

June, 2008

Solution Landscape for Closed Loop Inventory Management

Inventory has been and continues to be the lifeblood of supply chains, especially in times of great economic difficulties. Properly managed, it drives revenue and efficiency for companies. Aberdeen benchmarked the people, processes, technologies, and metrics associated with inventory management in March 2008 with over 200 companies taking part in the survey. Inventory management has become a mainstream planning activity with 58% of companies indicating that they have had an initiative in place for more than two years. The solution landscape in this area is also active with various vendors with each having their own strengths in certain verticals, process areas, etc. This Research Brief explores the capabilities of the software vendors focusing on closed loop inventory management.

Economic Uncertainty is Swinging the Pendulum Towards Costs and Return on Net Assets (RONA)

Examining the key pressures that companies are facing with respect to inventory management, we see that the corporate need to improve return on invested capital (39%), rising supply chain costs (39%), and pressure to improve service levels (36%) are acting simultaneously and creating the need for doing trade-offs across these three mutually exclusive business pressures. The focus on costs is primarily to the environment of economic uncertainty faced by companies globally.

Figure 1: Key Pressures to Improve Inventory Management



Source: Aberdeen Group, June 2008

Research Brief

Aberdeen's Research Briefs provide a synopsis of the principal findings derived from primary research, including key performance indicators, Best-in-Class insight, and vendor insight

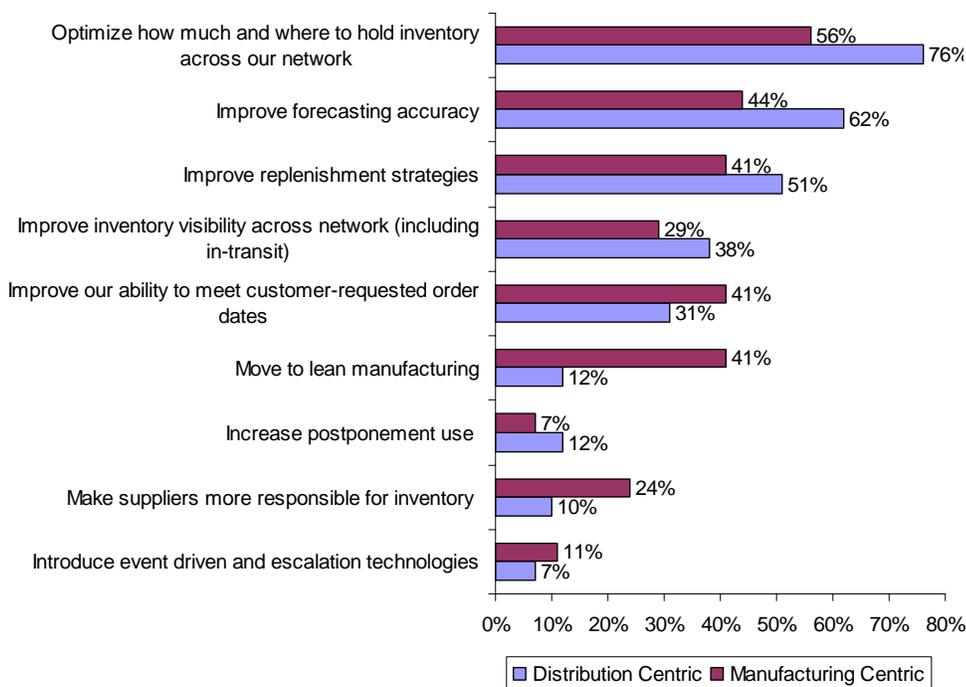
"Inventory management continues to be a highly siloed process for us without integrity of customer service levels and other metrics from planning to execution. We consistently miss planned service levels and have no way of finding out what was the root cause."

~ VP of Supply Chain,
Consumer Packaged Goods
Manufacturer

In the distribution centric industries we see the key pressure being the pressure to improve service levels (41%) with the rising supply chain costs slipping down to 32%. This implies that these industries are more focused on serving the retailer segment and meeting customer level expectations. It is also interesting to note that the retailers in the survey have noted global sourcing and selling resulting in increased lead-times as a very influential pressure. This is driven by the move towards private label manufacturing and direct import models within the retail sector.

