Demand Management:
A Cross-Industry Analysis of Supply-Demand Planning

By

Peng Kuan Tan
Bachelor of Science
Imperial College of Science, Technology and Medicine, University of London, 1992

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Signature of Author.......................................................... Master of Engineering in Logistics Program, Engineering Systems Division
May 12th, 2006

Certified by.................................................. Larry Lapide
Research Director, MIT Center for Transportation and Logistics
Thesis Supervisor

Accepted by.................................................. Yossi Sheffi
Professor of Civil & Environmental Engineering
Professor of Engineering Systems
Director, MIT Center for Transportation and Logistics
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Abstract

Globalization increases product variety and shortens product life cycles. These lead to an increase in demand uncertainty and variability. Outsourcing to low-cost countries increases supply lead-time and supply uncertainty and variability. Coupled with the increase of mergers and acquisitions, which increase supply chain complexity, and the unforgiving nature of having too little or too much inventory, these factors have accelerated the importance and adoption of the Sales and Operations Planning (S&OP) process.

S&OP is driven by a cross functional team, with the purpose of balancing supply and demand with the objective of maximizing a company’s goals. It manages the supply and demand uncertainties, balances the different internal and external stakeholders’ interests, and aligns the operations towards its strategy and vision.

In support of the Supply Chain 2020 Project at MIT, this thesis focuses on analyzing the S&OP function across industries. Using the Phase I SC 2020 theses, literature, white papers, and interviews with industry experts, this thesis compares and contrasts the S&OP practices across nine industries. It examines their best practices and underlying principles, as well as the macro factors that have shaped the practices for the last ten to fifteen years, as well as what is expected in the future.

Companies with the “best” S&OP processes collaborate internally to balance sales and operations, and align all internal stakeholders’ interests. Furthermore, they collaborate externally with suppliers and customers to reduce supply and demand uncertainties. They also understand and manage demand and supply uncertainties, and align their effort towards their goals. These companies synchronize operations and are agile to changing environments.

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Dr. Larry Lapide  
Research Director, MIT Center for Transportation and Logistics  
Massachusetts Institute of Technology
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1 Introduction

1.1 Scope

The Supply Chain 2020 Project intends to identify and analyze the factors that are critical to the success of future supply chains out to the year 2020. Phase I largely entailed researching today’s excellent supply chains in nine industries to identify what is important to maintaining a competitive position.

The Phase II research is focused on identifying the fundamental principles that underlie best practices in these same nine industries. The thesis will focus on analyzing supply-demand planning, one of six functional areas in which supply chain management plays an important role. In particular, it studies the Sales and Operations Planning (S&OP) processes used by the nine industries with an attempt to compare and contrast the processes used, identify the industrial best practices and their underlying principles, as well as to identify their evolution. To conclude, it will project the future trends and provide a framework for a company to identify key focus areas for their S&OP improvements.

1.2 Motivation

S&OP has gained in importance over the past years driven by the following trends:
a. **Increase in Demand Uncertainties and Variations.** Technology advancement, innovations and globalization, have increased the rate of new product introduction significantly. Coupled with the shortening of the product life cycle, products are proliferating at a faster rate than ever, resulting in higher demand uncertainties and variations.

b. **Increase in Supply Uncertainties and Variations.** The increase in outsourcing to low-cost countries and global procurement for lower cost items, have increased the complexities and interdependencies of the inter-companies relationship. The tightly integrated systems mean that a small variation in one of the systems could potentially be amplified into a large variation in another system. The increase in merger and acquisition activities has further increased the supply uncertainties.

c. **Increase in Cost of Lost Sale and Over-Supply.** With the wide choices available, the cost of a lost sale has increased dramatically. While previously, it may be purely losing an item lost sale, the current situation tends to be less forgiving and it is likely to be losing the customer entirely, including the extended products and services. For example, if a customer could not find a particular Hewlett Packard (HP) printer, he would probably switch to another brand of printer. What HP loses is not only that printer sale, but the sale of ink cartridges and future printer sales from this customer. Similarly, with the rapid development
in technology, new product introduction and shortened product life cycle, excess supply not sold over a period may become obsolete and worthless very quickly.

S&OP process is one of the most important competitive weapons for ensuring that the enterprise is producing the right product, at the right quantity, servicing the right customers, through the right channels, at the right time with the right rewards and incentives. This requires a much more refined segmentation of the customer, channel and geographical marketplaces, and the increased ability to be able to determine the optimal demand and supply trade-offs.

In a recent Aberdeen study, more than 70% of respondents indicated that they are or will shortly be improving their S&OP processes and technologies to better arm the enterprise competitively.

In “The Sales and Operations Planning Benchmark Report” by Aberdeen Group June 2004, it found that the “best of breed” S&OP companies have significantly higher complete order fill rates, gross margin percentage and customer retention percentage as shown in Figure 1.1 below:
In the same report, it was also reported that S&OP can improve post-sales services and support, manufacturing and marketing effectiveness by 30-50%, while improving procurement, fulfillment and customer service by at least 50%. Most importantly, it can increase sales revenues by more than 70%.
1.3 Methodology

S&OP started as early as 1984 in a few major companies such as Proctor and Gamble, Boeing and Caterpillar in the form of Material Resource Planning II (MRP II). Many companies had some form of processes to balance supply with demand though it may not have been termed as S&OP. However, it was not until the early 2000-2001 when companies, consultant firms and software companies began to market S&OP as a source of lowering the product cost, increasing service levels and sales, and thereby increasing overall company profitability. It therefore explains the lack of academia literature in this area, but an abundance of white papers from the software and consultancy companies.

The thesis therefore adopts the approach of first reviewing the past twenty-one Phase I Supply Chain 2020 Project theses and the S&OP literature. Next, a review was conducted on the software, consultancy, research and education company white papers and presentations. Finally, interviews with industry experts were conducted to gain further insights.

1.4 Outline

The thesis is organized into six chapters. Chapter Two reviews the S&OP literature and past SC 2020 theses in the nine industries. From that view, the preliminary S&OP process used by each industry is established. Chapters Three traces the history and
evolution and offers some current definitions for it. Chapter Four details how S&OP is used in each of the nine industries.

In Chapter Five, the similarities and differences of S&OP used across the industries is discussed. In addition, the industry best practices and their underlying principles are identified. Finally in Chapter Six, the current and future S&OP trends are discussed. In summing up, a framework is established to help companies focus their S&OP improvement efforts.
2 Sales and Operations Planning Literature – Supply Chain 2020 Theses

2.1 Supply Chain 2020 Theses - Nine Industries

A review was conducted on the Phase I Supply Chain 2020 Project theses for the nine industries, which are comprised of Automobile, Computer, Telecommunications, Consumer Products Group (CPG), Aerospace, Pharmaceuticals, Petroleum, Retail and Apparel/Footwear. While most of these theses did describe the demand and supply planning functions, there are only five theses providing how the companies manage the demand and supply planning through S&OP. This therefore makes the comparison of S&OP in the various industries impossible and more research and phone interview were required to bridge the information gap.

Nonetheless, based on the demand and supply planning described, there are a few trends that could be generalized. First, the product structures are divided into either “Make-to-Order” (MTO) or “Make-to-Stock” (MTS). The MTS companies such as Gillette and Procter and Gamble (P&G) in the CPG industry,(Rah E 2005) are moving from make-to-forecast to make-to-demand driven, largely enabled by the information technology which provided them with real-time consumption data. Essentially, make-to-demand driven is still make-to-forecast but based on real-time consumption data rather than past data. This demonstrated the shortening of the cycle time from planning, production, distribution, consumption and planning. A unique case seems to appear in the apparel fashion industry which focuses on short production lead-time and smaller batch production so
that when there is a forecast error, the cost of error is low, while the speed to respond to the error is fast. For example, Zara could do a modification to an existing design and get the product out to the street within ten to fourteen days.

