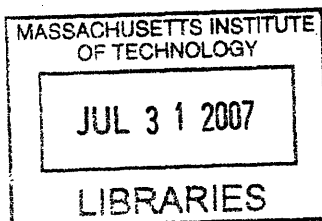
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Abstract

As companies become more global and begin to outsource manufacturing and other services, the uncertainty in the supply resource increases. Demand uncertainties increase as these same companies expand into new countries to serve new customers. The globalization of business has created problems that many companies do not know how to overcome. One way of overcoming these challenges is to implement a process called global sales and operations planning (S&OP).

Sales and operations planning is a collaborative process that aligns the supply side of an organization with the demand side. Aligning the goals of the different departments eliminates the “silo” mentality and creates a streamlined organization. This streamlined organization works as one team with the goal of meeting the financial expectations set by the executive team.

Global sales and operations planning is a process used to match supply and demand throughout the world. To do this effectively, the process must be divided into multiple processes based on the characteristics of the supply chain for the product, the business units within the company, and geography that the business unit is located in. When the S&OP process is divided correctly, it allows the executive members of the company to communicate financial expectations to each of the business units, while the individual business units can match the supply and demand characteristics of the product.

Vascucorp. is a company that is facing the same problems that many other companies face when trying to implement an S&OP process into their company. This thesis will focus on trying to form a common platform that companies can use to implement a successful global sales and operations planning process.

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1 Introduction

1.1 Scope

This study of global sales and operations planning is the result of problems that a medical device manufacturer is facing in its own S&OP process. The problems include multiple products serving many different customers in dozens of countries all over the world. This thesis will focus on what characteristics make a global sales and operations planning process most successful, and how a company like this medical device manufacturer can divide a single S&OP process to make it most effective in a global environment. In addition to dividing a global S&OP process, the thesis aims to find an evaluation process that can be applied uniformly across many different S&OP processes. Finally, the flow of financial information throughout a global S&OP process will be examined.

1.2 Motivation

In “Demand Management: A Cross-Industry Analysis of Supply-Demand Planning”, Tan states that S&OP has gained in importance over the past years due to three trends in the corporate world: increase in demand uncertainties and variations, increase in supply uncertainties and variations, and an increase in the cost of a lost sale and over supply. These trends are even more apparent in a global business. As companies move supply sources to areas with cheaper labor

and customers all over the world come to expect more from companies, global S&OP processes will become very important.

In addition to higher expectations and supply sources that are located throughout the world, a recent law that was passed by the United States Congress has made global S&OP even more important. That law is the Sarbanes-Oxley Act. This law was created to protect investors from companies that mislead the public about the performance of their company. Public companies that are traded on a stock exchange must release expected earnings figures to the public each year. Prior to the Sarbanes-Oxley Act, executives within companies were not punished if the numbers were incorrect. Now they will be. A global sales and operations planning process, if used correctly, can eliminate the possibility of incorrectly reporting numbers that the company cannot achieve.

1.3 Methodology

Sales and operations planning was pioneered in the early 1980's at a small company in Memphis, Nevada called Bently. The process involved the sales department and the operations team, and was meant to help determine a forecast that both could agree on. Since that time, the process has evolved and in the late 1990's, consulting firms began marketing this process. Over the past eight to ten years, very little academic research has been done, but many companies and consultancies have written white papers about the subject.

This research began with a review of previous MIT Supply Chain 2020 theses that review sales and operations planning. Secondly, Vascucorp's S&OP process was profiled and explained in detail. Next, company experts presented their experiences and views on the subject, followed by the views and experiences of management consultants and software consultants.

1.4 Outline

The thesis is organized into five chapters. Chapter Two profiles the S&OP process at a large medical device manufacturer. This is an in-depth case study that is one example of how a global S&OP process can work. Chapters Three and Four profile three different global S&OP processes. Chapter Three focuses on a large consumer product goods company that has been using S&OP for over twenty years, while Chapter Four explains the global S&OP process at a pharmaceutical company and at a large material company. Chapter Five reviews the opinions of the experts in the field. Two consultant's views on Global S&OP are summarized in this chapter as well as the methods for developing and evaluating a Global S&OP process. Finally, Chapter Six provides the summary and recommendations for dividing a global S&OP process.

2 S&OP Case Study at Vascucorp

This research begins by analyzing the sales and operations planning process for a large medical device manufacturer. The large medical manufacturer, which will be referred to as Vascucorp throughout the thesis, has been in the medical device industry for close to fifty years and has been a leader during most of that time. Currently, the company uses an S&OP process to manage the supply and demand for its products. This process is profiled below.

2.1 Organization and Product Background

Vascucorp produces three main types of products. These products are grouped into three families called product one, product two, and product three. Each of these products is explained in detail below.

Product one is the most profitable product produced by Vascucorp. This product line consists of roughly 40 SKUs that are manufactured in a five-step sequential process in eleven separate plants located around the world. The main difficulty in the production planning process that Vascucorp faces is that the drug-coated stents expire if they are not used within a certain time period after the production process is complete.

The second product family that the company produces is made up of approximately 4500 stock keeping units (SKUs). These SKUs are divided into nine product families, and are used for diagnostic (DX) and interventional (IX) procedures. Three of these families are manufactured at the company's own facilities and six are purchased from contracted manufacturers (OEMs). Regardless of who produces the devices, the margins are much lower than the DES products. Despite the small margins, Vascucorp implemented S&OP for these products as well. For the past eight months, the S&OP process has been implemented and used to monitor the production process and inventory levels.

The third product family is used for diagnostic and interventional procedures as well. This product line is much like the second product family in that it manufactures products in the company's plants and purchases products from OEMs. Despite the similarities, the process in this division is less than six months old and is still developing its own S&OP process. Since the process is so new, the focus of this research is on the first and second product families.

2.2 S&OP Process

As soon as Vascucorp launched the first product family, the demand for the product reached hyper-growth levels. Despite the high cost to the customer, and high margins for the company, the supply of the product could not meet the demand for the product. Eventually, a competitor received approval for their competing product from the Food & Drug Administration and almost instantaneously the competition took control of over fifty percent of the market. In April of 2005, after numerous customer service issues and a dramatic reduction in demand due to the competitors' product, the marketing and supply chain departments began to meet to discuss monthly demand. The goal was to develop a forecast that the operations group could produce to

so there would be a lower percentage of errors in the demand forecast. Eventually, the process evolved into its current sales and operations planning process which consists of a series of meetings run on a monthly cycle that consist of 4, 4, and 5 week periods. It is owned and run by the supply chain group under the Vice-President of Operations.

Vascucorp is a global business that is divided into two markets, the US (United States), and OUS (Outside the US) markets. The US market, which is where the S&OP process began, includes the United States only. The OUS market includes four separate “umbrellas” with a total membership of approximately 50 countries. The umbrellas include:

- 1) Europe, Middle East, and Africa (EMEA)
- 2) Asia Pacific (ASPASC)
- 3) Japan
- 4) Latin America

Each of these umbrella groups is responsible for selling all medical devices for the corporation in their specific region. The umbrella group also has its own profit and loss statement (P&L) as well as financial responsibility to the parent company. Finally, the separate umbrellas have their own supply chain group, sales force, and marketing group. These groups determine their own forecasts and relay them to the OUS planning organization. This method of dividing the companies is due to regulations and other factors that the company must address individually. The problem with the divisions is that the incentive system that is currently being used in the company is very ineffective. Forecasters and business units are rewarded for beating goals and punished for not meeting them. This causes the demand forecasters to error on the safe side and under forecast on a regular basis. This leads to problems on the supply side of the business

because the forecasts are biased. Furthermore, the different OUS umbrellas face the difficulty of communicating effectively across the different time zones and other complications while communicating internationally.

Currently, the process itself is not measured. In the past, the company was using a S&OP maturity matrix score card to determine the success of the process. The scorecard was a list of 20 questions derived from the Oliver Wight Class A Checklist that could be ranked on a scale from 0 to 5 to rate the effectiveness of the process. It was handed out at the end of the meeting each week and filled out by the meeting attendees. This evaluation method was abandoned after a few months because the results from the scorecard appeared useless. Instead of measuring the performance and effectiveness of the process, Vascucorp measures the results of the business that the S&OP process is involved with. These metrics include line item fill rate, back order duration, forecast accuracy, and cost of goods sold. These metrics are considered to be practical results from the process itself.

