Improving Inventory Replenishment for Retail Product Promotions
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Executive Summary

Inventory optimization solutions are designed to help retailers determine the right product quantities to order to meet expected demand. These solutions calculate inventory policy parameters for the right “order level,” “order up to level” and “safety stock” for a particular product at a particular location, which the retailer’s ERP/SCM system can then use to order inventory.

The problem many inventory optimization systems encounter is that they react to demand only within a predicted lead time. While these solutions do a good job of predicting normal demand levels, they come up short when the retailer runs a product promotion. Buyers typically treat promotions as exceptions in these optimization systems and handle them manually. When product promotions cause extremely large fluctuations in demand, buyers tend to order too much product too late. The result is out-of-stocks at the beginning of the promotion and overstocks at the end.

To successfully address this lead time shortcoming, inventory optimization solutions must be able to anticipate promotional demand ahead of normal lead time parameters so retailers can position the necessary quantities in the distribution channel. This paper reviews the demand requirements for promotions and describes how inventory optimization should accommodate promotional demands to truly optimize the replenishment process.

The State of Replenishment Planning

During a visit to a national grocery warehousing company, I had the opportunity to observe buyers while they were using their new inventory optimization solution. The buyers were happy with the solution’s performance for products that sold at a relatively steady rate. However, it didn’t perform as well for heavily promoted products. And some products fluctuated between overstocks and out-of-stocks.

I asked one of the buyers to show me his pipeline inventory report. The report revealed an obvious problem – inventory spiked suddenly after medium-sized drops the previous week. The buyer explained that he used the report to respond to “unanticipated” advance demand resulting from scheduled ads. I was surprised. The inventory optimization system was supposed to anticipate demand. Yet the warehouse was caught off guard when orders came flooding in before ads.

These grocery buyers were suffering from a shortcoming common to many inventory optimization solutions. At the end of the supply chain, these systems have trouble interacting with replenishment because they are unable to accommodate massive fluctuations in demand at the store level. Although product must be positioned upstream well in advance of these promotions, the normal lead time structure found in inventory optimization solutions only has visibility to one lead time period at a time.
Large Fluctuations in Demand Due to Promotions Create Inventory Problems

One of the key reasons inventory optimization systems are unable to accurately predict promotional demand is that inventory optimization systems typically look at a single demand stream. This practice makes sense for upstream locations that are characterized by a normal flow of information, consistent lead times and plenty of space for inventory volume fluctuations. But customer-facing locations have two types of demand - turn volume and promotional volume.

Turn volume is stock that accommodates typical upticks or downturns in volume. Turn volume can include everyday volume, seasonal volume, and even normal increases and decreases in consumer demand not attributed to a demand event. Turn volume could be an average four- to six-week period that holds within a 10 to 15 percent range of demand.

A large promotion will have a significant impact on inventory optimization and the replenishment system's turn volume and creation calculations to overreact. These traditional inventory optimization and replenishment solutions typically address promotional volume using normal lead times. This lack of foresight means warehouses must expedite delivery. And because these systems don't use separate inventory metrics designed specifically for promotions, they require higher than necessary inventory levels to meet increased safety stock needs over standard turn volume requirements. The result is massive amounts of redundant stock in the supply chain, leading to almost certain overstocks at the customer-facing location. The increase in turn and promotional volumes creates a bottleneck, flooding the supply chain with unneeded inventory.

How Can ‘Optimized’ Replenishment Better Accommodate Promotions?

For inventory optimization to better control inventory, it needs to emulate real buying activities and inventory flows. When warehouses install inventory optimization, they often leave replenishment to the existing purchasing system. This means they take many replenishment activities out of the optimization mix and handle them as exceptions. This method might work in a small portfolio or a single-echelon environment. But once complexities, such as multi-echelon optimization or end-of-chain constraints, are added, inventory optimization starts to fall apart.

To fully integrate with inventory control, management and inventory optimization must be able to react to downstream demand in a consistent manner and improve emulating the actions, space and time constraints found in end-of-supply-chain environments.
The Upstream Reaction

In a multi-echelon environment, inventory optimization and replenishment use the concept of networks. A network is the path a product takes to get to a final customer. In inventory optimization, the path can be either a step toward the customer-facing location or it can “be” the customer-facing location for either a specific product or for a percentage of the product volume. When acting as an internal warehouse, the network responds to demand from downstream customer-facing locations. When acting as its own customer-facing location, it reacts to its own demand signal. These single or multiple demand signals constitute different networks in multi-echelon optimization.