The increase in outsourcing non-core functions to the low-cost areas contributes largely to the second trend of increasing collaboration with partners and sharing of critical information. For example, Lucent had outsourced all their warehouses and transportation functions in the last few years, while both Dell and IBM (Roy S 2005) used their suppliers to maintain component inventory; therefore the sharing of demand information is critical so that the suppliers are ready to fully support them. Wal-Mart (Chile C and Dau M) had invested in its IT system, Retail Link, to store supply chain information and share it with its suppliers in order for them to help ensure high on-shelf availability. The collaboration with downstream customers to obtain Point of Sale (POS) data reduces the "Bullwhip" effect as companies have better visibility of true demand, and are therefore able to reduce the effect of production and replenishment lead-time and its variability. This allows companies to better plan their operations and replenishment strategies to better meet the customer demand. Similarly, the collaboration upstream with suppliers, ensures a more steady supply of raw material and components, and therefore has the effect of reducing supply uncertainties. Both Wal-Mart and Dell share POS data with their suppliers so that their customers can better forecast the demand and ensure a continuous flow of supply to both Wal-Mart and Dell.
Other forms of strategies to manage demand uncertainties and variations adopted by various industries and companies are:

a. **Collaboration with Customer.** Cisco through its free consulting services attempts to understand its customer better, while Lucent does it through its Supply Chain Network (SCN) and P&G through its Customer Business Development (CBD) groups. P&G also obtains POS data from retailers like Wal-Mart and through the information, P&G can reduce the “Bullwhip” effect and better respond to customer demand.

b. **Everyday Low Price.** Both P&G and Wal-Mart uses Everyday Low Price strategy to minimize demand variations due to forward buying from promotions.

c. **Long Fulfillment Lead-Time.** Cisco uses a long fulfillment lead-time of twenty-one days to minimize its demand variation though its internal fulfillment lead-time capability is much shorter than that.

d. **Quick Response.** Similar to Zara’s ability to response quickly to market changes and demand with ten to fourteen days, P&G adopted an efficient consumer response strategy to ensure efficient product mix, efficient new product introduction, efficient promotion and efficient replenishment, while Wal-Mart uses Inforem, an IT system, to automate replenishment process for their retail stores.
e. **Half-Batch Production.** Similar to Zara for small batch production, Gillette uses a half-batch production method. The lower production quantity allows it to better match its supply with demand.

f. **Postponement.** Gillette employs postponement techniques for its finished goods packaging, while Zara postpones 50% of its fabric purchases by having grieg fabric on hand.

### 2.2 Review Summary

In summary, the product structure, if it can be modularized, provides the companies an option to “Make-to-Order”. A good example is the computer industry where computers can be assembled to order and Dell chose the MTO option while IBM (now known as Lenovo) chose the MTS option for its Personal Computer (PC) business.

The increase in outsourcing has led to increased importance of supplier and customer collaboration to effectively reduce supply and demand uncertainties, respectively.

Other form of strategies used to manage demand uncertainties include having everyday low price, promising “long” fulfillment lead-time, having an agile organization to better respond to changing demand, having smaller production batches and the use of postponement.
The past SC 2020 theses have limited information on the various industries practices on demand planning, supply planning, and demand and supply integration. Research into white papers and presentations done by consultant firms, software companies and research institutions, and phone interviews with industry experts have been conducted to fill the gap.
3 Sales and Operations Planning Overview

In this chapter, the definition of Sales and Operations Planning (S&OP) is examined. Further, it explores the importance of S&OP and the history and evolution of the S&OP processes.

3.1 What is Sales and Operations Planning?

Most companies have termed their supply-demand planning as S&OP. Others may name it as integrated supply and demand planning or even supply and demand balancing. The below discussions provide a working definition of S&OP. Figure 3-1 provides the framework for the discussions.

Figure 3.1: Sales and Operations Planning Overview
Purpose of S&OP. S&OP aims to align the sales, marketing, operations, finance and supply chains plan towards achieving the company strategic objective and goals such as higher profit and higher service level.

Tactical Level Planning. It's planning is done at the tactical level usually on a monthly basis. Strategic planning, which usually looks into an eighteen-month or more horizon provides the strategic inputs into the S&OP process and drive it to achieve the strategic goals and objectives. The deliverables from the S&OP process are sales, marketing, finance, operations and supply chains plans to support future operations.

S&OP Planning Components. In most companies, S&OP comprises of demand planning, supply planning, and demand and supply balancing. Some have included performance measurements as part of S&OP and a few have even included strategic planning as part of S&OP.

a. Demand Planning. These system components support the development of a demand plan and an "unconstrained" baseline forecast that are used as demand-side inputs to the S&OP process. Quantitative forecasting is done based on marketing and sales inputs such as past sales, promotional activities, marketing efforts, new product introductions and price changes. Market intelligence is gathered from field sales and marketing personnel, as well as from downstream customers who share their forecast or Point of Sale (POS) data. For example
Wal-Mart shares its POS data with P&G through its Retail Link, thus allowing both to leverage Collaborative Planning, Forecasting and Replenishment (CPFR).

b. **Supply Planning.** These system components support the development of supply plans that are used as the supply-side inputs to the S&OP process. As such, they help to generate the inventory, procurement, logistics and distribution, and capacity and production plans that will be followed to best meet the "unconstrained" baseline demand forecasts. If, however, the supply capacity is insufficient to meet all expected customer demand, this results in a "constrained" demand plan.

c. **Demand-Supply Balancing.** This is the part where decisions are made on the right product mix, right production quantity, right allocation to its customer to achieve the right incentives and rewards. Supply constraints such as capacity constraints or supplier’s limitations are managed at this stage.

**Cross-Functional Team.** The S&OP process involves members from all functional groupings including the demand forecasting organization, marketing, sales, finance, operations and supply chain.
Table 3.1: S&OP Team Members’ Roles and Responsibilities

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Roles/Responsibilities</th>
</tr>
</thead>
</table>
| S&OP Lead              | • Facilitates the S&OP meetings  
                          | • Develops and distributes the S&OP meeting agenda and notes  
                          | • Documents all issues brought up during the S&OP meeting. Updates and tracks the Issues  
                          | • Provides production plan / demand plan / Inventory status summary |
| Sales Team             | • Provides input on Forecast and customer insight  
                          | • Provides actual sales |
| Manufacturing Rep      | • Provides input on manufacturing schedules/constraints (including technical and packaging) and commits to changes  
                          | • Provides input on manufacturing schedules/constraints  
                          | • Coordinates with Procurement and provides material inventory and lead time information |
| Finance Rep            | • Brings Finance “in the loop” on S&OP decisions and facilitates feedback for consolidating financial performance  
                          | • Provides financial expertise to assist in making S&OP decisions  
                          | • Provides input on the impact of decisions to financial performance |
| Marketing/Business     | • Provides input on market trends and customer service levels  
                          | • Provides sales trend and achievement |
| Analysis Team          |                                                                                                                                  |
| Product Marketing      | • Provides input on new product development and promotion programs plan  
                          | • Provides market intelligence |
| Team                   |                                                                                                                                  |
| Shared Roles           | • Track S&OP team performance metrics, determine root causes for poor performing metrics and tackle root causes. |

Source: Accenture
Figure 3.2: A Typical Sales and Operations Planning Process Flow

Number of Meetings. In most companies, the demand review and supply review meetings are conducted on a weekly basis and an executive level S&OP meeting on a monthly basis. In the weekly demand meeting, the demand forecasting organization with the sales, marketing and supply chain departments will develop the unconstrained sales plan. This will be handed over to the weekly supply review meeting to prioritize the allocation of supply to the sales plan. The weekly supply review meeting is usually represented by members from operations, supply chain and finance so as to ensure the right quantity of the right product is manufactured and allocated to the right customer, so as to give the company the right incentives and rewards. On a monthly basis, the S&OP meeting attended by the executives from the sales, marketing, finance, operations and supply chains, will be held to review last month’s performance and make tactical decisions for the next month, as well as further out in the eighteen to twenty-four months horizon.
S&OP Meeting Activities. There are pre-S&OP meetings, S&OP meetings and post-S&OP meetings activities as follows:

a. **Pre-S&OP Meeting Activities:**
   - Conduct weekly demand and supply planning.
   - Measure performance and identify gaps.
   - Perform root cause analysis.
   - Identify potential options/alternatives/solutions
   - Identify potential upsides/downsides
   - Prepare an exception-based update and options for decision, for the S&OP meeting

b. **S&OP Meeting Activities:**
   - Review outstanding actions from preview S&OP meetings.
   - Review current month performance.
   - Take actions on proposal to tackle performance gaps.
   - Review actions and risks for the next one to four quarters.
   - Summarize and confirm new S&OP plans, actions, and decisions.

c. **Post-S&OP Meeting Activities:**
   - Follow-up on decisions and plans made during S&OP meeting
   - Factors the decisions and plans into the weekly demand and supply planning.
3.2 Why is it Important?