If we take a look at the strategic actions that companies are taking to manage these pressures we see the slight differences in approaches that the distribution centric and manufacturing centric companies have.

Figure 2: Strategic Actions Being Taken by Companies



Source: Aberdeen Group, June 2008

Distribution centric companies are focusing more towards improving their inventory optimization processes, improving their forecasting accuracy and replenishment strategies. On the other hand manufacturing centric enterprises are focusing in addition towards improved ability to meet customer requested order dates and lean manufacturing.

Process Playbook of Closed Loop Inventory Management

Aberdeen's April 2008 [Technology Strategies for Closed Loop Inventory Management](#) study identified the concept of closed loop inventory management and highlighted the Best-in-Class differentiators. In this

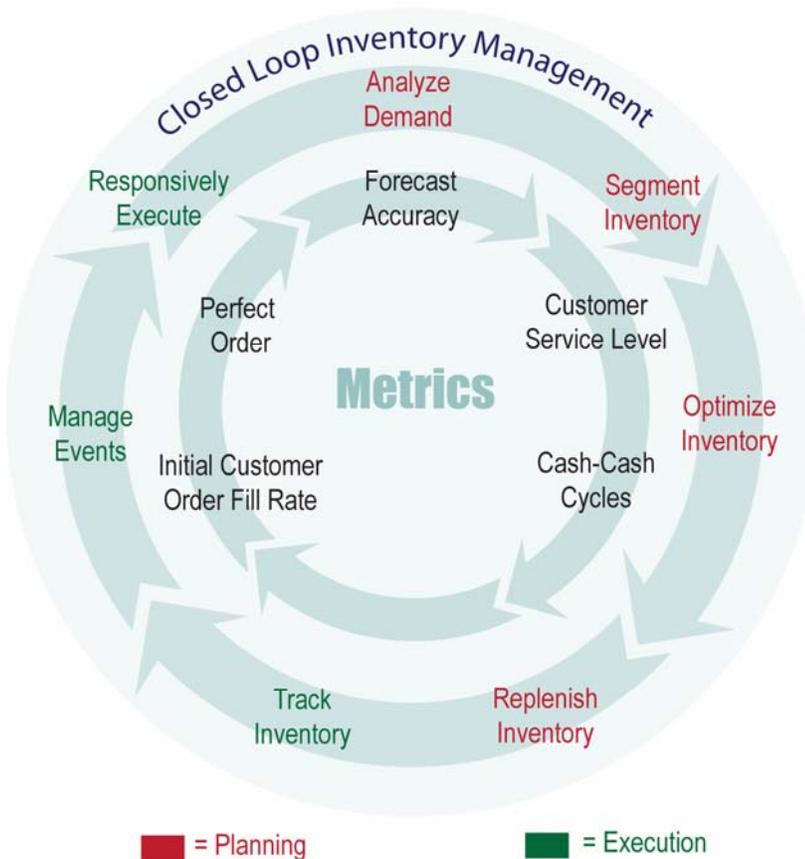
Industry Segmentation

- √ Distribution: apparel, consumer packaged goods, distribution, food / beverage, retail, wholesale
- √ Manufacturing – aerospace / defense, automotive, computer equipment and peripherals, general manufacturing, health / medical / dental devices, industrial equipment manufacturing, telecommunication equipment

document we will explore in more details the concepts involved in each of these process steps.

Figure 3 shows the components of closed loop inventory management that directly address the root causes of poor customer service levels, rising costs and poor RONA. The details of these process steps are as follows:

Figure 3: Process Playbook for Closed Loop Inventory Management



Source: Aberdeen Group, June 2008

1. Demand Analysis

The inputs to this process are demand forecasts created by downstream forecasting systems. There are three sub-steps involved in this area:

Step 1: There is a need to profile the demand based on SKU level granularity because typically demand forecasts are provided at a higher level of granularity (product family or categories)

For example, consider the example of a CPG manufacturer which needs to replenish to the retail customer's regional DCs. The demand management process at the CPG manufacturer's level is designed to arrive at a forecast at the product category / brand level and then allocation methods are used to arrive at the forecast at the item-location level (SKU). These simplistic

allocation methods often do not consider the impact on service levels with the downstream inventory replenishment processes resulting in excess inventory being stored at the safety stock buffers. What is really needed is an approach that considers the demand profile of each SKU.