2.2.1 Product Family One: S&OP Meeting

As stated above, product family one consists of 40 SKUs that are manufactured in a five-step sequential process in eleven different plants. There are two parallel processes, one for the US market, and one for the OUS market. The entire supply chain consists of the following steps over a 64 day time period (this is shown in Figure 1 as well):

- 1) Components are purchased from OEMs or manufactured by Vascucorp.
- 2) Product one is coated with a drug in one of three different locations.
- 3) The product is crimped onto the balloons and packed into packages at the Puerto Rico facility for the US market and at the Mexico plant for the OUS market.

- 4) Suppliers sterilize the packaged products at the Texas facility for the US market, and at a facility in Europe for the OUS market.
- 5) The finished product is sent to a lab to be tested for quality assurance. This step takes up to three weeks to complete.
- 6) The finished products are distributed to the network of distribution centers located around the world.

The 64-day supply time cycle is critical for multiple reasons. The first reason is that the long lead-time prevents the company from reacting to a sudden increase or decrease in the demand for the product. Secondly, the product expires in the third month¹ after it is sterilized. The expiration creates a problem in that if too much product is produced, it will sit in the distribution centers and expire. If too little is produced, there will be missed sales – a typical “news boy” problem. To make the situation even more difficult, the demand is very volatile. To decrease the risk of either happening, large pools of inventory are held before and after crimp & pack as well as after the coating process. Since the expiration date is set at the sterilization step, the finished goods inventory is regulated at this process. To regulate the product flow through the supply chain during the 64-day cycle, a separate group was created for this product family. This new group is called the worldwide supply-planning group. The main responsibilities include coordinating all master scheduling, component forecasts, supplier capacity, rough cut capacity planning, and plant capacity. The supply-planning group is unique in the company and its sole responsibility is to support the flow of goods for product family one.

¹ This is for the US market only. In the Japanese market, the product expires exactly three months from the date of sterilization, and in the European market, the date of expiration is in the 5th month after sterilization.

US Supply Chain



OUS Supply Chain

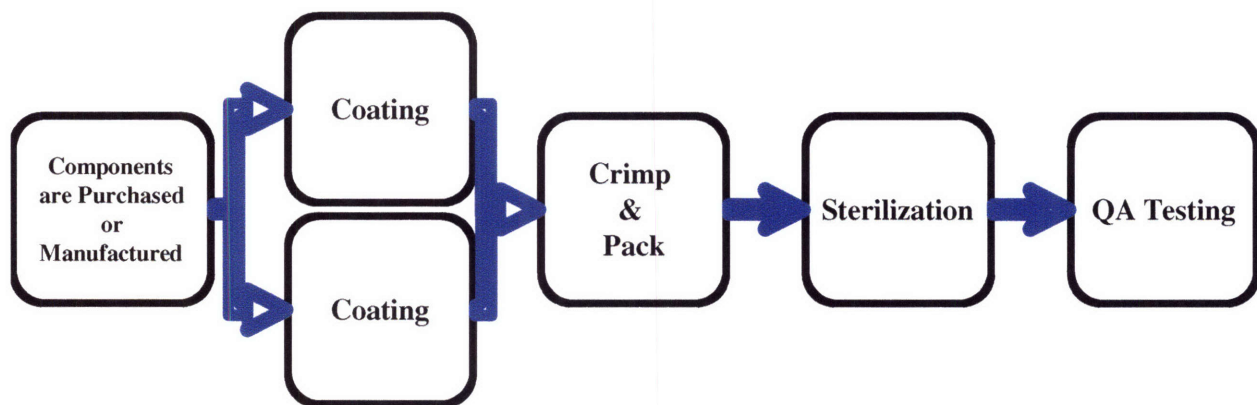


Figure 1: The US and OUS supply chain.

The S&OP process for product one consists of five meetings used to match supply and demand.

The process is described below.

1. Demand Pre-Meeting: The demand pre-meeting is the first meeting held at the beginning of the first week of the monthly cycle. It is an informal meeting between the marketing product director (equivalent to a brand manager), the supply chain demand planner, and the supply chain product manager. At this meeting, the attendees decide on the competitive assumptions that will be used as marketing intelligence to determine the unconstrained forecast. As stated above, the demand is so volatile that the forecast is determined strictly from marketing intelligence. Since the marketing information is used strictly to form the forecast, marketing is completely

responsible for the forecast. The statistical forecast from Manugistics, which is the forecast software package used, is used only as a sanity check.

2. Demand S&OP: This meeting is held on the first Thursday of the monthly cycle to review the unconstrained forecast for the proceeding 3-24 months and the results from the previous months. The attendees include the US product directors and global marketing directors from the marketing group; the vice president of supply chain, US supply chain directors, product managers, and demand managers from the supply chain group; the finance controller; and the vice president of sales. The meeting begins by reviewing the “deck” which includes performance metrics. The deck is a report that includes metrics on actual sales, line item fill rate (LIFR), backorder duration, actual financials versus business plan, and forecast accuracy of both the revenue products (units that are sold) as well as non-revenue products (units that expire and must be replaced for free). Once the metrics are reviewed, the unconstrained forecast is reviewed and agreed upon. This forecast includes demand for new products as well as replacements for product that are anticipated to expire in the upcoming month.

The day after the Demand S&OP is completed; the demand forecast for the OUS is incorporated into the US demand forecast to create an aggregate forecast. The OUS forecast, from the OUS planning organization group, has added all of the demand from the umbrella groups and aggregated them together.

3. Demand Handoff: As stated above, this supply chain is very unique, and therefore is managed that way. In this meeting, people from the supply chain group meet with the supply-

planning group to review the unconstrained forecast. The director of worldwide supply facilitates this meeting.

4. Supply S&OP: The supply meeting is held on the second Thursday of the month. Operations people attending the meeting are the Master Planners, Supply Planners, Materials Director, Director of Manufacturing, Planning Manager, Director of Operations, and the Plant Manager. For the supply chain group, the Demand Planners, Product Managers, and Supply Chain Directors attend the meeting. The director of worldwide supply facilitates the meeting. In this meeting, the main topics of discussion are the work in progress (WIP) inventory, the raw materials inventory, and the whether or not the capacity can meet demand. The WIP inventory is also a very important part of the discussion due to the complex 64-day manufacturing process. The plants must all be aware what should be produced and at what time so the finished goods inventory can be closely monitored. The meeting ends with a final number that represents the constrained forecast for the month.

5. Executive S&OP: The executive meeting includes information about all three product lines; one, two, and three. The president of the company, vice presidents from marketing, finance, operations, sales, and manufacturing, the director of worldwide supply, and the product managers from both regions attend the meeting. The focus is on the financial results of the company, and whether or not the S&OP plan will meet the business plan (BP) that is reported to Wall Street. These results or metrics are presented in a nine-page document that summarizes key financial metrics. The group also reviews manufacturing utilization in the current time period as well as capacity requirements in the future. Finally, and maybe most importantly, issues that

cannot be solved in prior meetings are escalated to this meeting so the executives running the company can make the final decision. Typical issues that get escalated include significant differences between the S&OP plan and business plan or a decision to continue production and incur significant costs or cut production and allow customer service to slip.

2.2.2 Product Family Two: S&OP Meeting

The S&OP process for the second product family has evolved from the S&OP process of the first product family and has been active for just over 6 months. Although the process was developed from the original S&OP process, it has been modified to meet the needs of the second product family. This S&OP process is also run on a 4, 4, 5, week quarterly cycle. The weekly meetings follow the S&OP meetings for the first product family throughout the week. The demand for the products in this family is relatively stable with some seasonality. This trend in demand allows a software program from Manugistics to produce a reliable monthly forecast for the 4500 SKUs in this product lineup. Once the forecast number is determined, the marketing department inputs their knowledge to determine the unconstrained forecast. The marketing group uses promotions and other tools to shape monthly demand. If the initial forecast is lower than what the business plan calls for, it is their responsibility to increase demand.