The increase in systems complexity, new product proliferation, and the shortening of product life cycles has resulted in higher demand and supply uncertainty and variability. Furthermore, a more competitive market place as a result of globalization is driving profit margins down very quickly. These have therefore accelerated the adoption of S&OP as one of the most critical business processes required to enable companies to achieve profitable growth. S&OP strategies accomplish this goal by helping companies to make Right-timed tactical planning decisions on the Right combination of customers, products, and markets to achieve the Right rewards and incentives.

Over the years, the risk and cost of poor decision making in the area of matching demand and supply has increased. In the past, excess supply could result in excess inventory and this can be sold off over time. Whereas for under supply, customers will be driven to select alternative products. The emerging landscape is less forgiving as excess inventories have to be sold off at large discounts, while customers may be lost forever through a lost sale.

S&OP therefore changes the following:

a. **Demand Forecasts.** From different departments working on their own forecasts to all departments working towards a single set of forecasts for use by all departments. This drives company alignment and keeps it lean.
b. **Decision-Making.** From decision-making based on limited information within departments to decision making based on company-wide inputs. This results in more company goal and objectives-driven decision-making, balancing all departments’ interests.

c. **Planning.** From departmental-based planning to cross-functional team planning focusing on achieving company goals and objectives. This results in global optimization rather than local optimization.

S&OP therefore enables a company to **optimize globally** towards its **goals and objectives**, yet with an **aligned and lean structure**.

### 3.3 How has it been evolved over the years?

While Oliver Wight had claimed that S&OP started as early as 1984 in the form of MRP II, AMR Research traced it back to 1987. The lack of a consistent process definition and high profit margin in the 80s and 90s limited the adoption of S&OP.

As profit margins were being squeezed in the beginning of 2000, companies began to look at reducing cost while increasing sales and service levels. Consultancy and software companies begin to see the potential of marketing the matching demand with supply optimally as the way for a company to grow profitably. This was helped by the Y2K
scare where companies rushed to upgrade their computer systems and hence established a ready platform to implement S&OP software and tools that can facilitate the processes.

The key changes of the S&OP processes over the past years are:

a. It has evolved from a four-step to a nine-step process as shown below in Figure 3.3:

Table 3.2: S&OP Evolving from Four-Step to a Nine-Step Process

<table>
<thead>
<tr>
<th>1990s</th>
<th>Early 2000</th>
<th>DDSN Leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop a demand forecast</td>
<td>Collect sales input</td>
<td>Collect sales and market input</td>
</tr>
<tr>
<td>Balance demand with supply</td>
<td>Develop a forecast</td>
<td>Develop a demand plan</td>
</tr>
<tr>
<td>Consensus meeting</td>
<td>Collect sales and market input</td>
<td>Develop a demand plan</td>
</tr>
<tr>
<td>Publish the plan</td>
<td>Develop a constrained supply plan</td>
<td>Demand consensus refinement</td>
</tr>
<tr>
<td></td>
<td>Review and gain agreement through a consensus meeting</td>
<td>Shape demand based on what-if analysis on demand for supply</td>
</tr>
<tr>
<td></td>
<td>Publish the plan</td>
<td>Develop a constrained plan by supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What-if analysis by supply to determine trade offs on the measurements and identify demand-shaping opportunities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review and gain agreement through a consensus meeting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Publish the constrained plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measure and communicate the plan</td>
</tr>
</tbody>
</table>

Source: AMR Research, 2005

b. It has evolved from a supply chain based process into a business process involving marketing, sales, operations, supply/procurement, and research/development.
c. Shorter product lifecycles, higher product mix, and higher product volatility are all putting pressure on margins and accelerating the importance of S&OP processes to drive company goals and objectives including financial performance.

d. With the advancement in technology and the increase in S&OP software, the generation of an S&OP plan now takes about four to eight hours instead of a week.

e. As the clock speed shortens and technology reduces the planning cycle, S&OP has moved from a quarterly process to a monthly process. This helps to develop plans more accurately tied to the dynamics of supply and demand.
4 Sales and Operations Planning in Nine Industries

4.1 Consumer Product Group

The CPG industry can be broadly categorized into: Food and Beverage, Footwear and Apparel, Cleaning Products, Consumer Electronics, and Personal Care Products, including cosmetics and toiletries. Standard & Poor’s industry surveys estimates the nondurable goods global market size is about $156 billion (Rah 2005).

The CPG industry is characterized by heavy competition and rapid new product introduction despite steady global demand. As the quality from the private label brands improves, the private labels compete aggressively with the traditional brands. Coupled with the limited market size, since the consumption of CPG goods is rather steady, and concerned with product expiration, CPG companies have been engaging in strong advertising, marketing and promotions to shape the product demand. To capture a bigger piece of the pie and to increase the size of the market, companies have engaged in incremental innovations and complete innovations. This has resulted in a rapid introduction of new products and the shortening of the product life cycle.

CPG companies use S&OP to sense and shape demand. Point-of-Sale (POS) data are gathered from customers either through Vendor Management Inventory (VMI), CPFR or any collaborative effort with its customers to share POS data. With the POS data, more
accurate demand forecasts can be made, and these can be used to determine effective promotion strategies and the timing of new product launches.

As CPG companies are less capital intensive, they have a high variable cost and low fixed cost structure. They therefore, are not as concerned as companies with high capital cost investment on asset utilization. The production can be varied to meet the forecasted demand quantities subject to economies of scale.

CPG companies usually look out into the twelve to twenty-four months time horizon for their S&OP process as this is usually the timeframe which the maximum capacity of the companies cannot be changed significantly. As CPG companies are more material and distribution-based, the increase in capacity is usually the result of adding a factory, distribution centre or warehouse.

4.1.1 Demand Planning

Gillette collaborates with some key customers to obtain POS data. These data are used to improve their demand forecasts, which trigger production. Meanwhile, Gillette is experimenting with methods of using POS data to trigger production directly as they move towards a demand-driven planning environment. Similarly, P&G still does forecasting, and uses the POS data which is captured in its consumer driven supply network (CDSN). CDSN captures the POS data and distributes the relevant data to all network partners, including stores, warehouses, retailers, manufacturers, and suppliers.
Essentially, CDSN improves forecast accuracy with the usage of POS data and sharing of data with partners.

P&G introduced a value-pricing program to provide low prices everyday, reducing the need for promotional pricing which caused the inefficient forward-buying of retailers. Instead, it shapes the demand by heavy marketing spending and branding efforts. P&G also initiated Customer Business Development (CBD) teams to be located in the customers’ sites in order to work closely with them in sales, product supply, marketing, finances, and other systems. It was started as a partnership relationship with Wal-Mart, and the company now has more than eighty CBD teams to serve its strategic customers.

### 4.1.2 Supply Planning

For Gillette supply planning, it has around 80-90% of the orders that are made-to-forecast, under the eighteen-month planning horizon, with the remaining orders that are pack-to-order. The average customer order fulfillment time for regular orders is about six days, while the fulfillment time for pack-to-order orders is about fifteen days. The master production schedule covers eighteen months, and the production plan is divided into three periods: firm period, slush period, and liquid period. It begins with the liquid period which is the most flexible period when the factory has a general idea of orders expected to come in, but does not commit to vendors and suppliers yet. Then comes the slush period when planners spend time adjusting the schedule to variability in demand and
supply. The firm period is about three weeks before the start of production where no change to the production schedule is allowed.