Networks can also facilitate pooling for slower-moving products. When individual customer-facing locations don’t have enough demand, warehouses can pool products at an upstream location and distribute them to a wider geographic region. In constructing pooling locations, the organization sets up multiple networks to deliver product economically.

When organizations employ multiple upstream sources or multiple delivery processes (e.g., multiple networks), various replenishment issues can cause inventory optimization problems. The following are some of these source and delivery issues that the inventory optimization solution must understand and manage.

Multiple Sources

Buyers take advantage of multiple sources from many upstream, sister or peer locations to circumvent supply chain inefficiencies. The choice of sources depends on economics or the type of replenishment required. Since inventory optimization is designed to improve supply chain efficiency, the existence of multiple sources should be irrelevant. But cost variations can affect both inventory policies and replenishment strategies. Inventory optimization should therefore integrate multiple source decisions so that the replenishment process emulates real decisions. Some examples of multiple source decisions that inventory optimization solutions should handle include:

**Bulk purchasing discounts**: Vendors often offer incentives for the purchase of a bulk order from a manufacturing or plant facility. These incentives might include a lump-sum truckload allowance or per-case allowance that makes it attractive to get a large order directly from the source location. Vendors usually do this when the cost of moving product through the chain is higher than the allowance for the customer to pick up the product at the source. It’s a win-win proposition and is cost-effective for both parties.

**Multivendor products**: Many vendors produce the same generic product. When the vendor of choice doesn’t have the product available, potentially disrupting supply, the organization can put in place a rule to evaluate and select the next vendor in line. However, creating multiple vendors in many inventory optimization systems often creates suboptimization due to poor service level metrics and lagging lead times due to constantly shifting vendor expectations.

**Outside staging locations**: Some supply chains have begun to use outside inventory locations to stage promotions. Vendors will move products with a history of
promotional uplifts to a location that serves multiple downstream locations rather than moving large quantities of product through normal channels. This new development is a cross between pooling and plant direct shipments. The vendor flows back and forth between a regular network and a promotional network. The challenge is understanding when to shift between the two networks.

**Alternate sources inside the supply chain:** Often, inventory is overstocked at one location and must be moved to other locations over a period of time to cover demand. This type of inventory leveling is often an ad hoc process where inventory is identified on a scheduled basis. Because the idea is to spread the inventory to the most useful places, inventory can come not only from the recognized network, but from any location. In some supply chains, the default replenishment process is to use internal inventories before going to an external source. This process is called auto-leveling and opens up all kinds of upstream and peer inventory sources. In most cases, this replenishment scheme requires rules that are based on the acceptable logistics cost.

**Multiple Deliveries**

Multiple deliveries mean that a product’s replenishment plan can outstrip space or time limits at the inventory starting point or ending point. At the upper end of the supply chain system, full trucks (or large orders) of product move from one warehouse to the next. Quantities get smaller each step in the supply chain. As you near the end of the chain, replenishment quantities also fluctuate broadly due to customer demand. The question becomes how to space replenishment to overcome space and time restrictions. The inventory optimization solution should address various delivery issues:

**Multiple deliveries for one event:** Often the landing point for a large group of orders does not have the delivery capacity or space to accommodate all products for one event. Multiple deliveries are spaced over a longer time period to move staged quantities to the location to supply product for the event.

**Multiple deliveries over a period:** Vendors and retailers may set quantity commitments. In this situation, there’s an incentive to stage orders over a given period or season. This kind of order creates a multiple lead time assignment that is far different than the normal network lead time.

**Pushing the lead time out for an event:** When large quantities of product are committed to for a promotional event, the buyer must develop a process to secure the large replenishment order from the vendor and then move it to the stores for merchandising. This practice requires a longer lead time than a normal order. Most grocery and consumer packaged goods products work on this premise.

**Pulling the lead time back for an event:** When products, such as fashion or clothing, are seasonal or holiday focused, the system must expedite lead time so product can arrive in stores before the holiday.

To address the real-world needs of replenishment planning, inventory optimization needs to take into account all of these upstream reactions – particularly as the product moves to customer-facing locations. When inventory optimization can address these replenishment challenges, it becomes a much more dynamic planning tool.
Moving Upstream Reactions Into Real Replenishment

An important area where upstream reaction meets real replenishment is when demand splits into turn volume and promotional volume. In most inventory optimization solutions, demand is simply demand. Inventory optimization will recognize a spike in demand and position inventory required to support the event at the predetermined service level. But when promotions occur, demand spikes while reaction lags. The reason is that the system’s constant lead time focuses on normal turn volume. During a promotion, buyers must create alerts and manually circumvent the optimization process to expedite or delay orders to address the event plan.