This S&OP process faces a significant problem in their process that the other group doesn't. That problem is that the company does not have visibility into the OEM's production capacity. Since two-thirds (6 of 9) of the product families are produced at contract manufacturers, there are many unknowns in the process. Currently, the OEMs are given a weekly production schedule and are monitored by a person in a strategic sourcing role. This has worked in the past, but the

company cannot respond to an increase or decrease in production levels very quickly. Right now, the company only reviews the financial impacts of the OEM produced products.

The S&OP process for product family two is as follows:

1. Demand Pre-Meeting: The demand pre-meeting is held at the beginning of the first week of the cycle. The marketing product director for each product meets with the supply chain demand planner to discuss the statistical forecast. The product director adds some market intelligence and the unconstrained forecast for the US market is set.

2. Demand S&OP Meeting: The demand S&OP meeting is held on the first Thursday of the monthly cycle. Members from four departments attend including the US product directors and global marketing directors from the marketing group; the vice president of supply chain, US supply chain directors, product managers, and demand managers from the supply chain group; the finance controller; and the vice president of sales. The moderator of the meeting presents the deck and reviews the metrics included in it. The deck includes the year-to-date financial information for actual sales, financial targets from the business plan, and one page of performance metrics for each of the products that the company produces. The metrics include weekly sales units, forecast accuracy for lag 2 and lag 3 time periods², line item fill rate (LIFR), and average back order duration for each product. Each of the pages also includes a monthly forecast for the 9 preceding months and 5 preceding quarters for a total of 24 months as well as the business plan projected units. These two metrics can be compared to determine what products aren't meeting the corporate financial goals.

Following the monthly demand meeting, the company takes the demand from the four umbrellas in the OUS markets and rolls them up into one total forecast. As explained above, the demand forecasts from the OUS markets are usually revised to show the true expected demand from the region.

3. Demand Handoff Meeting: The demand handoff meeting occurs on the second Monday of the monthly cycle. In this meeting, the supply chain product managers and demand planners give the unconstrained monthly forecast to the director of manufacturing, the materials manager, and the supply planners from the operations group. Assumptions and clarifications are explained to the operations team. The supply chain product manager moderates this meeting.

4. Supply S&OP: The supply S&OP meeting occurs on the second Thursday of the monthly cycle. During the time between the demand handoff and the supply S&OP, the three days are spent reviewing the production capacity in the plant, and determining if supply can meet demand. The operations group, which includes the materials planner, the materials director, the director of manufacturing, the planning manager, the director of operations (for DX/IX/ENDO) and the plant manager, presents this information in a deck much like the one from the S&OP demand meeting. If the demand can't be met, the reasons are explained to the supply chain group, which includes the directors, the product managers, and the demand planners, and alternative plans are discussed. A decision is then made to change the product mix or decide which products are the most important to produce.

² Lag 2 and Lag 3 represent the forecast that was made 2 or 3 months ago for the current month. These forecasts are the most important because they represent the lead-time that is necessary for a change in the production schedule.

The deck also includes information about capacity utilization for the current month as well as for the following 11 months. This information is used to predict when the plant will need to increase or decrease capacity. If a significant amount of increased capacity is needed, the company will use that information to plan accordingly.

5. Executive Meeting: The executive meeting for this process is combined with the executive meeting from the other process and is explained above.

2.3 S&OP Alignment with Financial Goals

The Finance department at Vascucorp develops an annual business plan that is used to report the expected financial results for the company to Wall Street. The marketing department is responsible for shaping demand to meet the financial results that are set. Through the S&OP meetings, the marketing directors are able to do this. The problem at Vascucorp is the disconnect between the financial department and the marketing department. At the beginning of the year, the business plan is created with no insight from the marketing department.

Throughout the year, the marketing department is struggling to make the business plan number. The sales and operations planning meetings should bridge this gap, but currently there is very little insight from the finance group at the S&OP meetings. As the year progresses and the financial results change, the business plan is updated every quarter.

3 The S&OP Process in a Consumer Products Good Company

More than fifteen years ago, a large consumer product goods (CPG) company began using S&OP. Since that time, it has continued to improve its process and has developed it into one of the most successful processes in the world. The following chapter profiles a sales and operations planning process at this large CPG company.

3.1 Criteria for Process Separation

This CPG company defines sales and operations planning as a business process that supports a specific business unit. The company is divided into seven global business units and seven geographic regions. Each of these is listed in Table 1.

Table 1: The break-up of business units and regions in the CPG company

<u>Global Business Units</u>	<u>Markets Served by CPG Company</u>
1. Household Care	1. North America
2. Baby	2. Latin America
3. Family	3. Western Europe
4. Feminine	4. Greater China
5. Beauty	5. Asia, Australia, & Malaysia
6. Health Care	6. Northeastern Asia
7. Skin Care	7. Central & Eastern Europe, Middle East

Within the business units, there are different categories of products that the company splits its products into. This allows the company to run over 90 separate S&OP processes. The criteria

the company uses to decide how many different processes it needs depend on the number of unique supply chains in the company. The supply chain is defined as the set of suppliers, manufacturing facilities, and distribution network to support a certain group of products. If a product line has similar supply chains, those products are combined into one business unit and that business unit is supported with an S&OP process.

In the seven different business units, there are two specific examples that illustrate this point very well. The first is an example of laundry detergent. Laundry detergent is sold by this CPG company in each of the seven markets listed above. Since it is so heavy, the product is very expensive to ship. Instead of producing the detergent in one region and sending it to the different regions, it is produced in each of the markets. To produce in each of the markets, the company has manufacturing facilities in each of the seven regions as well as a supplier network and distribution network. To support each of these business units in their respective regions, an S&OP process is run on a monthly cycle. To bring together all of a business unit's supply and demand information, the company runs a global S&OP meeting that presents all of the information to the president of the business unit. In a completely different situation, the company manufactures pills in one plant for customers around the world. Since the pills are light, easy to transport, and generally have a long shelf life, they are easy to transport from one continent to another. In this situation, one S&OP process is run to match supply with demand for the entire world. In this situation, there is no need for individual meetings in each area, the demand is forecast for the entire world.

Leading each of these S&OP processes is a general manager that reports to a president of one of the global business units. These general managers have profit and loss (P&L) responsibility for the plants and product lines that are involved in their processes. Since they have this responsibility, they also have the authority to make financial decisions that impact their business.

The sales and operations planning process at the CPG company is much like S&OP at other companies. The basic process is shown in Figure 2 below.