Gillette had also implemented the half-batch production for some of their products. This led to the lowering of average inventory holding and thereby lower inventory holding cost. Nonetheless, this is traded off with the increase in the number of changeovers and they are currently working to shorten the changeover times.

Similar to the Gillette effort on smaller production batch, P&G strives to have “Just-in-Time” production, one that produces every item every day. They have improved from their monthly production of every item to almost weekly production of every item. This reduces the inventory holding throughout the entire supply network.

4.2 Retail

Generally defined, the retail industry is the composition of retail outlets that sell merchandise to consumers. Retail includes both products and services sold in stores, through catalogs, and through the Internet. The industry includes all products that are sold in the following retail outlets: Department Stores, General Merchandise Stores, Hypermarkets and Supermarkets, and Specialty Stores. Based on the S&P General Retail Industry report that was released in May 2004, retail sales in 2003 equated to $3.40 trillion (Chiles and Dau 2005)
In S&OP, retail companies are more concerned with demand forecasting. They use POS data and statistical models to forecast sales and make decisions on when to order and how much to order. They are generally concerned with seasonality, pricing, promotions and marketing. On the supply planning end, retailers aim to share POS data with their strategic suppliers so as to reduce the replenishment lead-time and improve product on-shelf availability.

4.2.1 Demand Planning

The industry is more concerned with getting the right forecast and therefore the importance of obtaining accurate and timely POS data. The industry is unique in getting the POS data direct but the challenge lies with getting useful data, accurately and timely, and to manage the massive amount of data for useful trend analysis and forecasts. For example, Wal-Mart invested approximately $4 billion in developing IT Retail Link. One of the major functions of Retail Link is to store the massive amount of data including POS data, average price, current inventory by store, and current on order quantity. The information can be viewed by day, by week, by store, or in any other combination, as well as by day, by Discount Store, and by SKU. This information is key to Wal-Mart’s ability to forecast accurately.

4.2.2 Supply Planning

For supply planning, the industry is more focused on collaborating with its suppliers. For example, Wal-Mart uses its Retail Link to share data with vendors and to aid in shipment
routing assignments. Suppliers are given large amounts of raw data concerning their product sales in Wal-Mart Stores and the information can be downloaded into the vendor’s data managing system and manipulated and analyzed in any way that would aid the vendor in managing its own products. Through these collaborations, Wal-Mart hopes that the vendors can improve their supply chain and provide a higher service level to Wal-Mart at lower cost. This, in turn, will allow Wal-Mart to provide everyday low price items to its customers and with high fulfillment rates.

4.3 Apparel/Footwear

The apparel/footwear industry addresses the fashion apparel aspects of the industry such as ready to wear apparel, footwear and accessories. Historically, the industry is characterized as low technology and labor intensive, with low-priced imports and competes primarily on cost. As the items get more fashionable, the demand uncertainty, product differentiation, price, and product life cycles for individual SKUs increase.

The apparel/footwear industry is characterized by long production lead-times, short selling seasons, and difficult demand forecasts complicated by sizes and colors matching. Most apparel/footwear companies lower production cost by outsourcing production or purchases of components, such as fabrics to low-cost countries like Indonesia and China, thus increasing the production lead-time. In general, apparel/footwear items can be classified as fashion items and evergreen or classic items. Fashion items have a short selling season while evergreen items have a rather steady demand over a number of years.
usually. The forecast of apparel/footwear is complicated as it faces the sizes and colors issues, making forecasting at an SKU level highly inaccurate.

The industry usually tries to postpone its production by keeping its item in “generic form” till the demand is more certain. For example, Zara keeps 50% of its fabric on hand in greige form so that the long procurement lead-time can be shortened to just a week for dyeing the greige fabric. The shortening of the procurement lead-time shortens the forecast period and hence yields a more accurate forecast. For Zara, they are able to achieve a lead time of four to five weeks for completely new designs and ten to fourteen days for modifications to designs with fabric on hand.

Similarly, Reebok has used risk-pooling and postponement strategy in its National Football League replica jersey forecast and order. Reebok adopted a hybrid strategy of ordering a mixed number of dressed jerseys printed by players’ names but at lower overall cost, and blank jerseys without players’ names but printed at a later stage with a higher overall cost. As the NFL season progresses, teams trade players and players’ popularity changes. The blank jerseys are then used to “produce” the popular jerseys. With postponement and risk pooling, Reebok is able to achieve a high fill rate and profit.

4.3.1 Demand Planning

As explained above, the demand forecast for fashion apparel/footwear is difficult due to the short selling season, long production lead-time and the low demand at SKU level due
to sizes and colors. Though the demand forecasting is difficult, Limited Brands aims to do it as well as it can through S&OP as it considers the lost sale per unit to be too high for their high profit margin products. On the other hand, Zara adopts a strategy of “exclusivity and scarcity” whereby their products are produced in small batches to create the demand greater than supply image to generate the urgency to buy when its customer sees something they like.

4.3.2 Supply Planning

Much of the effort is then to shorten the production lead-time through the use of postponement and risk pooling strategies so that the forecast lead-time is shortened and a more accurate forecast can be achieved. For example, Limited Brands designs its supply chain with the objective of getting the right product to the right place at the right time at all costs. They are prepared to speed up the entire supply chain at any cost as it focuses on sales revenue with high profit margin. Similarly, Zara adopts a “quick response” strategy by shortening its production lead-time.

4.4 Computer

The computer hardware industry is defined as the OEM manufacturers and sellers of finished computers and can be segmented into three broad groups based on the nature of the final products, namely, the personal computers (PC), the servers and the workstations.
For the purpose of S&OP discussion, only the PC products will be considered. In the PC industry, the challenge is to keep sufficient inventory so as to meet customer demand yet not overdoing to the extent that it become obsolete when new products are introduced. The industry is unique in the way that the product is modular and thus allows the option for “build-to-order” (BTO). Dell chooses the BTO option while IBM (now part of Lenovo) largely continues with the traditional “make-to-forecast” model. Unlike the retail industry, customers in the PC industry are more prepared to shop online for their PCs and wait for a few days for the delivery. Most importantly, customers value the ability to customize their own PCs rather than the PCs available at shopping malls.

4.4.1 Demand Planning

In general, Dell is less concerned than IBM in its demand planning as it operates a BTO model. Dell is less concerned with product obsolescence as all the parts for the PCs that are kept in component form can be used to support multiple PC models. Furthermore, Dell and its suppliers have the ability to shape the component demand by its pricing. The key purpose of Dell’s demand forecast is to share the data with its suppliers so that they are prepared to support the demand.

4.4.2 Supply Planning

Dell shares its forecast and daily consumption data as far as thirteen weeks in advance with its suppliers. This is to give the suppliers a better sensing of the market and
facilitates their inventory planning in their storage locations close to Dell. For supply planning, IBM too shares its forecast with its suppliers and most of its suppliers maintain inventory close to IBM facilities.

Dell matches its demand with supply in four consecutive time horizons, ‘one month horizon’, ‘two weeks horizon’, ‘three days horizon’ and ‘daily production planning’. Each planning horizon has its own tasks and objectives. For example, the one-month planning looks at the next month demand forecast with the objective to allocate capacity to meet it. The two-week plan looks at possible components and manpower shortages and work out contingency plans to handle the potential shortfalls. In the three-day planning horizon, overtime requirements are decided, while during the twenty-four hours planning window daily production runs are committed. In addition, Dell manages its shortage on a three weeks time horizon. Short-term shortage is managed by shaping demand or upgrade. In the case when there is long-term shortage of any specific part item, a shortage meeting is called to work out contingency plans.

### 4.5 Telecommunications

The telecommunications industry is defined as those companies selling communications end products such as cell phone, wireless equipment and routers. The industry is very similar to the computer industry as technology is developing rapidly but has long production lead-time. The industry is therefore very concerned with getting the right forecast as a wrong forecast could result in excessive inventory and will be extremely
costly to the company. In the 2001 when there was a global down-turn of telecommunications demand and the bursting of the Internet bubble, both Cisco and Lucent accumulated large amounts of inventory and had to write off most of it.

