

The Supply Chain: Where Push and Pull Are Friends

For supply chain success, abandon dogma and seek a hybrid approach.

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FOR THE past decade, pharmaceutical manufacturers have struggled to cut inventories in their supply chains. On the surface, they have made little progress. Gains in efficiency seem to be swallowed by rising complexity and volatility. The average inventory to COGS ratio in pharma—55 percent—is the same as it was ten years ago. Pharma managers looking for a way out of this situation could learn much from industries like electronics, which have tackled many of the same challenges with considerable success.

Fragmenting markets and increasingly diverse customer demands have certainly added to supply chain complexity. According to our Pharma Operations Benchmarking (POBOS) study, for example, the number of SKUs handled by a typical plant doubled between 2004 and 2009. Complexity is painful for supply chain managers, in part because it makes volatility more expensive to handle: inventories must double to maintain the same service level across twice the number of SKUs, for instance.

Increasing volatility has multiple causes. Some is external: market fluctuations due to supply shortages caused by quality issues, demand spikes driven by pandemics, or the growing importance of tenders. Other volatility is internal, driven by characteristics of the supply chain itself. Even where final demand for products is relatively stable, long production campaigns and large, infrequent customer orders dramatically amplify volatility via the well-known “bull-whip” effect. We frequently see situations where, while final demand fluctuation is only two or three percent, the demand experienced by the packaging plant can swing by 30 to 150 percent, leading to overcapacities in production or high work-in-progress and finished goods inventories.

OPPOSING FORCES

The different drivers of demand volatility seem to call for different responses. In tackling volatility driven by external factors, supply chain managers will often look to increasingly sophisticated planning and forecasting systems, which “push” product into the supply chain according to predicted demand. Production managers, by contrast, frequently cite the success of Lean manufactur-

ing systems, like those pioneered by Toyota, which reduce internal volatility with their appealingly simple “pull” based scheduling systems.

In practice, both approaches have their limitations. Pull systems, which work so well when demand is level, can struggle to respond rapidly to peaks, forcing companies to stockpile costly safety inventories in their buffers or “lean” supermarkets.

THE HYBRID APPROACH MODIFIES KANBAN TO MAKE BETTER USE OF AVAILABLE FORECAST DATA.

Push scheduling theoretically helps to manage volatility, but in practice a plan is only as good as the skills of the people, the master data, and the forecast used to drive it. When the forecast turns out wrong, push systems can quickly run into problems, and costs can pile up. Unfortunately for the proponents of push scheduling, forecasts are wrong as often as they are right. When we assessed the performance of demand forecasts at one pharmaceutical company, for example, we found that the forecast was less accurate than a simple linear extrapolation of sales data 60 percent of the time.

A THIRD WAY

Now some companies have made a deliberate decision to abandon dogma and seek a hybrid approach that combines the best attributes of both push and pull. From lean pull systems, managers can draw on simplicity, strict control of WiP, and the reactive nature of the process. From SCM, they can know how to handle complexity and effectively use available forecast data and robust IT systems.

The hybrid system relies upon the simple kanban approach used in lean production, but modifies it to make better use of available forecast data. Kanbans are visual signals used to instruct an upstream process to manufacture a certain amount of product. They are usually cards, or software messages, but they can even

be the bins used to hold intermediate stage materials. Typically, when a downstream process has used one kanban's worth of material, it sends the kanban upstream to instruct the previous process to make one more.

By integrating forecast data into the pull-based scheduling system, the hybrid approach dramatically increases the system's ability to respond to foreseeable short-term spikes in demand, caused by seasonal fluctuation, new product introduction, or promotional activities, for example. To instruct the system to make additional product in preparation for a forecast peak, planners issue special "disposable" kanban cards for the required additional production quantity. These cards are used only once, "pushing" additional product through the system to temporarily increase finished goods inventories, and are thrown away once production of the additional quantity is complete.

The secret to the effective operation of the hybrid system is deciding how much to make based on permanent versus disposable kanbans. Extensive simulation of different demand scenarios reveals two factors are the main drivers: forecast error and demand variability. Taking it to the extreme, 100 percent permanent kanbans are used if forecasts are poor and demand variability is very low. An empirical formula determines the percentage of permanent kanbans for all intermediate cases. This "trusted" portion of demand can be anything between 50 and 80 percent of the total demand, depending on the product portfolio, the market dynamics, and the behavior of people in the supply chain.

In this way, plants can be confident that all their additional production will be absorbed by real demand. If demand exceeds the trusted fraction, finished goods inventories will be depleted to a critical level, and a new production order issued using permanent kanbans. Wherever specific events lead to demand peaks, disposable kanbans avoid stockouts.

A key benefit of the hybrid approach is simplicity of implementation. Production staff do not need to learn a new system—they just use the standard kanban system whether they are producing to forecast, or to stock. Existing shop-floor control systems can be used and IT integration is straightforward and simple. This simplicity has proved to be a particular benefit for companies seeking to improve supply chain performance in developing regions, for example, where local management may struggle to enforce compliance with more complex traditional supply chain management and scheduling systems.

At companies that have struggled to cope with complexity and demand variability, the effect of the new approach has been substantial. One electronics manufacturer, for example, had switched its entire production to a classic pull-based scheduling system. That change delivered dramatic improvements in service level, inventory reduction, and manufacturing productivity. But problems remained. To maintain service levels in the face of volatile demand, the company needed to keep large component inventories in a huge on-site

AT ONE MANUFACTURER, THE HYBRID APPROACH REDUCED FINISHED GOODS INVENTORY BY 50-70 PERCENT.

supermarket. The problem gradually became worse as increasing SKU complexity drove those inventory requirements ever higher. When it switched to the hybrid model, the company was able to cut finished goods inventories by a third.

As pharma companies begin to experiment with the new approach, the results have been just as compelling. One drug manufacturer used a combined push and pull approach to manage production scheduling across multiple plants, some in developing economies. By replacing its existing supply chain management system with a simple, kanban-driven pull scheduling system, the company dramatically improved its overall supply chain efficiency. At the same time, disposable kanban cards allowed the company to respond to predictable volatility, like seasonal demand peaks, regional plant closures or promotion activities in its OTC business. Overall, the hybrid approach reduced finished goods inventory by 50 to 70 percent, depending on the product line.

In the face of increasing product complexity and rising demand volatility, pharmaceutical companies are struggling to reduce inventory costs while maintaining service levels. Now some companies are overcoming the limitations of conventional supply chain planning approaches by using a new system which combines the simplicity and robustness of lean, pull-based scheduling systems with a vastly improved ability to respond to spikes in demand. 

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