ITC INFOTECH

Business-friendly Solutions

Where does **MEIO** fit in your supply chain and how to implement it?

Introduction

Parameters affecting Supply chain are getting more dynamic and hence strategies have to keep evolving. It must be adaptable and agile enough to meet emerging business challenges and customer needs, and it needs to be flexible enough to drive tactical and operational decisions aimed at optimal performance.

Best Inventory Management strategy is a decision most companies review from time to time considering the changing business environment, product maturity and consumer behavior. A typical workflow of Inventory Optimization involves answering most efficient answers to queries: What type of Inventory? At what service level? Thus, how much to stock & where?

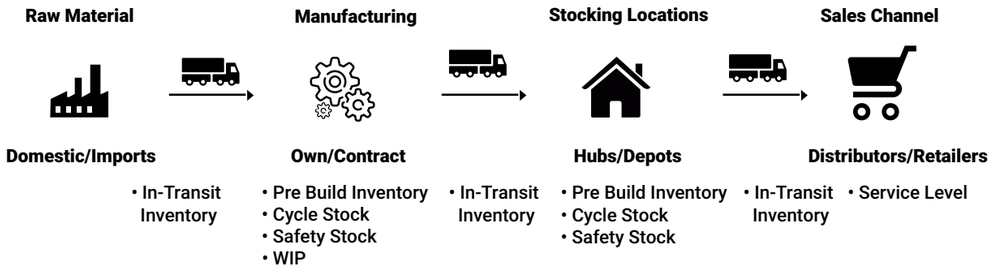
With rising uncertainties in global trade, firms are turning to two types of solutions to handle their supply chain: inventory optimization (IO) and multi-echelon inventory optimization(MEIO) to stay competitive. The very question Inventory planners are asking themselves is about when to continue working with standard Inventory Optimization and when to look at MEIO.

Multi Echelon Inventory Optimization

MEIO is an advanced methodology in comparison to standard Inventory Optimization. Various studies as well as our own implementation experience have shown that a forward deployed inventory policy for FG (employing MEIO) could lead to direct savings in value terms to the tune of 5%-6%

Multi-echelon inventory optimization looks at the end-to-end supply chain as a single system (where for the same product the stock levels at one echelon have dependency on stock level of other echelons). It optimizes safety stock buffers (in WIP/FG form) across the supply chain and considers interdependencies between stages and variables that cause chronic excess inventory, such as long lead times, demand uncertainty, and supply volatility.

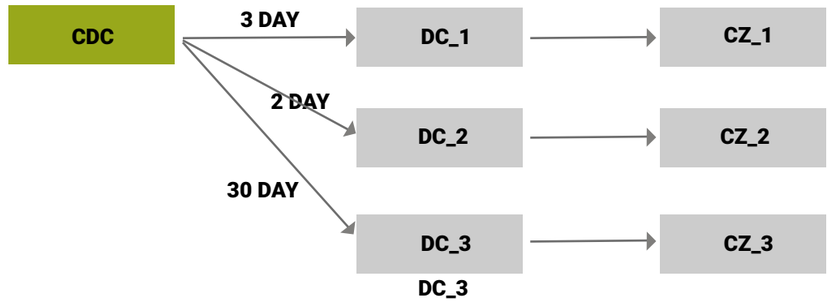
The goal of MEIO is to continually update and optimize safety stock levels across all echelons. The picture below depicts a standard supply chain network and the various types of inventory at each node and link. The cycle and in transit inventory are mostly governed by operational complexities (how frequent replenishment is possible, which is the best sourcing site) and hence changing these is not possible without changing the underlying operations/network. Pre-build inventory is a strategic decision made when demand is seasonal, and some inventory is built up in the lean season to level capacity, which may not be sufficient to satisfy peak season demand. Safety stock optimization, on the other hand, can be achieved without having to bring around any operational change.