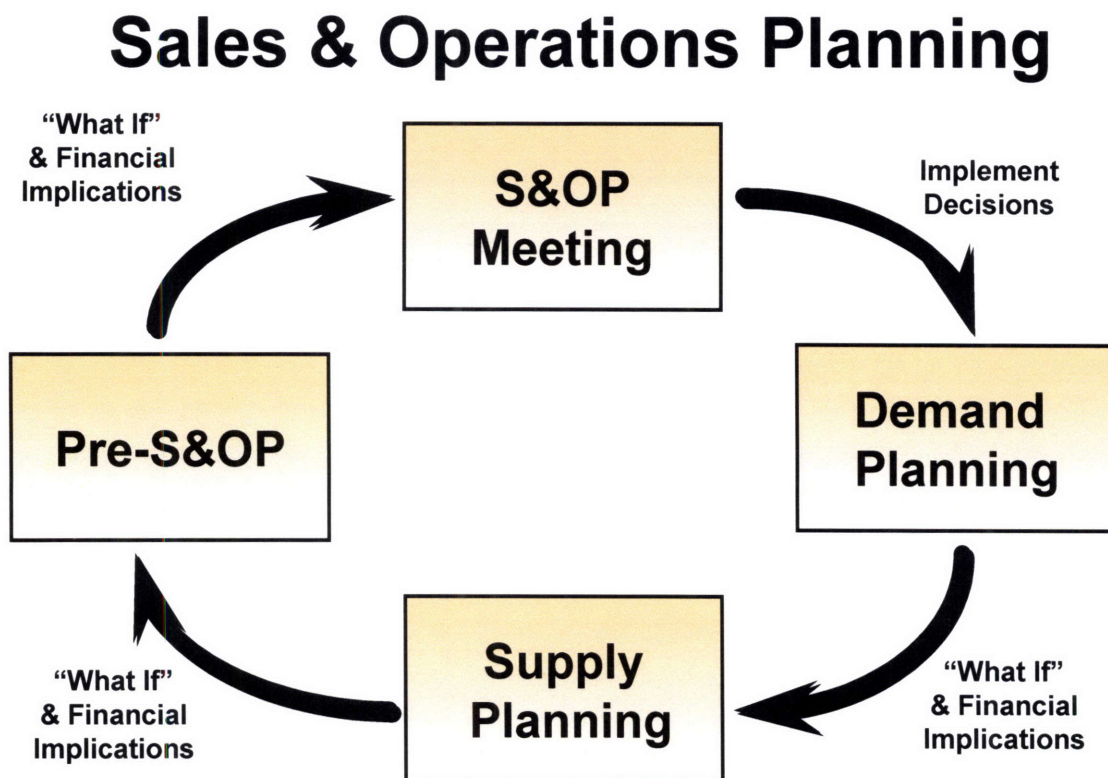


Figure 2: S&OP process at the CPG company

The difference is the attention to detail and importance that the leaders of the company place on the fundamentals of the process. This CPG company stresses the importance of four main factors in their process. Each of these factors is described below.

1. Inviting the right people to each meeting and making sure they attend. The people that should be invited to the meeting should have the power to make decisions that directly affect the supply and demand of the product.
2. Having the right data in the meeting so decisions can be made during the meeting. This requires that the information is prepared prior to the meetings.
3. The finance group has input into all or most of the decisions. Since the finance group develops the business plan, it is very important that they understand the decisions that are made in the meeting and how they are going to affect the overall business plan of the business unit. If a decision must be made regarding the amount of low margin product to produce versus a high margin product, the finance group must be able to make that decision or incorporate the impact of it into the financial plans.
4. The forecast focuses on the time from 3-18 months into the future. The forecast should focus on the time after three months out due to supply issues. The production schedule for a manufacturing plant is locked in two weeks from the production date. During the time from 1-2 months out, the production schedule is set, but the product mix can change if needed. This is done after the company analyzes the cost of responding and the benefits outweigh the costs. The forecast must also extend up to eighteen months into the future so appropriate decisions can be made regarding plant capacity and merchandising decisions.

In addition to these fundamental skills, the meetings must focus on high level decisions as well as decisions for individual SKU. The combination of high-level decisions and important products is essential to running a successful meeting.

3.2 Process Evaluation

To evaluate the S&OP process, the CPG company has developed an assessment tool from the *Oliver Wight Class A Checklist for Business Excellence* and from its own knowledge of what a successful S&OP process looks like. The Oliver Wight checklist is a series of questions focusing on the success of different aspects of the business. These aspects include planning processes, managing people, business improvement, and managing the supply chain among other topics. This checklist is described more in Chapter 6. The knowledge from the CPG company is a set of best practices from other S&OP processes within the company. The knowledge concentrates on how specific jobs within the S&OP process should be done, how the different S&OP meetings should be run, how planning should be done, and other parts of the process that are essential to a successful process. The assessment tool is a list of 140 questions that rate different aspects of the process on a scale from 0-5. In addition to the success of the process, the bottom line business results are included into the rating. The goal of the assessment process is to understand how the process is working and then determine how to make it better.

The assessment process consists of two different types of evaluations; the annual corporate assessment and the self-assessment. The self-assessment tool is used to communicate expectations to the people in the different positions within the process as well as to standardize the process across the company. This is administered by people within the group and used to train people in new positions. The corporate evaluation is done annually, and conducted by an expert in sales and operations planning. This yearly evaluation rates each of the S&OP processes. The results of the evaluation are used to as a basis to improve the process.

3.3 *Financial Results of S&OP*

Within each of the S&OP processes at the CPG company, there is a function that has the responsibility to report the financial numbers to the General Manager of the business unit. The numbers can be aggregated by either geographic location or by business unit. The financial plans are done this way because the supply and demand is managed in each of the S&OP processes and the overall business results are managed at a higher level. Although this model may make it seem like the entire company is a holding company, it is not. The financial expectations are communicated to each business unit from the executive management team. The S&OP process enables the business units to meet those expectations by providing the information necessary to make decisions.

4 The S&OP Process in Other Industries

4.1 S&OP at Bayer Material Science

Bayer Material Science is a division within Bayer that produces polymers. The company produces and ships their product all over the world. Because of this, the lead times to manufacture the product and ship it to its final destination are very long. The company has implemented S&OP to help coordinate the monthly planning process.

Bayer Material Science is a global business that is divided into four business units that produce different materials like polyurethane and polycarbonate. Each of those business units is divided into four regions – North America; South America; Europe, Middle East, and Africa; and Asia. Each region has its own marketing department that shapes demand, and they are responsible for reporting point of sale data for each of the customers in their region. Within each business unit, there are at least two supply sources located in different regions, with some business units having three supply sources or in some cases one supply source in every region.

One S&OP process is conducted for each business unit. The process is made up of five meetings run on a monthly schedule. The first meeting is the demand review where the forecast for the following 12 months is reviewed. The company focuses on the time from 3-12 months into the

future for two reasons. The company doesn't focus on the time from 1-2 months because in that time, the product that is going to be sold is already in transit or is in the production process. The time from 6-12 months is important for the company because in this time, the company can create value by pre-building inventory or repositioning inventory if the company can foresee supply constraints. The second and third meetings in the S&OP process are supply review meetings. The second meeting is a global balancing review that looks at the supply constraints and the inventory positions in the company. Decisions are made on where to produce product and where to ship it. The third meeting is a regional balancing meeting where the company looks at where to hold inventory in the region and which customers should be served in case of a shortage. The fourth meeting is a consensus meeting that reviews the supply and demand numbers and checks to see if they are aligned. In the meeting, the attendees also review important decisions that need to be made and decide which ones should be escalated to the executive meeting. Finally, there is an executive meeting that reviews the financial numbers and makes decisions on issues that could not be resolved in the previous meetings.

The company evaluates the success of the S&OP process using two different methods. The first is by looking at measurable metrics that include forecast accuracy, inventory management, and customer service. The company looks at three parts of forecast accuracy – last month vs. sales, accuracy of lag 3 and lag 6 forecasts, and the accuracy of manual vs. statistical forecasts. Secondly, the company reviews the inventory levels of the company against the inventory targets. Finally, the company looks at a customer service metric that is called “on time and full”. This calculates the percentage of orders that are shipped on time with every line item included. The second method of reviewing success of the S&OP process is by looking at the effectiveness

of the process. This effectiveness measure looks at communication between marketing, procurement, logistics, production and other departments in the company to see how well the company is working together.

Bayer Material Science, like many other companies, develops the business plan and the S&OP plan separately. The difference however is that Bayer uses a five-year plan to project their goals into the future. The business plan is developed from the five-year plan and the S&OP plan helps the company achieve those goals. The difference between the two is that S&OP empowers the company to make decisions to achieve the business plan while the business plan is made up of the financial goals of the company. The difference between Bayer and many other companies is that it can take 3-4 years to build a new plant to make materials. An S&OP plan does not project that far into the future and therefore something must take its place. The five-year plan at Bayer does that.

4.2 S&OP at a Pharmaceutical Company

In one specific company in the pharmaceutical industry, the S&OP process is run much differently. In this example, the company's main customers are large retailers like Wal-Mart, Target, and other warehouse clubs. The demand for the product, which is made up of approximately 500 SKUs, is fairly hard to predict because the company does not have insight into promotional events that the retailers are running. The combination of unpredictable demand and a large number of SKU gave senior level managers the idea to implement S&OP.

