S&OP VERSUS PULL BASED MODELS: A CHRONIC CONFLICT?

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Two sets of leading edge operations and supply chain management approaches have gained momentum and followers in recent years: the first are based on predicting future demand and are usually referred to as S&OP-*Sales and Operations Planning*; the second are management models mainly based on reacting to current demand, driven by actual demand, such as *Lean* and *TOC-Theory of Constraints*.

An underlying question has the managerial mind spinning: Which is the best model? Should we subordinate the operations of every process in the supply chain (procurement, production, distribution, commercialization) to the future or to the present? At first sight, it would seem that a chronic conflict is created between both management approaches; thus forcing a manager to chose only one amongst them. Furthermore, this leads to strong positions at every camp that adamantly explain why the contrarian focus is wrong: some followers of S&OP argue that models driven by current demand or actual consumption cannot react well to some situations of variability in demand given that it is necessary to anticipate sufficiently due to the long lead-times and replenishment conditions at every link in the supply chain; on the other hand, some followers and experts of pull based models explain that demand planning or demand forecasting processes are not accurate enough to achieve a high *Service Level* (98%) without causing inventory problems with all its negative collateral effects.

Both arguments are solid and correct, but it doesn´t necessarily lead to a chronic conflict. Most of those that speak against the opposite focus know their own thinking model very well but have not mastered their counterpart´s model. For all the above, and as a result of some opinions that we have read and listened to which argue that there is no solution to this conflict, we decided to write this article.

Let´s begin with the following insight: it is not the same to make medium-term (3 to 18 months) or long-term decisions (more than 18 months) as making decisions for the short-term. Medium and long-term decisions generally have to do with resource planning involving CAPEX, particularly when facing investments needed to expand installed capacity or supply chain infrastructure such as machinery & equipment, manufacturing plants, warehouses, distribution centers, platforms, etc. The rationale is also to design optimal future flows throughout the supply chain to cope with challenges and conditions of the environment. These decisions cannot be made looking at the short term because to optimize these flows, as well as building or redesigning or building one of these distributions hubs doesn´t take a few weeks or months. Therefore, if building a production line or a new plant takes one year, it is necessary to anticipate at least that amount of time and everything must stem from an adequate planning of demand to be able to size the necessary expansion of capacity. This has several implications:

1- These decisions do not require a forecast or a detailed plan at the sku-zone-week level given that, to plan for a new distribution center or a manufacturing plant, it would be enough to know the total monthly production volume needed at that hub-aggregated by family or type, to make the correct decisions.

2- This aggregation makes forecasts at the family-region/country-month level accurate enough to make medium and long term decisions. In this case, aggregation plays to our advantage.

3- Medium and long term decisions are much more related to the time it takes to execute the capacity expansion decision or the period of time for which the optimization, design or investment decision is required. They are less related to the replenishment times for every link in the chain, which mostly deal with the short term.

For the above reasons, those that advocate the definitive death of forecasts or sales plans will not see their dream come true because medium and long term decisions will always need to see the future as base for their analysis and execution (and sales managers and directors will need it as well, as a reference for determining goals); as a consequence, S&OP principles and good practices will continue strong and current.

Nevertheless, the short term is a world with a vey different nature. Most operational decisions for planning and execution live in this world: what, when and how much to buy, produce and distribute. Thus, this is the day to day world for those that work in procurement/purchasing, production and distribution. It doesn´t matter if the company is a manufacturer, a wholesaler, a distributor or a retail chain.

But if you were to apply the principles of demand planning described above to the ***very-short-term*** (the current week) as part of a S&OP process, you would have some uncomfortable conversations and go to meetings where explanations are given about how in spite of having inventory surplus in some products, some other products have stock outs and sales are lost…and the magnitude of these problems is not insignificant. If you belong to an operational area surely you are thinking that everything would improve if the commercial area would only give you more accurate forecasts or sales plans, and if you are from the commercial area your opinion is that having plans with any precision is an occult science bordering on witchcraft; "if the company´s operational processes were more reliable we would be able to sell at ease!". Does this sound familiar?