To overcome this restrictive one-size-fits-all reaction to demand, inventory optimization must recognize the differences in turn and promotional volume. One way that leading-edge installations address this concern is by determining a baseline turn volume, e.g., the product’s normal demand over time. The normal turn volume is based on a consistent set of inventory parameters. For instance, most ordering is set up with a one- to two-week lead time to get the product from one location to the next to support normal demand variance.

Promotional demand must be treated differently due to time and space constraints at the end of the supply chain. The system also needs to understand when promotional demand hits. A good way of identifying the promotional demand is to set the demand signal to recognize when the demand volume jumps a specific threshold over normal turn volume. When that threshold is broken, the system needs to know what to do with the demand.

Let’s take a look at several scenarios.

The Single-Source, Single-Delivery, Short-Term Event

The single-source, single-delivery, short-term event is the most common promotional event. In this situation, demand clearly increases over the normal turn volume baseline. The supply chain doesn’t expect this volume, and upstream locations can’t react without advance warning. For example, a grocery store creates a loss leader feature ad and demand jumps by 70 to 200 percent.

To eliminate the risk of lag time in responding to the promotional demand, the demand signal must be recognized early and communicated. Normally, inventory optimization optimizes the next period. In a promotional situation, inventory optimization needs to work in concert with forecasting and have the ability to recognize multiple demand streams. When demand increases due to a promotion, a business rule must be in place to pull this segment of the demand away and apply it to a different lead time metric.
The Single-Source, Single-Delivery, Long-Term Event

This scenario is the same as the previous one, but with a twist. When a holiday or seasonal upswing occurs, the warehouse must ship a larger than normal order faster than the normal lead time so stores can stage and display the product before the seasonal surge begins. This situation often occurs when there is a long, but normal, lead time due to manufacturing constraints. The holiday volume is transmitted to the production schedule, and the volume is quickly pushed out. This scenario is more likely to occur with staple fashion items like pants or shirts rather than trendy items. The key is to expedite the production/shipment rather than build inventory to cover extremely large orders in a short period of time.

The Multisource, Multidelivery, Single Event

Many inventory optimization solutions find multisource, multidelivery options for a single event a nightmare due to the complex inputs needed to map the product flow. In this situation, direct demand does not come from the customer – it comes through the system until it gets to the plant. If large quantities of inventory are necessary for a promotion, the supply chain must sidestep regional and local warehouses and ship the product directly from the plant.

In this case, the optimization system needs to weigh the cost of shipping massive quantities of promotional volume through a vendor supply chain against picking the product up at the plant warehouse. It must also consider the trigger point and level of savings necessary to open up that plant warehouse for shipments to an outside entity.

To do this, the plant warehouse needs to determine the quantity at which it should shift from its internal warehouse to the customer-facing warehouse. And the inventory optimization system needs to know when that demand volume threshold has been met. The warehouse should also specify quantity breaks to qualify for the business rule exception, such as allowing only truckload quantities and/or multiples to ship out of the plant warehouse.

Of all of the mapping problems, multisource promotional location shift brings the most value. Obviously, the pure play promotional recognition process of pulling promotional demand into different delivery metrics makes important contributions, but shifting warehouse supply can significantly reduce supply chain costs. Using inventory optimization to shift lead time to accommodate inventory production and/or positioning creates savings by reducing expedited orders, improving production scheduling, speeding response to large orders and increasing buyer efficiencies.
Achieving Inventory Optimization Harmony

Buyers are usually skeptical about inventory optimization and replenishment solutions. With so many constraints, optimization is seen as a hindrance, not a help. But it doesn't have to be this way. Inventory optimization works extremely well at upstream inventory locations characterized by consistent lead times and flexible space. And if the optimization system recognizes both turn and promotional demand streams, deals with them separately, and then draws them back together after the promotion, it can deliver flexible lead times.

The result is an inventory optimization and replenishment system that can adapt to the needs of a promotion-based supply chain. No longer will the chain carry too much inventory simply because the optimization solution can't visualize the demand fluctuations in a timely manner. When both turn and promotional demand streams are connected, inventory optimization can bring the merchandising plans into the mix, allowing for better inventory control, lower expediting costs, faster inventory turns and fewer out-of-stocks.