



**Carter McNabb** writes that while inventory optimisation is not a foreign concept for supply chain folks, it comes with many interpretations

**IN RESPONSE** to hearing the term 'inventory optimisation', executives confidently pronounce 'We want some of that!' and practitioners often respond 'We've done that!'

But what exactly is 'that'? Read on for how to bring order to the chaos of the inventory optimisation universe and, with deference to the late Douglas Adams, don't panic.

For a capital-intensive business inventory optimisation is a unique opportunity to generate substantial return on investment by minimising inventory investment and generating free cash-flow, improving service levels, and increasing profits by reducing supply chain operating costs as a percentage of sales.

Broadly, 'optimal inventory' is defined as the minimal amount of inventory required to achieve stock availability targets at the lowest total cost.

Inventory optimisation techniques attempt to optimise the complex relationships between costs, capacities, target service levels and variability or risk (such as forecast error) and supplier delivery performance, for each item in each location across the supply chain network.

However, there are many techniques that come under inventory optimisation. It is important to understand which technique is appropriate.

#### STRATEGIC OR OPERATIONAL?

There are two fundamental tiers of inventory optimisation: strategic and operational/tactical.

Strategic inventory optimisation focuses on supply chain structure or policy. As such, its maximum refresh frequency tends to be annual or when a fundamental change to the supply chain is being considered.

Where strategic inventory optimisation focuses on questions of structure and policy, operational/tactical inventory optimisation deals with the recurring operational processes of demand and supply planning which may occur daily, weekly or monthly.

Operational/tactical inventory optimisation aims to keep inventories optimally balanced for the specified service level as various factors change. For example, inventories should adjust dynamically in response to changing demand patterns and risk factors such as forecast error and supplier performance.

For operational/tactical inventory optimisation to be truly effective, it must be genuinely integrated with demand planning and replenishment planning processes.

For example, if forecast accuracy increases then safety stocks should decrease so leading to an automatic decrease or deferral of replenishment requirements. Static inventory policies such as 'weeks supply' prevent inventory optimisation because they are not responsive to changes in supply chain variability and risk, service level targets or costs. In the previous example, an improvement in forecast accuracy has no direct impact on a safety stock policy of 'two weeks of cover'.

Following are some of the prevailing inventory optimisation techniques:

#### INVENTORY DEPLOYMENT OPTIMISATION (IDO) AND NETWORK FLOW OPTIMISATION (NFO)

These techniques determine where to store or produce inventory and how inventory should flow from source of supply to consumption. Decisions need to be made cognisant of the whole supply chain and are often made in the context of strategic supply chain planning.

For example, where products should be stored will depend on many supply chain network factors, such as the inventory value and its pursuant profit margin versus transportation costs. For example, a cement distributor might have relatively more sites holding inventory to minimise the number of shipments.

#### MULTI-ECHELON OPTIMISATION (MEO)

MEO can be applied in environments where product and/or component substitution is possible. In traditional inventory optimisation techniques, inventory levels for both Finished Goods and Bill of Material (BOM) components are set on an item-by-item basis based on service level, variability and cost optimisation techniques.

However, if the aim is a service level of 95 percent, having three interchangeable items stocked at a 95 percent gives an actual service level of over 99.9 percent, so inventories are excessive relative to service level requirements.

The same is true if three warehouses all stock the same product (provided that all warehouses can deliver to the customer).

MEO techniques factor in substitution possibilities across the distribution network and set the optimal stock levels based on service level targets across the interchangeable inventory population.

In environments where the substitution potential is high, MEO techniques can deliver inventory reductions of 10 to 30 percent above traditional techniques.

#### SERVICE LEVEL OPTIMISATION (SLO)

SLO is a technique that determines the optimal service level policy for a given set of constraints. As stated previously, the traditional method uses service level as the constraint — the lowest possible inventory for a given service level.

Because an additional standard deviation of supply chain variability must be carried, it often takes 50 percent more safety stock to increase service levels from 95 to 99 percent using this method.

As a result, the significant increase in inventory and carrying costs for a relatively small increase in service level can erode profits.

SLO is an approach that sets service level policies at the point where profit margins are maximised, based on the trade-off between profit margin, revenue realisation and inventory related costs.

SLO can also be used to determine the ideal set of service level policies by item given an aggregate inventory budget constraint. For example, if there is a \$5 million inventory holding constraint, SLO can determine the mix of service-level policies that maximises total fill rate to customers.

## IT FIGURES

Documented results for companies using both strategic and tactical inventory optimisation:

- Symbion Pharmacy Services: reduced inventories by 26 percent and increased service levels to 97 percent
- Supercheap Auto: Reduced inventories by 17 percent (or improved operating cash flow by \$23 million) while increasing service levels, margins and market share in a depressed sales environment
- Mitre 10: Reduced inventories by 15 percent and increased service levels to 95 percent
- Royal Australian Air Force: Reduced inventories by \$186 million and reduced understocks by 67 percent

This technique may assign higher service levels to faster-moving lower-value items and lower service levels to slower-moving higher-value items.

#### MARGINAL ANALYSIS AND OPTIMAL SPARING

Marginal Analysis is used primarily in Maintenance Repair and Overhaul (MRO) industries. It seeks to determine the cost-optimal mix of rotables, repairables and spares to deliver maximum asset availability (e.g. aircraft, power generator) for a given budget. Conceptually, this technique shares some similarities with MEO and SLO but the mathematical approaches are different given the unique characteristics of MRO environments (e.g. very slow moving items, repair cycle turnaround time, etc).

#### CONSTRAINT BASED OPTIMISATION

This technique is used to determine inventory strategies given the presence of significant critical constraints which are common in constrained manufacturing, scheduling and processing environments. Examples include grain processing and distribution, petroleum processing and distribution, process manufacturing such as float glass production or dairy product manufacturing and commodity export shipping.

#### THE BENEFITS

Effective application of inventory optimisation can include improved working capital and asset efficiency, increased service levels and reduced operating costs.

Inventory optimisation delivers a 'multiplier effect' on business performance ratios: it improves profitability and at the same time reduces the capital required to generate those profits.

Hopefully, this guide has provided an overview of the various regions of the inventory optimisation universe and which parts of it you might like to explore (or stay away from). Happy travels.

And with final respects to Douglas Adams; when in doubt the answer is 42. ||

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