4.5.1 Demand Planning

Demand forecast accuracy is crucial to the survival in this industry as demand is highly uncertain due to the technology advancement. Cisco adopted the strategy of being close to customers and close to the standard-setting bodies in order to have a better sensing of demand. Cisco uses its free consulting services to understand customer needs and demand while it involved itself closely with standard bodies to decide on standards and therefore able to adopt and incorporate new standard quickly. Cisco also uses a long order fulfillment lead-time of twenty-one days to reduce the demand variation. Lucent has similarly used its Supply Chain Networks (SCN) group to be the single point of customer contact to gain intimacy and customer understanding.

4.5.2 Supply Planning

Cisco keeps itself lean by having almost of its production out-sourced so that it is able to response to the changing technology and demand effectively. Furthermore, it has shifted part of its focus from hardware to software. In addition, Cisco keeps R&D cost low by acquiring technology-rich companies and integrating them. In this way, Cisco is keeping its asset cost low in a medium capital intensive industry. Similarly, since the 2001 crash,
Lucent adopted a Virtual Manufacturing Strategy (VMS) by selling most of its twenty-nine manufacturing facilities, while at the same time outsourcing its manufacturing requirements.

4.6 Pharmaceuticals

The pharmaceutical industry is in a highly regulated environment with an important role of preserving human life. The industry is distinct in that it has a long R&D period with a low probability of success for new product development. Nonetheless with the massive R&D in the industry because of the high rewards, rapid new product introduction is a feature of the industry. As the industry faces more regulation, companies usually deal with the national health of each country to introduce its products and the success or failure could mean a drastic change in its demand. On the other hand, once a deal is through, the demand seems more stable.

4.6.1 Demand Planning

The demand forecast usually looks into five to seven years ahead as this is the period from product R&D to introduction. The long range forecast is highly inaccurate as the probability for R&D success is low and the introduction of new products to each country is subjected to the national health approval. However, having the long range forecast globally with a shorter range for each location can improve the forecast accuracy. For example, Lily has a refreshed global thirty month forecast from sales offices, updates the
last three months production performance, reconsiders inventory or changes in anticipated launch dates, and creates a new plan of manufacturing for all products and all sites, while each site focuses inside a six-month horizon.

As the production of medicine is highly regulated, the production is likely to be controlled and restricted to a number of plants. This helps the demand forecasting as individual countries/regions demand can be aggregated.

### 4.6.2 Supply Planning

For supply planning, the long term demand forecast addresses its long term capacity planning while the short term demand forecast provides the parameters for production and supply chain matching. For example, Lilly has a long-range business plan covering the next five years and it is used as the basis for a five-year capital investment plan. Critical to the industry is the need to produce medicine with a “healthy” expiration date so that it can be consumed before expiration. This is a challenge especially for nuclear medicine with short shelf life. This means the demand, production and distribution planning must be well synchronized. Furthermore, medicine that can save lives must have high order fulfillment rate so that no one will be deprived of medicine when it is needed.
4.7 Automobile

The industry has a long production lead-time and with customers not prepared to wait long, it hampers the industry’s ability to “make-to-order”. While the industry is focused on trying to reduce its lead time in order to adopt the MTO model, demand forecasts are crucial for sizing capacity and for sharing with its suppliers in order to have “Just-in-Time” parts delivery, and hence production. There are already moves for dealers to place orders to the automobile manufacturer in two timeframes. The first is to place a quantity order for a generic model of car and the second is nearer to the delivery date synchronized with the production schedule, to determine the “option package”.

4.7.1 Demand Planning

The automobile business is one of the most competitive industries where companies compete in price, quality and innovations. Demand forecasting is important to the industry as the long production lead-time has yet to reduce to a level below customer waiting time. With the competitive nature of the industry, the demand is further complicated with the rapid new product introductions to increase market share, while maintaining price-competitiveness.

4.7.2 Supply Planning

Supply planning is important to the automobile industry as it has high fixed cost structure due to the high capital investment. It takes three to five years for it to increase its
capacity while in the tactical and operational timeframe; it is more concerned with the capacity utilization. Toyota had led the way in the “Just-in-Time” production in the 1990s and this lean production strategy has increased the importance of collaboration with its suppliers to ensure JIT delivery of components. The ability to achieve good asset utilization and lean inventory management ensures the price competitiveness of the company.

4.8 Petroleum

The petroleum industry capacity is limited by the oil sources around the world while the demand of petroleum has been increasing steadily over the years. Demand for petroleum is increasing but stable. Long range forecasting is done so as to assess the need to increase exploration activities in search for oil in order to increase long term capacity. Companies in the industry use price to actively shape the demand in order optimize profit margin.

The production is constrained by short-term capacity. The industry has a long lead time to adjust its capacity. With a high fixed cost investment, the industry tries to maximize its utilization. However, as petroleum is a non replaceable resource, the asset utilization is subject to balancing the demand, supply and price in order to maximize profit.
4.9 Aerospace

The aerospace industry has a very long production lead-time of nine to eighteen months. However, as the customers of this industry are willing to wait that long for the planes, the aerospace companies like Boeing are able to adopt the “Build-To-Order” model whereby planes are being built only after orders are placed. The industry is very heavy in its assets and has a long lead-time for changing its capacity. This explains the reason why some companies like Boeing and Airbus in the industry, have a long range forecast of as long as twenty years.

The industry has a long order fulfillment lead-time. For example, Boeing needs its customer to confirm orders eighteen to twenty-four months in advance though its production lead-time is nine to eighteen months. As the capacity cannot be changed in the short run, accepting or rejecting an order is driven by the capacity.

Being in a high fixed cost industry, companies are mostly concerned with asset utilization as the main priority. They are concerned with generating demand to meet the current capacity and need not over generate the demand beyond capacity as they cannot meet the excessive demand in the short term. Forecasting down the supply chain is also important for the industry. For example, Boeing tries to produce accurate forecasts that would enable component suppliers to be more informative to the raw material suppliers. This in turn, reduces order lead time in an area where bottlenecks occur as all manufacturing industries compete with the aircraft industry for resources.
5 Sales and Operations Planning Synthesis and Analysis

This chapter will compare and contrast how industries use S&OP, determine the “best” practices for S&OP and their underlying principles, and finally discuss on the macro factors that have shaped S&OP in the last ten to fifteen years.

5.1 Similarities

From Chapter four, it can be deduced that the industries studied have the following similarities in the way they adopt S&OP:

Alignment to achieve a set of company goals and objectives. Across the industries, companies use S&OP to align processes, systems and decision making towards the company goals and objectives. For example, Wal-Mart’s corporate strategy has been to be the everyday lowest-priced retailer. From the demand planning end, Wal-Mart uses everyday low price to have consistently high demand with low variation. Wal-Mart also avoids the costs incurred from having to heavily merchandize and promote products. From the supply planning end, it shares its POS through Retail Link with its suppliers to increase on-shelf availability and increase inventory turn. These result in high fill rate, and high sales revenue with low inventory holding costs.

Similarly, Dell’s corporate strategy has evolved into being the highest value-to-cost provider of personal computers and accessories. It keeps its prices low by direct sales,
while allowing customers to customize their PCs. From demand planning, Dell is aggressively shaping its demand through pricing in order to balance demand and supply. For example, component A1 may be selling very well and its inventory level has run low while component A2, a compatible substitute for A1, is not selling as well and its inventory is building up. Dell will raise the price for component A1 and reduce the price for A2 so that demand for A1 will drop while demand for A2 will increase. In the computer industry where new product and components are introduced rapidly, Dell and its suppliers avoid technology obsolescence very well through shaping the demand for its parts through pricing and thus can pass on these savings to the customers. In the supply planning, it shares its POS data with its supplier to improve fill rate with optimal inventory level.

**Demand Planning.** All industries are concerned with demand planning though it may be more important for those whose operating model is “make-to-forecast” and have high lost sale or obsolescence cost. Even for aerospace industry and Dell which operate with a “make-to-order” model, the long range forecast is essential for capacity planning while the short term forecasts are necessary for the suppliers to provide higher service level.