This pharmaceutical company has multiple supply sources that include company owned manufacturing plants as well as OEMs that manufacture products for the company. The S&OP

process is run on a monthly cycle and reviews demand for the company throughout North America. The process is made up of four meetings that include the demand review, supply review, consensus meeting, and followed by the executive review. The demand review determines the 12-month unconstrained forecast for the specific region with a concentration on the time from 4-5 months in to the future. The time that is 4-5 months into the future is concentrated on because that is the time the company needs to lock in production schedules and secure materials from suppliers. The supply review meeting looks at the capacity of the company owned manufacturing sites that are located in Puerto Rico and Virginia as well as the OEMs that are located throughout the US and Canada. Once the supply review is complete, the consensus meeting takes place. At this meeting, the unconstrained forecast is reviewed to make sure it is achievable and that it hits the financial goals of the company. The group in the consensus meeting also decides what issues to escalate to the executive level and which issues should be decided in the consensus meeting. Finally, in the executive meeting, the senior level management team looks at key performance indicators of the business, and also reviews the financial numbers.

To evaluate the S&OP process, this pharmaceutical company concentrates on one main metric to determine the success of its process. That metric is the customer service perception the customer has of the pharmaceutical company. Instead of using internally focused metrics, the company asks the major retailers to rate the company on customer service, and this rating is reviewed in the S&OP process. Although this evaluation method is unorthodox, it has served the company well.

The business plan at this pharmaceutical company is developed using the S&OP forecast for the upcoming year. The projected sales from the forecast are used to predict profits, and this number is used to develop a conservative business plan that can be communicated to Wall Street. The difference between the two numbers is that the business plan is conservative while the S&OP numbers are a stretch that the company strives to achieve.

5 Expert Opinions on S&OP

5.1 Criteria for Dividing S&OP Processes

The way a global S&OP process is broken up has a direct impact on how well the process works. Looking at the general purpose of the global S&OP process, a consultant from Oliver Wight explains how it works in its simplest form: “When looking at the definition of S&OP, the goal is to understand the current condition of the different business units, then to take actions to align the future plans with the goals and strategies of the company. Each business unit has responsibility to the larger corporate government. At the corporate level, the senior management wants to understand the current condition of the business so they can take action to align future plans with the goals and strategies of the business.” According to many consultants working for global companies, the most important aspect to look at when deciding how to separate an S&OP process is the supply and demand characteristics of the products the company sells. The demand characteristics that must be considered include whether or not the company is divided into regions throughout the world, and secondly the number of products. Supply characteristics are resources the company uses to produce its products. In the explanation below, manufacturing resources are used as the example. These resources include the number of plants that are supplying the products, who in the company is in control of the manufacturing plants, and whether or not the plants are dedicated to the regions that they supply. Usually, the number of manufacturing facilities is directly related to the characteristics of the product. For example, a heavy product that is sold in large quantities is unlikely to be transported long distances, and

would therefore be produced in each of the regions. There are four different possibilities of how an S&OP process should be split up, and each is explained below.

For the following examples of how an S&OP process should be split up, it should be assumed that the demand for the product is worldwide and as Tom Wallace suggests, the world is divided into four regions: North America, South America, EMEA (Europe, Middle East, and Africa), and Asia. Furthermore, each of the regions has its own sales and marketing departments that are dedicated to that specific region.

5.1.1 Scenario One: Single Worldwide Source

Scenario 1, shown in Figure 3, exists when a company has one manufacturing facility that supplies product to the entire world. Demand information is gathered for each of the regions and rolled up into one number for the supply review number. This information is collected from each of the sales and marketing departments in the different regions. If there isn't a sales and marketing department in each of the regions, then demand information should be gathered centrally and communicated to the supply review meeting as one number. Regardless of how the world is divided, one other important factor in making this S&OP process successful is that there must be one person in charge of the meeting that has responsibility for the profit and loss of the division that the S&OP process is run for. In this situation it would usually be the president of the company.

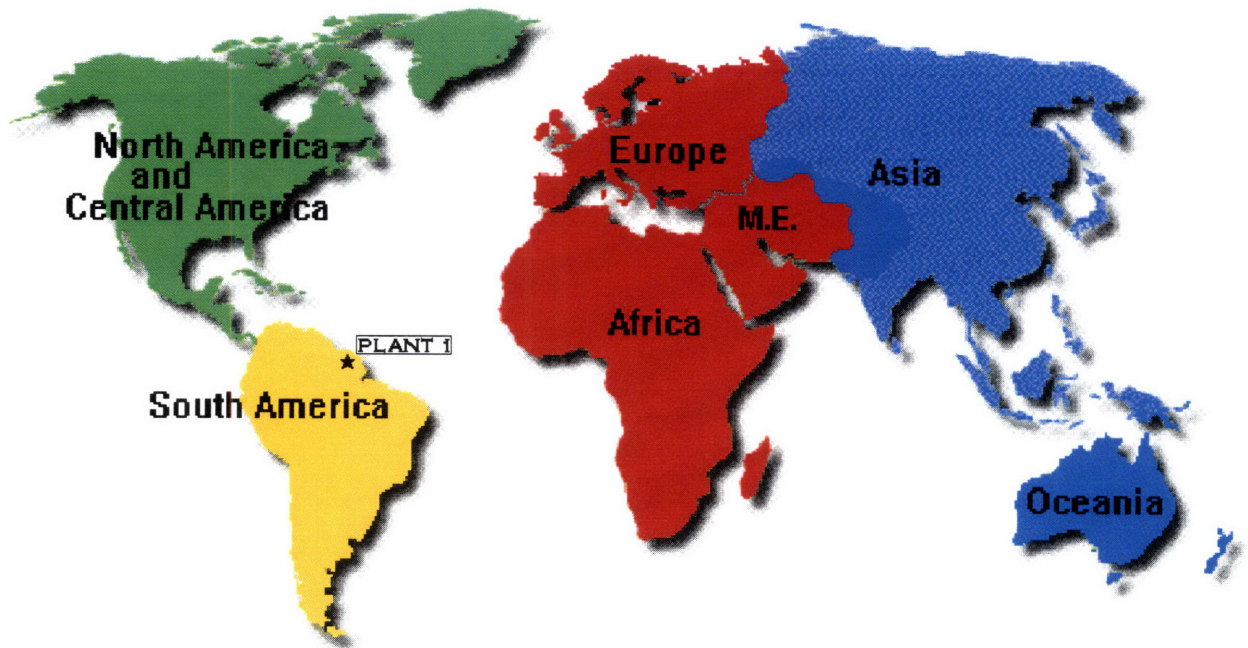


Figure 3: Scenario 1

5.1.2 Scenario Two: Multiple Regional Source

Scenario 2, shown in Figure 4, exists when a company has multiple supply sources that are dedicated to specific areas. Dedicated facilities means that the plant only produces product for that region or set of regions it is intended to serve. Production capacity is not shared regardless of shortages or excess capacity in other regions. In this example, one manufacturing facility is located in America that serves North America and South America, while one other independent manufacturing facility is located in Europe that serves EMEA and Asia. This is essentially dividing the world into two regions that need two separate S&OP processes. Demand data is collected from each of the regions and communicated back to the process that supports its respective region. Each of the processes should have one general manager in charge of the P&L for the region, and he should report to a person at corporate headquarters.