Even if detailed forecasts with high levels of accuracy were available, service levels and inventory turns would not improve because the synchronization of required components is still impossible due to other variability factors. The problem also is that to produce a perfect forecast is a theoretical impossibility. The perfect forecast is a customer order!. Operational processes make decisions in the very-short-term at the SKU level. In other words, you cannot tell a shoe manufacturing plant to produce this month 100,000 pairs of any shoes it chooses but instead you have to tell it how much it to produce this week for every SKU. The same happens to a buyer from a wholesaler or a retail chain: he wants to know how much to buy of every SKU from every supplier, and when to do it. This means that the level of detail required to make very-short-term decisions (this week/month) is high: forecasts are needed at the SKU-zone-week level. Bearing this in mind, an accurate forecast at the family-region/country-month to make reliable medium and long-term decisions, now becomes a very unreliable tool to make very-short-term decisions at the SKU-zone-week level. It is as if dart player were challenged with throwing a dart and hitting a fairly broad target (say, family-region/country-month) and then, with the same dart, to hit on the mark, at the very center of the target (SKU-zone-week). Even if the dart had better technology, such a throw would be unlikely to hit on the mark. This explains why, even with the best algorithms in our expensive ERPs, planners keep adjusting plans in the very-short-term and experience plenty of process re-work. Not to mention companies that have one digit MAPEs still have large variances when this metric is seen at the SKU-zone-week level. It is precisely at this level where decisions are made about what, when and how much to produce, buy or distribute!.

Therefore, the S&OP techniques and practices that we ponder about and suggest to be used for the medium and long term, provoke a short circuit in the very-short-term. If our aim is to achieve service level differentiation to wield true competitive advantage in the market, when trying to satisfy an important and unmet customer, we need to ALWAYS have the product the customer wants at the place and time expected (neither tomorrow nor at the store at the other end of town), at the right price/cost (including inventory carrying costs, not just cost of product and transport). This is not 95% of the time. That would be like being 95% faithful to your spouse - that is unfaithful! For the very-short-term, a model is needed capable of accepting the fact that we cannot accurately predict demand at the SKU-zone-week level and still be able to achieve service levels higher than 98% with acceptable levels of inventories.

Thus, a disruptive idea emerges: what would happen if our supply chain were capable of reacting at higher speed and flexibility to satisfy any reasonable current demand,

providing a high level of service? The first thing that comes to mind is that if we can react to current demand, then we would not need to forecast the very-short-term, thereby eliminating our dependency from projections for the coming weeks. Secondly, the necessary inventory level would be less because there is ratio between the velocity of lead-times and inventories. Finally, service levels would improve because with shorter lead-times it would be possible to react faster to close the lack-of-availability gap before it´s too late; particularly when demand increases suddenly and significantly, or when replenishment times are disrupted by a broken machine, a landslide blocks a road or there is a public disturbance situation. The velocity of reaction will always be one of the best weapons in the fight against "*Murphy*", who sometimes seems to earn a fixed salary in our companies, creating havoc in our plants or warehouses, or those of our suppliers. (Murphy's Law: What can go wrong will go wrong. Murphy's corollary: Murphy was an optimist).

How would it be possible to achieve the speed and flexibility required? Are we suggesting to eliminate inventories all together? NO! Inventories add value to the value chain as long as they help us to fulfill our value promises to our customers with regards to availability and timeliness, and without inventories it would be impossible to achieve the necessary speed and flexibility that this new idea requires because our total lead time is great than the time the customer is willing to wait.

We should then demand to shorten our lead-times from suppliers, plants or logistics processes? NO! There are other faster simpler ways to shorten lead-times without investing so much valuable effort, money and time. Besides, surely some of those reading this essay have already tried this path and results have been good, but it takes a very long time and the results took a long time to realize. Bear in mind that, in spite of the fact that your closest suppliers have a lead-time of 3 or 4 days, if you buy from them the same SKU only once a month, then you will never be able to have less than 1 month of inventory. Also your availability will not be high because, if demand changes, this product will have to wait several weeks before the supply chain can react to such changes. Oftentimes, by the time it finally reacts, the product is not needed anymore and demand has changed again. The same happens to production plants and distribution processes that have very slow shipping or scheduling frequencies. This is independent of lead-times from suppliers, plants and/or transport, which is where we have been focused for several years with a great deal of effort, time, money and other resources. A REASONABLE way has to be found to increase the frequency for purchasing, production scheduling, and shipping or distribution.