**Balancing Demand and Supply.** All industries need to balance the demand and supply though some may view demand as more critical, others supply as more critical, or even both as equally important. The ability to balance the interest of the marketing, sales, operations, supply chain and finance in order to achieve a company’s objectives and goals is an evergreen issue.
Cross-Functional Team. The ability to balance supply and demand necessitates cross-functional participation in the S&OP process in every industry.

5.2 Differences

The differences of the S&OP process adopted by the various industries are as follows:

Supply Planning. The industries can be roughly differentiated by the percentage of capital/asset to the entire organization cost. From the accounting perspective, it is the ratio of fixed cost to variable cost. The higher the ratio, the more capital intensive is the industry. Confirmed by the industry experts, the industries can be ranked as Retail, Apparel/Footwear, CPG, Computers, Telecommunications, Pharmaceutical (including R&D investments as capital investments), Automobile, Petroleum and Aerospace in ascending order of capital intensiveness. It can be further implied that the more capital intensive an industry is, the more it is concerned with asset and capacity utilization and therefore needs to focus on supply planning. For example, both aerospace and automobile are extremely concerned with its asset utilization.

Time Horizon. Furthermore, it seems that the time horizon is correlated with the capital/asset build up lead-time. The aerospace and petroleum industries have the longest capital build up lead-time and therefore their S&OP processes consider a time horizon as long as twenty years for the aerospace industry and about five to ten years for the
petroleum industry. The pharmaceutical industry has a long horizon of about 7 years as the process in researching into new medicine and getting it approved for use is within this timeframe.

Collaboration with Customers. Companies with “make-to-forecast” operating models are more concerned about collaborating with its customers than companies with “make-to-order” operating model as the ability to obtain accurate and timely POS data can result in more accurate demand forecast. For example, P&G collaborates with Wal-Mart and obtains the Wal-Mart POS from the Retail Link system.

5.3 Comparison Summary and Analysis

In summary, the comparison between the industries is shown in the below figure:

Figure 5.1: Summary of Cross Industry Comparison
Figure 5.1 x-axis shows that industries can be generally clustered into low, medium and high capital intensive industries. The Retail, Apparel/Footwear and CPG are clustered into the low capital intensive industries and therefore more concerned with demand sensing and shaping. The objective is to sense the demand, forecast it as accurate as possible and then shape the demand through marketing, sales and promotion to achieve the desired sales and profit. For example, Limited Brands in the Apparel/Footwear industry is focused on getting the right item to the right place at the right time to minimize lost sales, as the cost of lost sales is extremely high. Furthermore, they are focused on shaping the marketing trends and fashions through its marketing and promotion efforts, and this usually created demand that in the first place did not exist.

For the industries in the medium to high capital intensive clusters, they are more concerned with asset utilization as the asset cost is comparatively higher. They therefore attempt to shape the demand to their short term capacities with the objective of maximizing their profits. These companies also have a longer forecast horizon, a timeframe which decisions on their long term capacity can be made. For Boeing, their long range forecasts are as long as twenty years ahead while the pharmaceutical industry typically has a seven year forecasting horizon as this is the duration from R&D to new product introduction.

In the telecommunication industry, the companies are typically in the medium capital intensive cluster. Cisco, however, has most of its manufacturing outsourced and therefore can be considered as "low" capital intensive company. Similarly, Lucent had
aggressively outsourced their manufacturing plants, warehouses and distribution based on its “virtual manufacturing” strategy and had since moved to become a “low” capital intensive company. By outsourcing, Cisco and Lucent are effectively reducing its capital cost by increasing its supply lead-time.

The y-axis of Figure 5.1 shows the push or pull operating model adopted by the various companies. In general, companies in the CPG, Pharmaceutical, Automobile and Petroleum industries adopted a “Push” operating model. In a “Push” operating model, companies make decisions on production based on demand forecasts. CPG, Pharmaceutical and Petroleum may be adopting a “Push” operating model more due to economies of scale reasons, while the reason for Automobile industry is because of the long production lead-time, which is simply longer than the waiting time customers are prepared to accept.

Most of the companies in the Retail and Apparel/Footwear industries also adopt the “Push” model to have high on-shelf availability. They, however, are unique in the way that they deal with the end customers directly and therefore do not need to collaborate with their “customers” for getting POS data. For example, Wal-Mart spares no effort in providing its suppliers with POS data so that its suppliers can better forecast the demand and provide higher service level to Wal-Mart, which in turn achieves high on-shelf availability and high sales per square foot. According to Prof. Arnoldo Hax from MIT, Wal-Mart has a $440 sales per sq foot compared to $249 and $221 for Target and Kmart, respectively. This is almost twice as high as its competitors.
For the PC business in the computer industry, Dell chooses the “build-to-order” operating model which is a “Pull” model, while IBM (now Lenovo) chooses the “build-to-forecast” model, which is a “Push” model. In a “Pull” Operating model, companies make decisions on production based on actual demand rather than demand forecast. In a pure “Pull” operating model, companies do not hold finished goods, but only build the items upon orders received. In choosing the “build-to-order”, Dell reduces its demand uncertainty by compromising on economies of scale in production and distribution, and increasing customer order fulfillment lead-time.

In general, companies in the telecommunication industry adopt the “Push” model. Cisco and Lucent, however, have most of its manufacturing outsourced and can be considered as adopting a “Pull” model. The outsourced manufacturing companies are likely to operate in a “Push” model, but both Cisco and Lucent only “pull” stocks from the manufacturing companies as and when required. In this way of operating, Cisco and Lucent minimize their inventory holding, but their performance is heavily dependent on its outsourced companies and sometimes they can be held ransom for higher cost.

For the aerospace industry, it is unique that it has a long production lead-time of nine to eighteen months but the customer are prepared to wait up to eighteen to twenty-four months. This uniqueness enables companies like Boeing to adopt a “make-to-order” model and hence a “Pull” concept.
Collaboration with customers is more of demand planning, while collaboration with suppliers is more of supply planning. Considering this, we can have the following four distinct sectors as showed in Figure below:

**Figure 5.2: Conclusion from Cross Industry Comparison**

**Equally Light Focus.** Companies like Wal-Mart and Metro in the Retail Industry, Limited Brands and Zara in the Apparel/Footwear industry, and Lucent and Cisco in the Telecommunication industry belong to this sector. For the demand planning side, this sector is concerned with demand sensing and shaping while for the supply planning side, it is focused on collaborating with their suppliers through POS data sharing in order to get high service level from its suppliers.
Focus More on Demand. Companies like P&G and Gillette in the CPG industry belong to this sector. For the demand planning side, this sector is concerned with demand sensing and shaping, as well as collaboration with customers in order to obtain POS data for better and more accurate forecasts. On the supply planning side, it is focused on collaboration with their suppliers by sharing their forecasts with suppliers.

Focus More on Supply. Companies like Dell in the PC business and Boeing in the aerospace industry belongs to this sector. In demand planning, they are focused in shaping their demand so that it is close to their short-term capacity. In the supply planning end, they are focused on asset utilization since they belong to the asset intensive cluster. Being heavy in assets also explains the reason for having longer range forecasts as it helps them to decide on long term capacity. These companies are also concerned with suppliers so that they can get their supplies in time for producing the end items.

Equally Heavy Focus. Companies in the Pharmaceutical, Automobile and Petroleum industries are generally in this sector. In the demand planning side, they are focused on shaping their demand to their short term capacity, and they collaborate strongly with their customers in order to have better customer knowledge and accurate POS data. In the supply planning end, they are focused on asset utilization, longer range capacity and collaboration with suppliers.
5.4 “Best” Practices

The “best” practices are classified into three building blocks. The foundation block consists of having the right systems, right processes and right measures so as to produce the right people and right data. With the right people in place and the right data, right decisions can be made and right plans can be formulated and executed to achieve the strategic goals and objectives. The below figure gives a graphical representation of the three building blocks:

**Figure 5.3: S&OP “Best” Practices**
All business activities are driven off the consensus-based “one number plan” which is formulated, used and followed through by the cross-functional team comprised of sales, marketing, operations, supply chains and finance. The plan is realistic and explicitly linked to performance measurements, which are aligned to the company goals and objectives. The plan is a live plan which is continuously being updated, measured and improved upon.