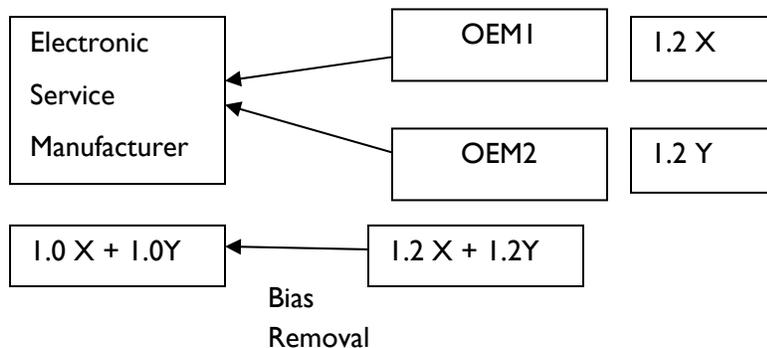
ILOG's Demand Profiler product is an example of a solution that itself works primarily on the SKU level (more specifically on whatever level the data is fed to it). There are pre- and post-processing processes that can be configured to "rollup" or allocate down the forecast outputs based on the demand profiles of the individual SKUs. The **Oracle Inventory Optimization** solution allows item attributes and groups to dictate whether the corresponding demand distribution should be treated as non-normal Poisson-distributed.

Step 2: There is a need to create customer level forecasts in addition to the SKU level granularity. The top 20% of customers who provide 80% of sales revenue are usually considered toward creating customer level forecasts.

Logility is an example of a vendor that provides customer level forecasts. Some of their customers have moved to customer level forecasting, based on a view of Orders, Shipments, and Point of Sale (POS) data, and the early adopters are taking that to the store or door level.

Step 3: Then there is a need to remove the forecast bias that is inherently present due to padding of demand by customers. For example, consider the example of an electronic service manufacturer that is provided forecasts from two OEMs (OEM1 and OEM2).

Figure 4: Electronic Service Manufacturing Supply Chain Example



Source: Aberdeen Group, June 2008

X and Y refer to the actual demand for the two OEMs based on past sales history. However they are providing a padded demand to the ESM provider because of an optimistic market expectation.

The ESM has the task of identifying the real forecast from the two OEMs based on past sales, and then coming up with the forecast bias. This forecast bias has to be taken into account for the ESM to come up with the safety

stocks. **SmartOps** is an example of a vendor that provides such capabilities through their Demand Intelligence module.

Technology enablers include in house developed tools and inventory optimization tools.

2. Inventory Segmentation

This process step involves being able to create highly granular inventory segments based on the mix of products that need to be produced rather than high level ABC analysis based on sales revenue. There is a need to do multi-pareto analysis based on multiple attributes. Some of the attributes that need to be considered for performing the inventory segmentation are: sales, frequency of demand, frequency of customer demand, profitability, distribution lead-times, sourcing lead-times, manufacturing costs, forecast bias, etc.

SmartOps, Logility & Syncron are some examples of vendors that do the multi-pareto analysis.

An example of a customer of **Syncron** is Renault Trucks spare parts division. They leverage the 'Picks' and 'Sales' of parts to create a stocking policy for their dealers. If the sales of the parts are high but the picks are few (i.e the order quantity is high) then they don't store this in the dealership. These parts will be ordered on demand. However if the picks are high and the sales medium to low then the parts are refilled at the dealership through a replenishment policy.

The same truck manufacturer leverages the following demand patterns within their service parts planning system: lumpy, slow, erratic, fast, positive trend, negative trend, new, dying, and obsolete.

Technology enablers include in house developed tools and inventory optimization tools.

3. Inventory Optimization

This process step involves being able to consider the entire network under consideration (either the finished goods inventory in distribution centric environments or WIP inventory for manufacturing centric environments) and right-size the inventory buffers.

A new generation of inventory management technology (invented after 2000) is at last enabling companies to properly account for variability and multi-level activity in the supply chain. These solutions are known as multi-echelon inventory optimization solutions. This technology globally optimizes inventory policies across supply chain tiers, accounting for both demand and supply variability using a stochastic (probabilistic) approach versus a rules-based or deterministic approach that does not fully account for variability.