Another fundamental element to increase the speed and flexibility of our operations is to use inventory as a tool to generate a point of decoupling in the chain. But what does that truly mean? An inventory position has to be designed to be able to satisfy a product´s regular demand during its replenishment time, as well as coping with demand variability and its replenishment time, so that any order is received has that inventory position and that it can be shipped COMPLETELY from there. For example: if you are a manufacturer and receive customer orders for immediate shipment, this decoupling idea implies that these orders are shipped from your distribution center, albeit not entered as input to the planning / scheduling process for the plant. The order simply does not directly enter the plant, period! Therefore, what the plant has to do is to replenish the quantity of product missing in the inventory buffer position set as the threshold, considering technical and production constraints (i.e. minimum production batches). If you are a wholesaler or a retail chain, the same will happen in your distribution center, with the difference that the plant isn´t yours but your supplier´s. The positive implications of this approach will be realized by your purchasing or procurement process. And, by the way: the exact same happens to the next link in the chain, that is, your direct customers, distributors or retail chain, who have exactly the same problems with service levels and inventory turns, only of a larger magnitude. They have to face the uncomfortable task of explaining the end customer why the product he wants is not available at that point of sale, at that moment of truth. Therefore, if you find a solution for that constant and important management concern

your customers have that makes them have excess inventory of products they don´t need for sale and, simultaneously, lost sales of products they do need, then your new value proposition will be highly valued by them. Your company will gain a REAL competitive advantage, if your sales force learns to sell it.

But, isn´t this what we do in our companies now? Isn't this idea just safety stock? NO! Think a little more about this: safety inventories do not fully comply with these conditions because they are designed to absorb variability only from one direction, not to service regular demand. This leads us again to forecast or plan that part of demand around the merry go round, here we go again to repeat what was described in previous paragraphs due to the inaccuracy and imprecision of such forecasts at the SKU-Zone-Week level.

On the other hand, methods based on inventory hedging and other Make-to-Stock / Forecasting methods tend to take present or forecasted orders as an input for planning and scheduling their plants and/or purchases and when the order finally reaches the distribution center, it is already committed to a specific customer thus not generating the desired decoupling effect. You cannot take this inventory from your distribution center to ship orders that are coming in because it is already committed to another customer since the purchasing or production process started! Do you see the difference? For this reason inventories oftentimes end up letting demand and its variability into your production or purchasing process, and do not fulfill their function to protect it. Safety stock is a "*paper firewall*"..

Now, if inventory positions did play their intended roll, then the replenishment time of one those inventory positions up to the next position, would be shorter than the current lead-time. Additionally, if the only thing every link in the chain has to do is to replace the missing inventory in the next inventory position, the process becomes simpler and the frequency with which a product is purchased, produced or distributed can be improved, reducing again total replenishment time. With this new and shortened replenishment time, the necessary inventory would undoubtedly be lower, and our responsiveness (reaction capacity) to demand changes will be much higher, which in turn would make service levels to increase considerably, even if your firm faces high variability of demand.

The type of inventory position that is used depends greatly from the type of flow and variability you face. Nevertheless, we all know that for some products demand can increase beyond the variability for which these inventory threshold positions are designed, or replenishment times can be stretch due to an unforeseen event ("*Murphy attacks!*"). Thus a true demand driven model need to have a method that dynamically changes the sizes of these inventory target positions. This is precisely the case when facing variability with a high variation coefficient.

Finally, it is important that you know that demand driven models are not disconnected from S&OP. It makes perfect sense to have S&OP governing the medium and long-term and a demand driven model govern the short-term (the following weeks and the current one) Throughout the time horizon it is necessary to adapt inventory target positions sufficiently in advance if the company intends to make a product promotion or will face seasonal demand. To contain variability and ensure healthy inventory turns and high service levels without changing the operations model, the buffers adapt to these needs. Projected demand at the SKU-Zone-Week level for the short-term is used and when the variability of such projected demand exceeds historical demand in a threshold defined by the variability of demand that current buffers can withstand (i.e. if projected demand is 50% higher than historical demand), then buffers are recalculated. These type of recalculations does not mean the same as the previous model where everything was dependent, because planned or future demand is used only to calculate the inventory target position. The

answer to what, when, and how much to buy, produce, and distribute is still governed by present demand or consumption, not on the projected demand.

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