Mark Covas, Director Global Demand Planning Gillette shared his experience in The Journal of Business Forecasting Spring 2006 “When I began my career in Sales, our estimates for customer orders for promotions and new products were always overstated
because we wanted to be sure there was enough product allocated to meet our customer’s needs. When I moved into Marketing we gave Supply Planning a forecast to build inventories to meet upside sales potential, but we submitted lower volumes for our financial commitments. To top things off, Supply Planning would build their plan by discounting what was given to them based on what they thought was realistic demand.” In the current context, such behaviors will probably result in high inventory level with low customer service, and therefore lower profit.

5.4.2 Right People

In the Right People building block, it has the following components as depicted in Figure 5.5.

Figure 5.5: Components of Right People
Leadership Commitment. In an AMR survey, 95% of the companies in the advance stage of S&OP implementation had strong executive sponsorship. The leadership provides the directions, support and resources for the ongoing S&OP implementation.

Cross Functional Team. A cross functional team will ensure that all key departments across the end-to-end supply chain are represented in the decision making processes. The team provides knowledge and expertise to arrive at consensus-based decisions with the organization interest in mind. The team also prepares for the S&OP meeting, participates at the meeting and follow-up after the meeting.

Role clarity. The process can only be successful when there is clear role definition of team members so that team members support and complement each other. For example, marketing and sales must own the unconstrained demand forecasts, while the operations and supply chains must input their production and distribution constraints to it so as to develop the constrained demand forecasts.

Competent and Systems Thinking. People are trained and understand Integrated Supply Chain business processes, knowledge surrounding all key areas of supply chain management, collaboration and team communication, and facilitation skills. More importantly, they understand how decisions from one functional area affect other key functional areas in the company, including supplier and customer supply chain processes. In addition, they understand the business strategy and how to keep decisions and actions in line with strategy.
Empowered to make Fact-Based Decision. Competent people closest to the issues must be empowered to make timely and fact-based decisions in line with company goals and objectives. This shortens the decision making process, increase the timeliness and value of decisions which are critical to the company’s success.

5.4.3 Right Data

Figure 5.6: Components of Right Data

Accurate and timely data which incorporate the inputs from all internal stakeholders as well as the suppliers and customers, is critical in maximizing the effectiveness of the S&OP. All data must be managed, maintained and integrated into meaningful simple report for decision making. Otherwise, the management will be overwhelmed with data
overload. Furthermore, the normal reports can be generated in a fixed schedule while urgent reports can be generated ad hoc so that information is presented in a timely manner to the management for decision making.

5.4.4 Right Systems

In the Right Systems block, the components are depicted in Figure 5.7.

**Figure 5.7: Components of Right Systems**

Aligned Personal Incentives. One of the most important aspects is the alignment of personal incentives to execute the overall “one number” plan at each level, in areas employees have control over. The ability to align incentives will have the dual purpose of achieving both departmental performance measures and company goals and objectives at the same time.
In Figure 5.8, the pentagon perimeter represents the company resources such as finance, people, systems and processes and it can “grow” over time if invested wisely. The lines from the origin to the respective departments represent the departments’ performance measures. The surface area represents the company’s objectives and goals and this is where the company strives to optimize. Now, if the department incentives are aligned to the respective department performance measures only, then every department will drive their own department performance measures. The end result is one which the company objectives and goals being compromised like in the below Figure 5.9, where too much resources have been used in driving sales and too little resources given to finance, operations, marketing and supply chain. The end result is one where the company’s goals and objectives suffered.
Figure 5.9: Scenario whereby Sales Consumed Too Much Resources Resulting in Non Optimal Company Goals and Objectives

Management Information Systems (MIS) and Integrated Decision Support Systems (DSS) Software and Tools. An MIS system is necessary to compile the huge amount of available data and arrange them into meaningful reports for management consumption. The DSS systems can pull data from the MIS systems to generate optimal solutions and conduct “what if” analyses. All the IT systems must be integrated internally and externally to ensure data integrity, as well as enable closed loop decision-making. According to Logility, the speed of generating meaningful S&OP reports with IT has shortened from one week to about four hours. Logility also claimed that its software has the ability to match demand and supply based on the Key Performance Indicators (KPIs) selected and these KPIs are chosen based on the company strategy.
5.4.5 Right Processes

The S&OP Process must be standardized globally so that there is a standard language for communication and alignment in participants’ mental models. The process is designed to facilitate leadership review of demand and supply imbalances, and provide a forum where business decisions that will balance supply and demand processes can be agreed upon at all levels.

According to the Journal of Business Forecasting, Spring 2006, Nike lost $400m in 2000 over a nine-month period because it had under-forecasted some sneakers and over-forecasted the others. If there was a good process in place to monitor and update the demand forecasts, then this would not have occurred.
Most S&OP plans are the result of a number of iterations around assumptions of expected demand and supply performance. Contingency planning studies changes in the inputs which have significant impacts to the demand and supply performance, and work out plans to handle these situations. This gives the company a much more flexible and well understood means for dealing with unexpected – but not unplanned for – circumstances.

The most successful S&OP processes implemented were not treated as projects, but as ongoing initiatives. The companies know that this is a journey, not an event or a project. In AMR research, the most mature companies worked for two to four years to improve their processes continuously and continue to do so.

5.4.6 Right Performance Measures

Figure 5.11 shows the components of the right performance measures as follows:

**Figure 5.11: Components of Right Performance Measures**
Clarity of Goals. A successful S&OP process balances sales and marketing activities with operational considerations towards a clear set of goals and objectives defined by the company strategy. The lack of goal clarity will hamper the S&OP process to balancing towards the right goals and objectives.

Alignment to Strategic Goals and Objectives. Performance measures for different functional areas are aligned with the company’s strategic objectives. Performance measures are a part of “continuous process improvement” initiatives and integrated into the company system and computed regularly. Furthermore, they are reviewed periodically to track for trending, pair with improvement plans, and tied to performance evaluations across company.

Root Cause Analysis. The ability to perform Root Cause Analysis when the performance measures fall short from the target is a necessary step for company to take, in order to meet its goals and objectives. Root Cause Analysis reveals the underlying reasons for falling short and allows a company to take the necessary actions to remedy it. In an Aberdeen survey in Jun 2004, it was found that 30% of the respondents did not have systematic measurement, and only about 10% of the companies performed root cause analysis as shown in Figure 5.12 below.
Shared Ownership. Common performance measures are jointly owned by all departments so that they balance their department performance measures with that of company performance measures. The right balancing of focus will lead to the maximization of the company’s goals and objectives.

5.5 Underlying Principles for “Best” Practices

The two key underlying principles for the “best” practices are Internal Collaboration and External Collaboration.

5.5.1 Internal Collaboration

In the past, most organizations were largely driven by their sales department as it was viewed that more sales revenues represent more profit. This is no longer true as companies begin to rank customers and products in terms of profitability and started to realize that there are “unprofitable” products and customers. With S&OP, a company can
select the right product mix, right production quantity and right allocation to its customers to achieve the right rewards and incentives. It is the ability to balance the supply and demand, and the ability to balance and align the different departmental interests and objectives, from which company goals and objectives can be maximized. The ability to synchronize the entire company operations with its strategy will allow the company to ride the wave of supply and demand uncertainties, but towards its vision.

**Figure 5.13: Examples of Giving Departments Relative Weightage to its Performance Measures in order to achieve Balance**

<table>
<thead>
<tr>
<th>Equally Light Focus</th>
<th>Focus on Supply Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Equally Light Focus Diagram" /></td>
<td><img src="image" alt="Focus on Supply Planning Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Focus on Demand Planning</th>
<th>Equally Heavy Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Focus on Demand Planning Diagram" /></td>
<td><img src="image" alt="Equally Heavy Focus Diagram" /></td>
</tr>
</tbody>
</table>
5.5.2 External Collaboration

Collaboration with a company’s suppliers and customers reduces the supply and demand uncertainties. This results in a reduction of the “Bullwhip” effect. Collaborating with its suppliers through Collaborative Planning, Forecast, and Replenishment (CPFR) or Vendor Management Inventory (VMI) improves supplier forecasts, and production and distribution planning. This potentially results in higher fill rate at lower cost and the savings can be passed on. Similarly, the same effect can be achieved by collaborating with its customers for POS data. Such external collaboration enhances the supply chain’s efficiency through improved information visibility and utilization.