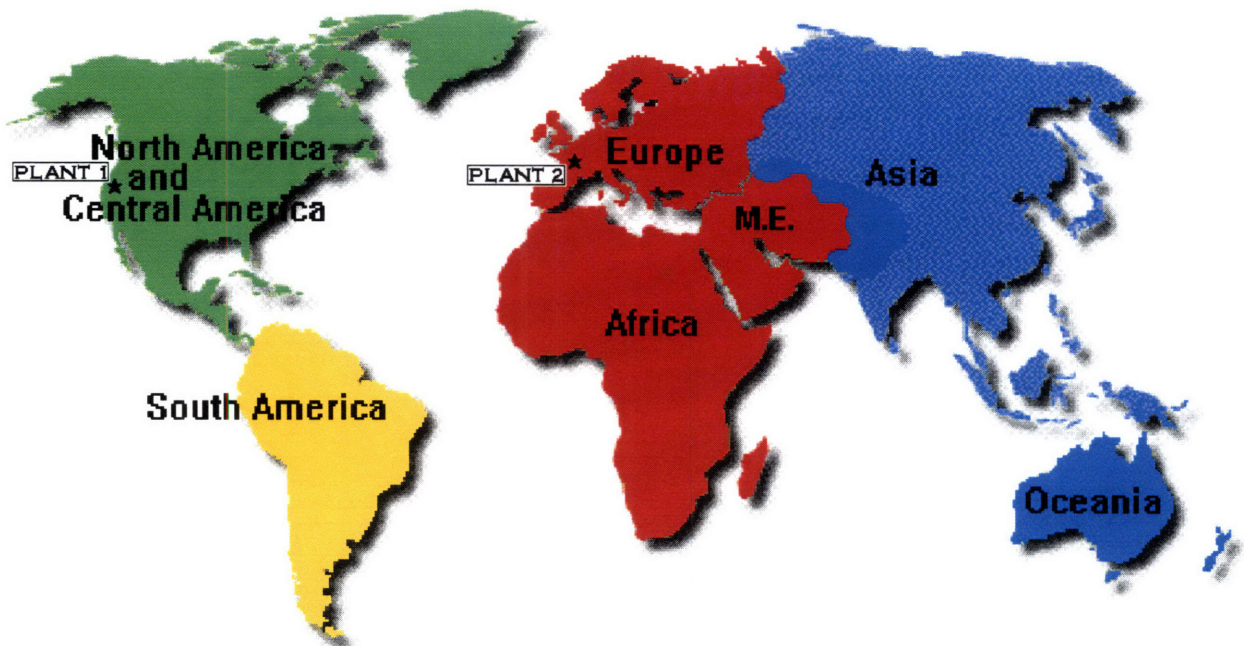


Figure 4: Scenario 2

5.1.3 Scenario Three: Dedicated Regional Source

In scenario 3, shown in Figure 5, one plant exists in each of the regions and is completely dedicated to that region. In this case, one S&OP process is run for each of the regions and run by a general manager or division president. Four total processes would be run in this scenario to accommodate the supply and demand in each of the regions. As mentioned above, the demand information would be collected for each of the specific regions and communicated to the supply meetings in the regions.

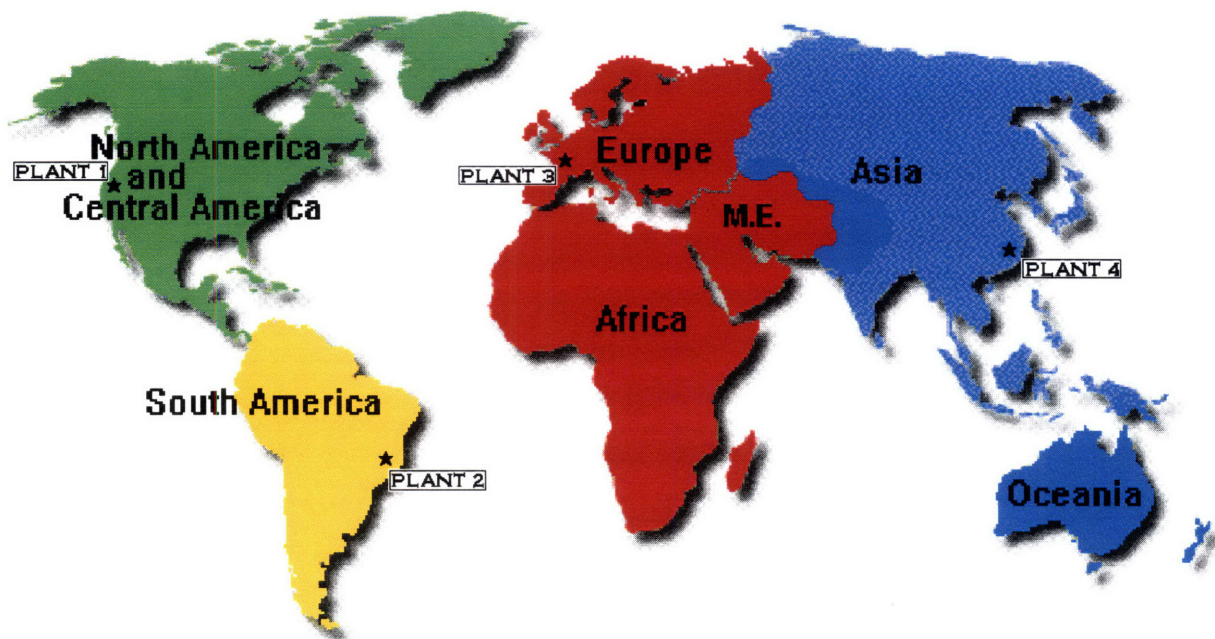


Figure 5: Scenario 3

The S&OP processes from each of the three previous scenarios are fairly simple and the meeting schedule can be closely associated with the Figure 6. In this figure, it is clear that each S&OP processes is independent of the other one and is run by the general manager or president of each division. The only contact with the corporate headquarters is to relate financial numbers to the parent company or for the company to communicated financial expectations for the year.



Figure 6: The Oliver Wight Integrated Business Management Model

5.1.4 Scenario Four: Multiple Shared Sourcing

Scenario 4, shown in Figure 7, is much more complicated than the previous three. In this example, many plants are located around the world and each can serve many or all of the regions in the world. There is control at both the regional level and the corporate level. The book Enterprise Sales and Operations Planning explains this best: “Sales and marketing are managed and controlled in a regional business unit. Manufacturing or the supply of products is controlled both regionally and centrally. Regional manufacturing or supply control is provided for local

manufacturing or supply management. There is also central control provided for global visibility and decision making about the manufacturing of supply product”. The reason the control is separated in this manner is because as demand increases and decreases in the different regions, the corporation can help the different regions communicate and share supply resources so the company can meet its customer’s expectations. In this scenario, each region with a supply resource should run its own S&OP meetings, while regions that don’t have a supply resource should be grouped into regions that do. Once a regional S&OP meeting has been completed, there should be an executive meeting that summarizes each of the regional meetings and communicates the financial impact to the executive team. The production capacities for each of the plants and regions, as well as overall trends in the business should be reviewed as well.

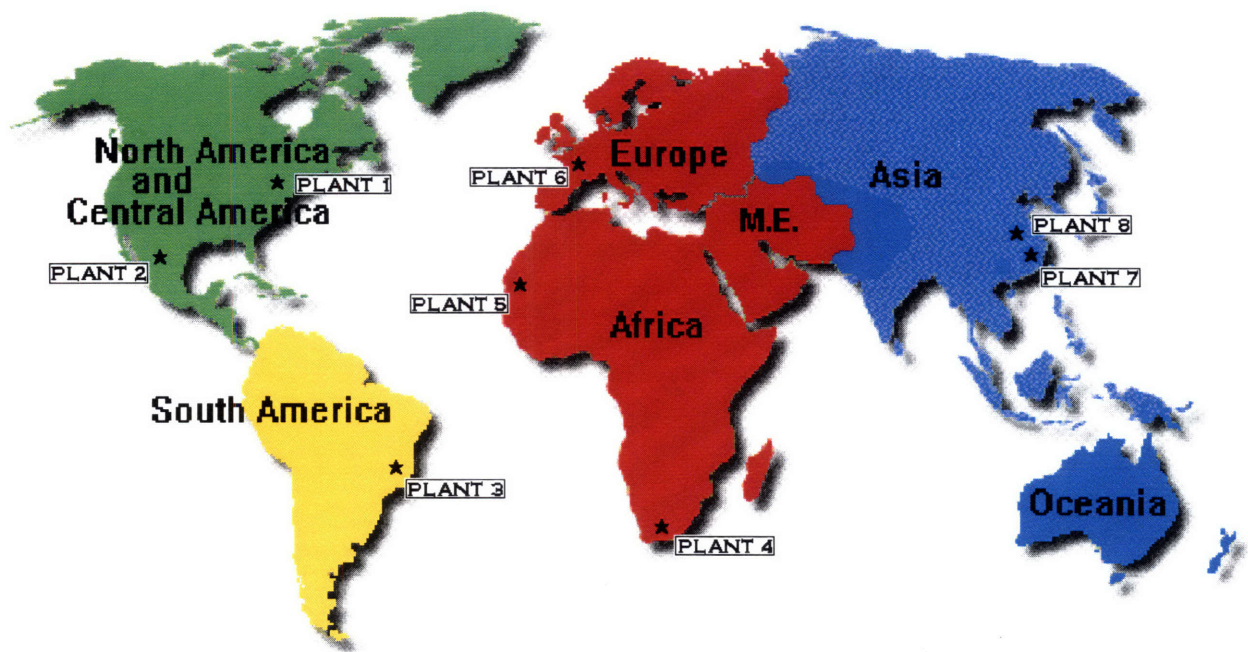


Figure 7: Scenario 4

Scenario 4 creates an additional step that is not included in Figure 6. To accommodate this extra step, Oliver Wight has another illustration that shows this process. This is shown in Figure 8.