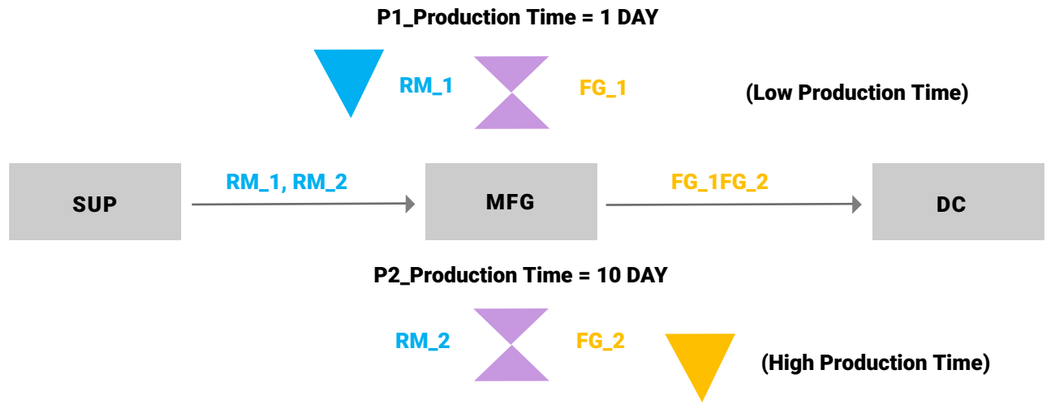
Hence, multi-echelon inventory optimization can be understood as multi-echelon safety stock inventory optimization, in the context where optimization must be done without changing the underlying operations.

MEIO looks at the entire chain to evaluate the right site and quantity of safety stock be maintained. Let us look at a couple of illustration how MEIO can help to reduce inventory by looking at entire network as a whole

- In a simple multi echelon distribution network, the decision between holding inventory at upstream nodes vs downstream nodes can be taken by looking at the network. In the picture below, it may be cost efficient to hold inventory for CZ_1 and CZ_2 at CDC directly due to low lead times from CDC to DC_1 and DC_2 and let the consolidation effect help in reducing inventory. However, for CZ_3, storing inventory at DC_3 may be necessary.



- In a production network, where there is an option to store inventory in RM vs inventory in WIP or FG form, again MEIO can come handy. In the case below, the conversion time to FG for RM_1 is much less compared to conversion time of RM_2. Hence, it may be cost efficient to store the first product as RM_1 (RM form) and the second product as FG_2 (FG form)



Is MEIO a panacea for all supply chains?

While MEIO is a more sophisticated technique and arguably better, is it the right technique for all supply chains? The efficacy of MEIO and its resultant savings vary significantly across multiple supply chains. Some supply chains, due to their inherent nature which support a multi-tier echelon system, can be a more suitable candidates for MEIO. Below are some of the factors which can drive this decision

- **Number of echelons in the supply chain:** For MEIO to be impactful, the supply chain should have multiple echelons that carry inventory. Often, multiple retailers only have one inventory echelon, preferring simply to buy from suppliers and store the purchased products in their warehouses. In a similar vein are various manufacturing firms, particularly make-to-order ones, who only have one pile of component inventory. A retailer with a hub-and-spoke system or a CPG manufacturing firm with raw material and finished good warehouses would each have two echelons at most, so the savings are just not prominent enough. There aren't enough choices to be made in the system and thus, the cost-benefit analysis is usually unfavorable in these cases.

- **Stable or Regulated demand:** In the case of a govt. regulated industry, or one where there is just one single big buyer or end product, it is not a pressing need to do demand forecasts every month, since it is not required as part of the tool that you use to set inventory levels on a frequent basis. So, in reality, it is possible simply to do an offline study every year or so and then reset the buffers based on those project results.

- **Degree of Distribution:** The more distributed the network, higher potential of optimization. Assuming all other factors are the same, a supply chain network where a central DC serves 2-3 DCs has less optimization potential than a central DC which serves 15-20 DCs.

- **Multiple Forms in which product can be inventoried:** In a supply chain network which has an option to store inventory in either RM, WIP or FG form, the potential for optimization shall be greater.