Strategic contracting and treating suppliers as the “extended factories” could result in “win-win” partnerships. The ability to jointly work on product development could result in identifying better quality components at lower cost. Furthermore, the fewer suppliers, the higher the contract value and the more reliable the suppliers need to be in order to maintain the business. Finally, the ability to assure suppliers of longer contracts allows them to be more optimal in long term capacity planning. In the end, these translate into more reliable suppliers providing supply at lower costs.

5.6 Macro Factors Shaping S&OP in last Ten-Fifteen Years

The following are the macro factors that shaped S&OP in the last ten-fifteen years:
Technology Advancement. The rapid advancement in technology and computing speed has changed the way business is conducted. It has improved data processing, data accessibility, data storage and data mining. Data can now be entered, exchanged and analyzed quickly and accurately. With Electronic Data Interchange (EDI) and Web-Based Technology, POS data can now be available not only to the retailer instantly; it can be shared with its suppliers and suppliers’ suppliers quickly as well. This provides the opportunity for the end-to-end supply chain to have visibility of the “true” demand and the possibility of reducing the “bullwhip” effect. Furthermore, data can now be assembled into useful reports for fact-based decision-making and Decision Support Systems can be made available to facilitate the decision-making processes. The time to assemble data and prepare useful demand and supply reports for S&OP meetings has therefore been dramatically reduced from a one week process to a four hours process. Technology like Radio Frequency Identification (RFID) will continue to be developed in line with the IT systems, such that the dream of total asset visibility throughout the entire supply chain can be realized, and this visibility can further shape the balancing of the supply and demand planning.

Globalization. With IT and Internet access, the world has indeed shrunk. Businesses have moved from country based to regional and global based. With it, competition has been more intense and more choices are made available to the customers. The increase in choices further lead to the proliferation of products and shortening of product life-cycles. In the end, companies are faced with a rapid increase in demand uncertainty and volatility. The ability to reduce the demand uncertainty and its variability could never have been
more important and this trend will continue, and hence the acceleration of the demand planning’s importance in the S&OP process.

**Outsourcing to Low-Cost Countries.** As the low-cost countries have opened up in the recent years, there is a strong flow of manufacturing to the low-cost countries. This resulted in an increase in the supply lead time and its variability, and the supply uncertainty and its variability. A recent survey by AMR Research on contract manufacturing indicates that outsourcing has increased the need to extend the forecast duration for business planning by five to nine months and the new forecast horizon is longer, averaging between sixteen to twenty-four months. Furthermore, the increase of supply lead-time and coordination between companies will increase the complexities of supply planning in the S&OP process.

**Mergers and Acquisitions (M&A).** 43% of companies surveyed by AMR emphasized the need for S&OP as a comprehensive business plan to align marketing, sales, and operations activities through acquisitions. These companies see S&OP as one of the most effective means to connect business plans and make operational tradeoffs through the merger assimilation. Companies like Cisco have been acquiring research rich companies as part of their strategy of innovation and introducing new products. Similarly, Limited Brand is buying and selling brands. For these companies, the ability to integrate supply and demand planning of the acquired companies is critical to their success.
6 Sales and Operations Planning Trends

6.1 S&OP Trends

Globalization will continue to increase the demand uncertainty and its variability, while outsourcing to low-cost countries will continue to increase the supply uncertainty and its variability. Coupled with the increase of mergers and acquisition, which increases the need for internal standardization and alignment, the trend to reduce the supply and demand uncertainties, and the greater need for aligning and balancing the different departments and stakeholders’ interests in order to achieve company strategic goals and objectives will continue. Therefore, in S&OP, the need for greater internal collaboration among all the department, and greater external collaboration with customers and suppliers is where maximum value can be created in the entire business, not just within the supply chain.

S&OP will continue to grow and mature as the industries search for areas to improve their profitability. According to Dr Larry Lapide’s four-stage S&OP process maturity model as seen in Figure 6.1, the future of S&OP will be one of event-driven meetings rather than periodic meetings. Furthermore, the processes are aligned internally and extended to the customers and suppliers through collaboration, and the resulting supply and demand plans. These processes are enabled by advanced technologies, integrating real-time information from both internal stakeholders and external partners, synthesized and analyzed to generate robust and timely demand and supply plans, and “real-time” key performance measures in dashboard format, with options and scenarios for decision making, and contingency plans.
6.2 Further Research Areas

This research has identified the best S&OP practices and their underlying principles. The ability to reduce both demand and supply uncertainties through internal and external collaboration, and ability to balance demand plans and supply plans with alignment to a company’s goals and objectives, are the underlying principles.

Future research efforts can expand on these principles into execution steps for company to take in the implementation of S&OP. Alternatively, a more in-depth study can be conducted into the right S&OP approach for companies falling into the sector of Equally

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**Figure 6.1: A Four-Stage S&OP Process Maturity Model**

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No Process</strong></td>
<td><strong>Rudimentary Process</strong></td>
<td><strong>Classic Process</strong></td>
<td><strong>New Process</strong></td>
</tr>
<tr>
<td><strong>Informal Meetings</strong></td>
<td><strong>Formal meetings</strong></td>
<td><strong>Formal meetings</strong></td>
<td><strong>Event-driven meeting</strong></td>
</tr>
<tr>
<td>• Sporadic scheduling</td>
<td>• Routine schedule</td>
<td>• 100% attendance and participation</td>
<td>• Scheduled only when demand and supply don’t align</td>
</tr>
<tr>
<td><strong>Disjointed processes</strong></td>
<td>• Spotty attendance and participation</td>
<td><strong>Integrated Processes</strong></td>
<td><strong>Extended processes</strong></td>
</tr>
<tr>
<td>• Separate, disjoint demand plans</td>
<td>• Joint adjustment of demand baseline and rough cut capacity plan</td>
<td>• Demand and supply plans aligned</td>
<td>• Collaboration in aligning demand and supply plans</td>
</tr>
<tr>
<td>• Supply plan not aligned to demand plans</td>
<td>• Supply plan aligned to demand plans</td>
<td>• External collaboration with limited number of suppliers and customers</td>
<td>• Demand and supply plans aligned internally and externally</td>
</tr>
<tr>
<td><strong>Minimal technology-enablement</strong></td>
<td><strong>Disjoint planning systems</strong></td>
<td><strong>Technology applications interfaced</strong></td>
<td>• External collaboration with most suppliers and customers</td>
</tr>
<tr>
<td>• Multitude of spreadsheets</td>
<td>• Separate demand planning software</td>
<td>• Demand planning packages and supply planning apps integrated</td>
<td><strong>Integrated technologies</strong></td>
</tr>
<tr>
<td></td>
<td>• Separate rough-cut capacity planning software to produce MPS</td>
<td>• External information manually brought into the process</td>
<td>• An S&amp;OP workbench</td>
</tr>
</tbody>
</table>

Source: Larry Lapide
Light Focus, Equally Heavy Focus, Focus More on Supply and Focus More on Demand as depicted in Figure 5.2.

6.3 Conclusions

If both demand and supply are certain, then a company’s goals and objectives would be optimal through one-time optimization. The reality is that demand and supply uncertainties and volatilities are ever-increasing and S&OP provides a process and framework to find out about these uncertainties, reduce them, and make the best use of them in striving towards the company vision. Just like in windsurfing, there will be wind and current uncertainties, and the best surfer will understand these uncertainties and make the most use of them as much as possible so that he/she can surf faster and better, and most importantly, towards the destination!

In short, a company with a great S&OP process will be one with synchronized operations internally and externally, and is most agile in adapting to the changing business environment. It will be one that is built to last!
Bibliography


CapeGemini (2005). Demand Management Delivering Superior Results Through Improved Demand/Supply Planning


