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Explaining Push and Pull Models

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Two predominant systems in supply chain operations are the "push" and "pull" models. With increasing global operations and expanding supply chains, companies are increasingly turning to "pull" methods, yet it is important to view both systems and the important role each plays. The fundamental difference between a "push" and "pull" model is an important one to understand.

The key differentiator between the two systems involves inventory management. In a true "push" model, stock is pushed up the supply chain generally held at the retail level or an offsite warehouse location to ensure customer demand is satisfied. This limits the occurrence of stock-out. The "pull" system turns this around and moves inventory further down the supply chain, to the manufacturer, supplier or even the raw material processor. Here, inventory is looked at in a different way as we will describe later. The effects of each system greatly influence the profit generation potential of the system, hence we will also look at the influential factors impacting each material flow model. But first, the question is why? Why are more companies turning to "pull" systems instead of "push" models?

The reason is fairly basic. Again, it involves inventory and the addition of flexibility. When we think about these two models in the global context, consider the cost of maintaining inventory in the US or Europe compared to China for example. The cost of inventory holding in China, where much of the worlds manufacturing is now conducted is much lower. By moving inventory down the supply chain, companies create an advantage in terms of inventory holding costs. This means "pull" systems draw demand forecasts in local markets, and plan for in-transit inventory and lead times in overseas delivery to account for customer requests.

The other reason is flexibility, and this influences both global and local operations. If a particular product is not selling, if inventory must be moved from one location to another, if demand patterns change, "pull" systems are better equipped to adjust for these changes. Inventory importantly translates into capital movement, which in the case of a "push" model is less flexible.

With a basic understanding of "push" and "pull" systems, we will now turn our attention to a more detailed look at each. By viewing more closely these two important models, we begin to see where each is applicable in current operations, how the system can be effectively managed and lastly, what are the key factors to consider when determining whether a transition from one model to another will increase profit generation.

Understanding the Push Model

The "push" model is a classic supply chain model, which places product upstream in the supply chain where it is required. Importantly, this commonly occurs before it is needed to ensure demand is fulfilled. What we often see is demand forecasting predictions for the end customer, and appropriate levels of inventory to satisfy those requirements. The model commonly follows a similar pattern throughout the supply chain so that inventory is maintained at each step in material flow process to ensure future demand will be met. Multiple Resource Planning (MRP) is the common scheduling procedure companies implement to

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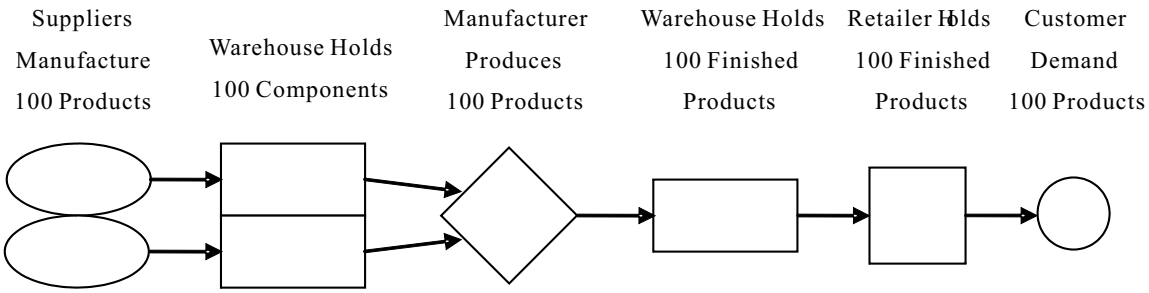
forecast demand and production planning. Here is a basic diagram of the operational flow. In this case we assume 100 products is the average demand:



In the most general sense, the "push" model literally pushes product upstream to ensure each customer in the supply chain has the product they need. Some common product segments we see the "push" model used in are household goods like toilet paper, laundry soap, or commodity products such as oil or electricity. They are products, which in most cases we today cannot live without.

The advantages of the "push" model are found in risk reduction made possible by maintaining higher inventory levels. In the case of low profit margin, high volume products, the cost of stock-out is high, as commonly customers will look to another immediately available option. Think of bath soap. If you go to a store with the intention of buying one type of bath soap and it isn't available, will you wait until the store carries the product? In most cases, the answer is no. Most consumers will purchase another similar product that fulfills their demand requirements. In this case, the out-of-stock soap faces not only a lost current sale, but also future sales as the customer may permanently switch brands. This is the primary reason why particular companies utilize "push" models.

Another advantage of the "push" model is control and predictability for the supply chain. Many companies have historically relied on the model for this reason. If demand for products such as bath soap is fairly stable, then the manufacturing and transportation process can be structured to closely control material movement and holding. Inventory is also much easier to manage, maintain and control as all that is needed is an optimal reorder point at which replenishment occurs. The downstream produces the product to fulfill the replenishment requirements, and the model can be stabilized.

A last potential advantage for "push" models looks at transportation as an economies of scale business. If in-transit inventory is shipped in larger quantities, then it is generally believed the price per unit of shipment will be reduced. Here we consider a different type of inventory, in-transit inventory, with the same purpose of preparing satisfactory product to fulfill demand. The goal here however is to reduce the transportation and logistics cost per unit, the same cannot be said for warehoused inventory. In order to ensure the "push" model is effectively managed, transportation consolidation and efficiency must be closely monitored to ensure profit margins are not lost. What many in the industry have realized is greater efficiencies can actually be achieved by reducing in-transit shipping levels, and hence we will turn our attention to the disadvantages of the "push" model.