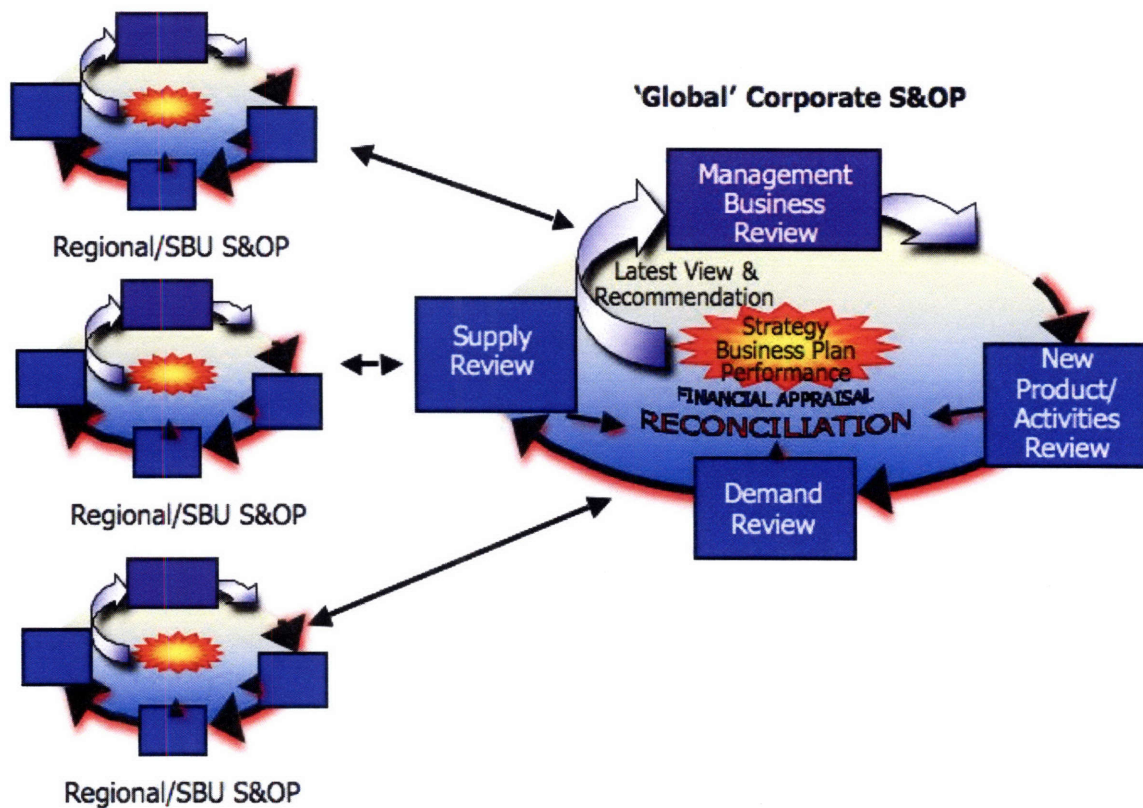


Figure 8: The Oliver Wight Global Sales and Operations Planning Model.

To help companies communicate and run the S&OP process more efficiently, many software companies have either created software or created add-ons for their enterprise resource planning (ERP) systems to support the sales and operations planning process. Although a simple spreadsheet can work, once a global company begins entering data from global sources, it is usually more effective for a company to use one of these systems when running the S&OP process. This software usually pulls data from an ERP system and presents it in a logical order for the people in the S&OP meetings. The advantage of this is that the data gathering process is

much simpler and more time can be spent making decisions and creating what-if scenarios help senior managers make decisions.

5.2 Evaluation of Global S&OP Process

Sales and operations planning is a process that helps companies meet their goals and to make money. An evaluation of a global S&OP process is not much different than an evaluation of a domestic S&OP process. A regular, usually annual, evaluation of the process is necessary to make sure the process is working correctly. According to consultants from T.F. Wallace and Oliver Wight, the best approach is to use a balanced scorecard. In the balanced scorecard, there are two areas to focus on; metrics traced directly to the results of the meetings, and metrics that measure the effectiveness of the meetings. The metrics directly from the meeting include forecast accuracy, inventory turns, and line item fill rate among others. This measurement alone is not an accurate indication of the success of the process. Outside factors such as a new product introduction (forecast accuracy), or the introduction of lean manufacturing (inventory turns) could influence the results of these metrics. The effectiveness of the meetings is important to measure along with the metrics because these are the true indicators of success. When a meeting is run correctly, the results the company expects from S&OP usually follow. Trying to determine if a process is run correctly is much harder to do than measuring business success. Process success is often defined by debatable metrics. These metrics include attendance of the correct people, ownership of the forecast, business strategy alignment in the meetings, regular meeting schedule, length of forecast horizon, and spreadsheet layout among others. These metrics generally don't have a direct impact on the business, but indirectly they do. If the incorrect people are attending the meetings, decisions won't get made. In the long run this affects the process and the business, but again, it cannot be measured directly.

According to Colleen Crum from Oliver Wight, the most effective way to measure the effectiveness of the S&OP process is to use *The Oliver Wight Class A Checklist for Business Excellence*. In this book, there is a chapter focusing on Integrated Business Management – the name Oliver Wight uses for sales and operations planning. This chapter explains 9 areas of Integrated Business Management that a company should consider when evaluating their process. These nine areas are shown in Figure 9.

