When Push Comes to Pull: It's Kanban

Actual consumption rather than forecasts drive the kanban pull system of replenishment. Implementing it may bring manufacturers closer to their distributors.

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Kanban, the Japanese term for a card used to signal the need for inventory replenishment, has become a term describing the “pull” method of keeping production lines optimally stocked with necessary parts and components - when they are needed and in the right quantity. As a product is consumed in the production process, an order for depleted inventory is immediately placed, either via a kanban card or electronically through a computerized kanban system.

As this system of consumption-driven replenishment proves its applicability across tiers of distribution and supplier networks, it is becoming an increasingly compelling alternative to more traditional Material Requirements Planning (MRP) or “push” style systems, which rely on forecasts to determine what and how much to produce. Although forecasts have proven useful in predicting overall demand, they can be poor indicators of exactly which products will be needed and when. Multi-tiered supply chains push manufacturers further and further from their customers, and forecasts further and further from reality. As a result, information is diluted by each layer in the distribution system, and excessive inventory and costly last minute change orders ripple through the supply chain.

In addition to these issues, manufacturers often complain that they incur large inventory-carrying costs with an MRP system, yet can still run out of key parts. These stock-outs stop production, delay customer shipments, increase premium freight charges and disrupt plant operations by forcing unnecessary and expensive changeovers. In the current MRP world there is often no clear record of how many times stock-outs occur or which parts repeatedly stock-out. Stock-outs also can lead to an overreaction of parts buying, followed by substantial excess inventory, which is often carried for months after a stock-out. Keeping expensive inventory is a waste of resources, including working capital, storage space, and the manpower needed for additional handling.

Unlike MRP forecast-driven replenishment, a kanban system re-orders based on actual consumption at the point of use. The simplest version of this is the ‘two-bin’ method. In this case, an operator has two bins of material. One is being consumed and another full. When the first bin is empty, the operator continues working using the second bin.

The empty bin is sent to the producing station, an obvious signal to replenish. The amount of material per bin is set so a full one returns before the operator runs out. Another example of the kanban process uses the manual kanban card, which travels with its inventory and contains information such as the description of the item or part number, and its location. Each card has a number and is used to trigger an order for replenishment when an item is consumed.

However, manual kanban's benefits are severely limited when an external supplier enters the supply chain. In an electronic kanban system the card information is translated into a barcode that is scanned and electronically communicated at each stage of the replenishment cycle (consumption, shipping, receiving, etc.). In this way, electronic kanban dramatically increases the effectiveness of kanban throughout the supply chain.

While MRP systems push material throughout the supply chain, pull-based manufacturing strives to synchronize production with consumption in real time, which increases on-time delivery performance, reduces stock-outs and costly last-minute change orders. As orders arrive, material is pulled from the end of the final assembly line, which instantly sends an order to final assembly to produce more.

Let's take a quick walk through what happens in a traditional multi-tier distribution network. Based on input from sales, a customer sends a forecast to the manufacturer. The manufacturer consolidates forecasts from several customers, prepares its own composite forecast and publishes the same to its contract manufacturers, suppliers and other players in the supply chain. In this scenario, the manufacturer is forced to carry substantial inventory (either owned by them or their suppliers) at each of the different tier's transaction points. These safety stock buffers are to ensure that stock-outs do not occur if the supplier cannot deliver on time or if there is a spike in demand. In theory, with an accurate forecast, this system should work perfectly. In reality, differences between the forecast and actual demand lead to stock-outs as well as significant excess stock throughout the supply chain.

On the other hand, the value of an electronic kanban system will go up as the number of supply tiers increases or become more complex. The replenishment activity transforms into a series of well-timed interconnected loops between the preceding and succeeding processes. Buffer inventory usually maintained at tier transaction points can be substantially reduced. Material replenishment levels and continuous information flow provides visibility for suppliers and customers. More predictable replenishment results in the elimination of intermediate tiers and their buffer stock in both the customer and manufacturer supply chains. Demand signals flow continuously through the supply chain and are delayed at each tier only as long as it takes to consume or ship material (ideally a day or less).

For example, as end user cartons are being consumed, signals are sent to regional warehouses to replenish those cartons. Regional warehouses carry larger pack units let's say pallets of those cartons. As a regional warehouse breaks open a pallet, it sends order signals to replenish another pallet to the central warehouse. As the central warehouse ships the goods, it sends a replenishment signal back to the respective manufacturer's distribution center.

Depending on the pre-set pack quantity, the distribution center sends the signal to the plant to produce an equivalent quantity of finished goods. The plant could be getting signals from more than one distribution center and therefore could schedule its production based on actual demand across all distribution centers.

As stated earlier, the goal of kanban is to tie the end consumer to the original manufacturer with minimal layers in between. However, geographical distances as well as long cycle times to produce certain parts necessitate intermediate storage locations such as a warehouse at the supplier or a distribution center in between. One of the keys to a successful kanban distribution strategy is to understand where intermediate storage locations are cost-effective and where they have evolved to compensate for a push-based replenishment strategy.

Letting go of the old ways, including an over-reliance on forecasts, is difficult. Many managers go halfway and find themselves with the worst of both worlds. Often, small pilot projects prove successful, but as the pilots are expanded, the amount of material managed and the number of kanban cards becomes unmanageable without new tools. Modern technology has created seamless electronic networks among manufacturers, distributors and suppliers that can be leveraged to implement the kanban process and deliver Just-in-Time (JIT) between the end user and original manufacturer.

Electronic kanban signals carry more information (including delivery location, lot size, cycle number) and occur in real time. Metrics tracked include: actual cycle time vs. planned cycle time; consumption patterns; supplier performance for on-time delivery, replenishment accuracy; when and what to resize; inventory vs. consumption; and inventory aging.

Electronic kanban, by more closely tying the consumer to the manufacturer, helps drive a process where the sale of a product is based on its value rather just its price. The flexibility and responsiveness of electronic kanban promises to drive the factories and distribution of the future to greater efficiencies and profits.

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