Our Inventory Optimization Solution

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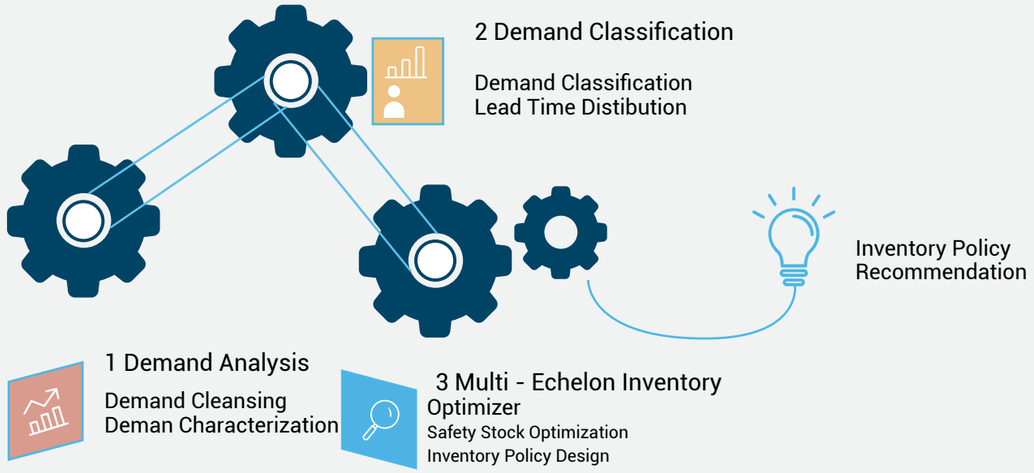
Lastly, but also very importantly, Inventory Optimization is a tactical decision which has to be reviewed more frequently compared to a Strategic Network Design decision or a Product Flow Optimization decision. Basis our experience, one of the key reasons why organizations don't review inventory norms as frequently as they like to is the effort needed in updating the optimization model. This is where a lot of companies are moving towards automation. ITC has special focus and capability on helping customers in building Input and Output Automation with various maturity levels (Excel Based, VBA macro based, SQL scripts, using ETL tools etc) so that model refresh is as easy as possible. As companies view optimization with a process based lens rather than a project based one, automation has emerged as a key success factor for operationalizing the solution.

While this may be a simpler and easier to use approach, this may not be the right method for all product-site combinations. ITC Infotech uses a robust Demand Classification exercise as a precursor to Inventory Optimization to identify the right distribution for each product-site combination. The diagram below shows a simple 2*2 classification on the basis of the order frequency and order volume

- **Lumpy**
- **Erratic**
- **Slow**
- **Smooth**

After the demand is classified, the right distribution is applied to the pattern before calculating/optimizing the inventory. To calculate the requirement at upstream nodes, demand propagation is done considering lead times. One of the questions often asked by supply chain planners is about validating the inventory norms as recommended by the solution. Some planners like to implement the inventory norms recommendations in a phase wise manner, selecting only a subset at the first phase, either one or few product groups or sites. This is a good way to make sure that the results indeed provide the desired service level thereby minimizing the risk.



ITC Infotech preempts and mitigates this risk to a large extent through Inventory simulation of the recommended norms using actual order data from the customer. Inventory Simulation allows norms validation by comparing the fill rates achieved in simulation to the desired service levels. A close alignment between the two also gives comfort to the planner before actual rollout. Another advantage of using inventory simulation is that multiple real-world constraints around production, storage and flow can be added to the model and the resulting fill rate achieved gives a much closer real-world indication of performance.

Conclusion

Multi-echelon inventory optimization has shown value. The quantum of benefit which can be realized depends on the nature of supply chain and its existing inventory management efficacy. We see that MEIO adds most value in cases with very long, usually manufacturing/product-centric, supply chains with high cost items, a complicated BOM, lots of choices of where to hold inventory, and lots of common components for different finished goods delivers. Inventory simulation is a good tool to be accompanied by an Inventory Optimization exercise which can provide validation of suggested inventory norms and help in smooth implementation.

Author Profile

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Anurag works as a Sr. Delivery Manager in the Supply Chain Practice at ITC Infotech. He is a seasoned Supply Chain and Technology professional with rich experience of 9+ years in areas of Strategic Network Design, Network Optimization, Inventory Optimization, Supply Chain Planning and Supply Chain Automation.

He has led and delivered multiple consulting and implementation supply chain engagements across the globe and has conducted Network Design workshops at premium B-schools in the country.

Anurag holds a Computer Science Engineering degree and an MBA in Industrial Management from NITIE.

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ITC Infotech is a leading global technology services and solutions provider, led by Business and Technology Consulting.ITC Infotech provides business-friendly solutions to help clients succeed and be future-ready, by seamlessly bringing together digital expertise, strong industry specific alliances and the unique ability to leverage deep domain expertise from ITC Group businesses. The company provides technology solutions and services to enterprises across industries such as Banking & Financial Services, Healthcare, Manufacturing, Consumer Goods, Travel and Hospitality, through a combination of traditional and newer business models, as a long-term sustainable partner.

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