The disadvantages of the "push" model are high penalties in terms of lost profits, and higher inventory holding costs throughout the supply chain. Think about obsolete products

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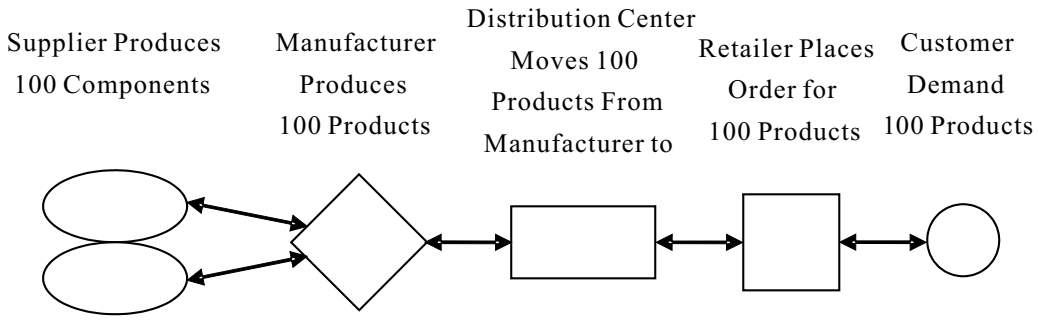
for example. With a "push" model, when a product becomes obsolete, the entire inventory must be sold at a large discount or taken as a loss. Commonly retailers face this problem at the end of a season, holiday peaks, or fashion season. In utilizing a "push" model, the end seller can sometimes over predict demand, forcing the manufacturer to over produce, and the loss incurred comes from both clearing product below the market price, and from the cash liquidity loss from investing in excess inventory.

Reduced flexibility is also a consideration in the "push" system. As production capacity is generally assigned based on forecasted demand requirements, if any changes in purchasing habits take place, overall demand levels or location specific demand levels vary, the model can do little to adjust. As inventory will be held on a pre-allocated basis, further costs will be incurred when moving product between multiple locations. Once a "push" model is implemented, the flexibility of changing the existing system is also very difficult as shown throughout many current industries turning to "pull" models.

Understanding the Pull Model

As customer preferences are increasingly pressuring manufacturing operations, companies are now moving more to "pull" models in supply chain material movement. In the "pull" model, the system is fundamentally changed where production only occurs once an order is placed, instead of maintaining inventory to satisfy the order immediately. This means the downstream operations are triggered by upstream requirements, and hence material flow occurs much differently. Here is the basic design of a "pull" model:



As we can clearly see from the model, inventory in the "pull" system can be greatly reduced. No longer are there warehousing and storage locations between the supplier and manufacturer, and manufacturer and retailer. Instead, product actually moves upstream only when required by the final customer demand order, so inventory in all cases, raw material, work-in-process and final product inventory, is minimized between the different stakeholders in the supply chain. This is a very basic overview, where different models may provide different outlooks on how inventory is managed.

As we begin to understand the "pull" model in this context, we can start to see the advantages created. First, as we have stated, inventory throughout the system is reduced. What we commonly see in "pull" models are smaller batch size orders and an increased delivery frequency. Think about Just-In-Time (JIT). JIT was built around a "pull" model to ensure inventory was minimized, yet replenishment occurs at satisfactory levels so that production operations are not slowed or delayed. With lower inventory, this means lower

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holding costs, increased resource availability in terms of manufacturing space, and greater capital flexibility. With reduced inventory, companies generally have more cash on hand for operational investments, process improvement projects and expansionary development.

Another advantage of the “pull” model is an increase in flexibility. As production is dictated directly by end customer orders, “pull” systems commonly allow a company the ability to adjust to demand changes and purchasing requirements. For example, if customers prefer one color of car over another, the “pull” model is built to produce to the color demands of a specific customer. In the “push” system, various colors are all produced at once and inventory is immediately moved to the dealer's location. In this case, the risk associated with unsold cars is greatly reduced by the flexibility created in the “pull” model.

What we can also see are the disadvantages, primarily a higher probability of stock-out and lower level of control. When considering a “pull” model, a company should always understand that if production is triggered by customer orders, then to minimize the lead time, in-transit inventory must satisfy the customer's immediate needs. This means finished product should already be on its way to the customer, when the customer order is placed. Herein lies the increased risk of stock-out.

Product movement control is also much lower and difficult to manage in a “pull” model. When inventory is maintained onsite, it is fairly easy to control. When inventory is managed in-transit, the difficulties are commonly multiplied and the predictability of delivery reduced. Distribution Centers are a good example as once product enters the inbound docking it is immediately deconsolidated and then reconsolidated for outbound delivery. There is a high level of error that can take place in this process. At the same time, as in-transit inventory is harder to monitor, companies often have a more difficult time tracking inventory levels. This occurs because they only focus on on-hand inventory, not including in-transit inventory. The control over the system must be managed in an entirely different way, and most companies face challenges here when moving from pre-existing models.

Both “push” and “pull” models have their place in current supply chain operations. As we stated early on, each model truly depends on the product characteristics, flexibility required, demand variability, stock-out penalty, lead time, customer drivers and a whole range of other considerations. If appropriately used, these models can create incredibly effective operational material flow systems to minimize costs and maintain increasing revenue and profit generation. If however, transitions occur from one model to the other without understanding the direct implications and potential challenges, many systematic problems can occur increasing lead times and supply chain costs.

Global and local supply chains will continue to adjust and balance their use of these two critical models. In some cases, companies utilize a hybrid model to ensure minimum control while also reducing the inventory costs and increasing cash flow for investment. There is certainly a trade-off here, yet in the end, a company must always consider what is the end goal they are looking to achieve, and how can the supply chain model they use create advantages to reach this goal and allow for continued future growth and success.