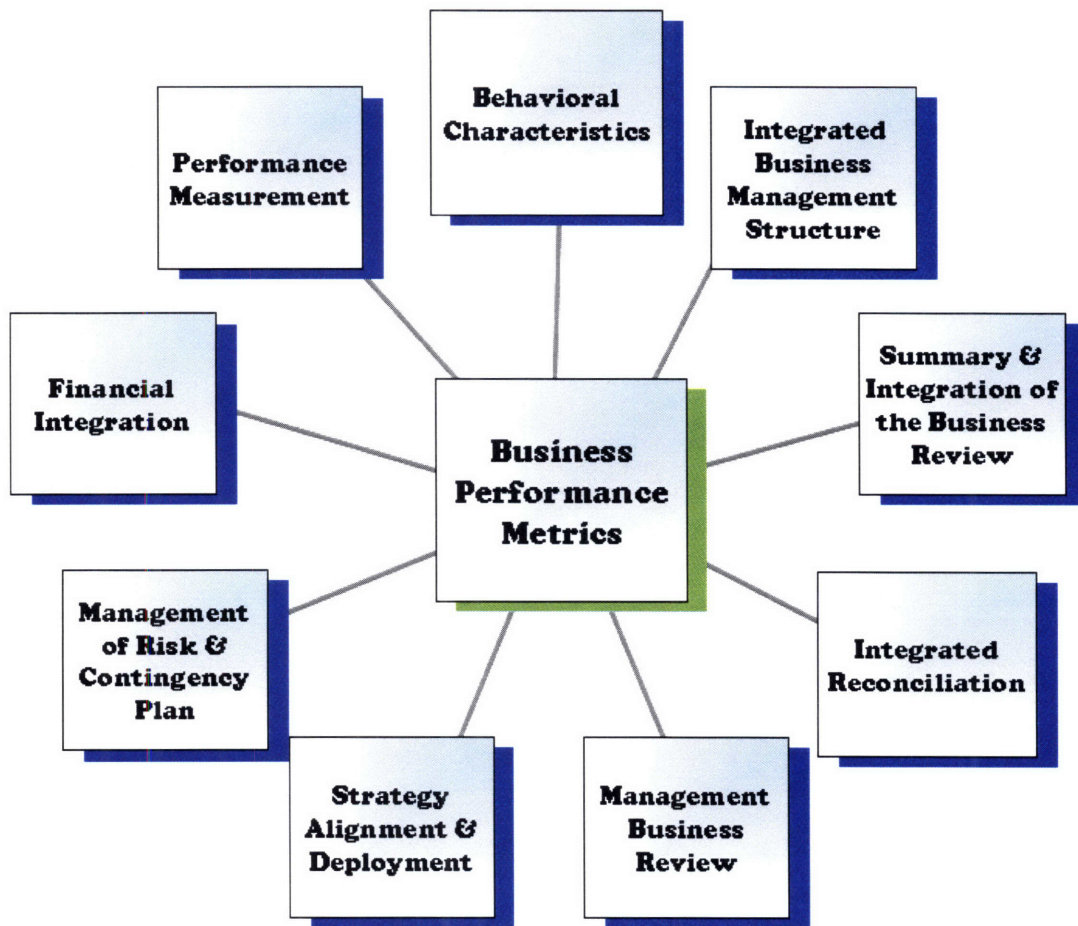


Figure 9: The Oliver Wight Class A Checklist for Integrated Business Management

The 9 areas of Integrated Business Management are used to measure the success or failure of the process. Each of the 9 areas has a subset of questions that are given a score from 0-5. The

higher the score, the more successful the process should be. The idea is that a successful process will lead to a successful business. To measure the business, five areas within the Business Performance Metrics (the center of the Figure 9) are measured. These 5 metrics include:

1. Sales Revenue - attainment of business plan
2. Operating Profit - attainment of business plan and as a benchmark against industry standards.
3. Return on Net Assets – ratio of operating profit to the net trading assets as attainment of business plan and as a benchmark against industry standards.
4. Cash – operating cash flow attainment of the business plan
5. Customer (OTIF) to Request – on-time-in-full against request is measured against a standard established in the business strategy.

The five metrics are the core measurements in an S&OP plan along with other business specific metrics. These five core metrics should be within 99.5% of the plan.

Tom Wallace of T.F. Wallace has a much simpler approach to evaluating an S&OP process. In his book: *Sales and Operations Planning – The How to Handbook*, the approach Mr. Wallace uses is a questionnaire that includes 25 questions. Each of the questions addresses a certain part of the process and is meant to be a guide that companies can follow to have a successful process. The different parts include meeting spreadsheets, process ownership, decision making, new product issues, and many others. The complete list can be found in Chapter 16 of the book. Each question can be answered yes, partial, or no and each is worth a certain number of points. The total sum of the points is an indicator of the success of the process. This checklist should be

done on a monthly cycle to track improvements and to bring the weaknesses in the process to the attention of the leaders.

5.3 Financial Aspects of Global S&OP

As stated above, an S&OP meeting can be split up in many different ways. The financial aspects of the process vary depending on the way the process is separated as well. In an ideal case, a global company looks at the forecast for the following fiscal year then sets the financial goals and business plan based on those numbers. This business plan is based primarily on the forecast from the S&OP process. Although this is the ideal way of developing the business plan, it rarely happens this way. More often than not, the finance group develops the business plan in the beginning of the year, and then the rest of the company struggles to meet the goals set by the finance group. This method of developing the business plan has become riskier in recent years due to the Sarbanes-Oxley laws. These laws hold executives responsible for the numbers they report to Wall Street and it is therefore more important for them to report the most accurate numbers possible.

6 Results, Conclusions, and Future Research

6.1 Results

Sales and operations planning is a process that is used by companies to match supply and demand. To use this process effectively in a global business, the process must be broken apart to support the business in the most effective manner. One interviewee recommends to “break up the process in a logical way based on business unit and geography”. The following four-step plan is a framework for a company to setup a global S&OP process.

1. Identifying Regions:

The company must look at its customer base and determine what locations the company plans to serve. Generally, the regions of the world are divided into continents or as Tom Wallace suggests in *Sales and Operations Planning: The How-To Handbook*, into four regions that would include North America; South America; Asia; and Europe, Africa, and the Middle East. This divides the world into more manageable areas that the company can serve more effectively. Although four regions can be used, this is not the only way it should be done. Companies can define regions in their own way based on how the demand for the product is spread throughout the world. These regions are areas that the company will collect demand data from and eventually communicate to the supply meetings.

2. Determine the Supply Sources

This step of the process is used to determine how many different processes the company will run. To do this, the one main factor that must be evaluated for each of the products that the company plans to sell is the supply chain. The supply chain, which includes the suppliers, the manufacturing sites, and the distribution channels, must be considered because products with similar supply chains should generally be grouped into the same S&OP process. Within the supply chain, the characteristics of the manufacturing sites are the deciding factors for number of S&OP processes. The specific characteristics that are important are the number of plants within each region, whether the plant is dedicated to the region or it is shared between the regions, and whether or not the plant is centrally controlled or decentralized. The different scenarios are shown in Figure 10 below:

		One Region	Multiple Regions	All Regions
One Plant		<ul style="list-style-type: none"> •One S&OP Process/Plant •Decentralized Control •Run by the General Manager of the Business Unit 	<ul style="list-style-type: none"> •One S&OP Process/Plant •Decentralized Control •Run by the General Manager of the Business Unit 	<ul style="list-style-type: none"> •One S&OP Process •Centrally Controlled •Run by the President of the Company
	Multiple Plants	<ul style="list-style-type: none"> •One S&OP Process/Region/Supply Chain •Decentralized Control •Run by the General Manager of the Business Unit 	<ul style="list-style-type: none"> •One S&OP Process/Region/Supply Chain •Decentralized Control •Run by the General Manager of the Business Unit 	<ul style="list-style-type: none"> •One S&OP Process/Supply Chain •Centrally Controlled •Run by the President of the Company

Figure 10: How to separate a Global S&OP Process

3. S&OP Executive Support

The third important factor of developing a global S&OP process is that there must be an executive that leads and supports the process that has P&L responsibilities. This is important for two reasons. The first is because the success of the S&OP process is most likely determined by the support from the executives of the company. According to Tom Wallace, “The major cause of sub par performance [in S&OP] is the lack of hands-on involvement by executives”. The second reason it is important to have an executive in charge of the process is that they are responsible for the profit and loss statement for their division or business unit. The S&OP process enables the people in the business unit to make decisions that have a direct impact on the profit or loss of the division and company. If the person in charge of the business unit is not there to make the decisions, those decisions will not be made. Furthermore, the general manager or president of the business unit must communicate to the corporate headquarters. If this person is not involved in the S&OP process, they cannot communicate the success or failure of the division effectively.

4. Evaluation Process

Once the global S&OP processes are separated and running and the policies have been put in place to make the process consistent in each of the regions, it is important to have an evaluation process. This evaluation process should consist of a balanced scorecard that measures business metrics and process effectiveness. As stated in the Oliver Wight Checklist, business metrics should include sales revenue, operating profit, return on net assets, cash, and line-item-fill-rate in addition to business specific measures. Process effectiveness can be measured looking at the

attendance of the correct people, ownership of the forecast, business strategy alignment in the meetings, regular meeting schedule, length of forecast horizon, and spreadsheet layout among many others. The process should be evaluated annually, and should be done in conjunction with a person inside the meeting and one person that is from another process. In addition to the scorecard being used on an annual schedule, the evaluation method should be made available to each of the people that are in the process so each of the participating members know their responsibilities.

6.2 Conclusions

As stated by Tan (2006), “If both demand and supply are certain, then a company’s goals and objectives would be optimal through one-time optimization.” This is no different in Global S&OP, and perhaps it is more difficult in a global business due to communication and language barriers. To run an effective S&OP meeting in a global business requires much planning and upfront planning to decide how the process will be separated. In conclusion, the most effective global S&OP meetings are ones that match demand with supply sources and plan accordingly.

6.3 Future Research

This research has looked at how an S&OP process can be separated most effectively in a global business. In addition to the separation process, the evaluation methods of the process and the financial alignment have been discussed as well.

Future research efforts should be focused on how the S&OP process is evolving into a real-time decision making process instead of a monthly process. In addition, research on developing what-if scenarios in the S&OP meetings will allow executive level managers to be better prepared and therefore make better decisions.

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