In this report, inventory optimization is looking at the operational aspects of planning within a time horizon of a four to eight weeks rather than longer term planning. The key characteristics of this type of solution are:

"There were some unique challenges associated with slow mover parts as well. There were over 600 SKUs for which there was exception handling in terms of removing outliers. These were slow movers that had returns in a time period that were larger than the sales in the same time period."

~ VP of Supply Chain,

NTU

- The solution needs to be enterprise ready and be used for operational purposes (weekly or more frequent usage) as opposed to quarterly level inventory stock setting
- There needs to be dynamic and integrated use of operational targets as opposed to one-off manual updates that are done infrequently
- Given the weekly nature of the usage, the solution needs to address plan / schedule adherence (how successful the previous inventory plan was)
- The solution shall allow for time varying parameters
- The solution should be tightly integrated to the execution systems
- In environments where raw material needs to be optimized in addition to finished goods, multi-echelon solutions are essential
- The solution needs to support time phased inventory policies

SmartOps is an example of a vendor that performs multi-echelon inventory optimization through their MIPO product tailored towards manufacturing centric industries. An example of a customer of **SmartOps** that leverages the MIPO product is Unilever.

Manhattan Associates provides a multi-echelon tool that is tailored towards the retail supply chain (the erstwhile **Evant** product suite that was acquired).

Mix optimization (often referred to as Service Level Optimization) is a strategy that companies adopt for maximizing service levels for their SKUs. Mix optimization involves striving for a high average CSL at a family level while minimizing inventory by having lower value SKUs to have a lower service level. **ILOG, ToolsGroup, Optiant, and SmartOps** are examples of providers of mix optimization capabilities.

Technology enablers include inventory optimization (multi-echelon or otherwise).

4. Inventory Replenishment

Having the right materials where you need them, when you need them, is the goal of any distribution-intensive industry. The creation of efficient and feasible replenishment plans for such large distribution multi-site, multi-echelon networks means dealing with millions of SKU-locations every day.

Delivering the target service levels to the end customer in this environment poses heavy requirements on the process: highly precise time-phased propagation of the statistical demand signal across the supply chain, elimination of any “bullwhip” effect amplification, and detailed capacity and calendar constraint representation. In other words, to be sustainable with a reasonable total cost of ownership, the process must be highly automated.

The requirement for this process is as follows:

- It needs to dynamically calculate and optimize highly reliable safety stocks that absorb the demand and supply uncertainty and guarantee target service levels. These safety stock inventories essentially act as supply chain shock absorbers.
- It also needs to perform optimized distribution logic of the stock as a function of the target service levels at the multi-echelon sites and warehouses.

This process can then transfer to the ERP a dynamic short, medium, and long term optimized replenishment plan for the entire network ready for execution.

Traditional approaches ignore the importance of the replenishment step and send the results of optimization directly to the ERP system thus nullifying the effort spent in creating the statistical profile for service levels for each SKU.

JDA and **ToolsGroup** are examples of vendors that provide intelligent inventory replenishment capabilities.

5. Global Inventory Visibility

Once the inventory has been replenished to the buffers, during the short term of a week or so having visibility to inventory at all levels is critical to attaining customer service level goals. This process has to cut across organizational boundaries and potentially across business units and geographies. This is the reason for the term “global.”

For example, a large industrial equipment manufacturer sells their products through the dealership channels has inventory at the following levels: dealer finished goods inventory, regional inventory stored at the marketing organizations, and plant finished goods inventory. All these inventory assets can be used to fulfill customer orders and thus impact the customer service levels.

The definition of inventory visibility here is purely based on the order promising / sales order stage of the process after inventory has been built based on the planning performed by the inventory optimization solutions.

An example of an inventory visibility solution that spans the planning solution and the ERP modules are: **Oracle** Advanced Supply Chain Planning considers actual inventory levels at various nodes and manufacturing stages, triggers appropriate exceptions, and creates a replenishment plan, which is executed in **Oracle** E-Business Suite.

Another example is that of the CPG sector where the visibility of inventory in-transit and across multiple alternate DCs is critical to provide an accurate order promise date to retail customers.

Tradebeam and **Syncron** are examples of companies that provide inventory visibility solutions.

Technology enablers include ERP, Distributed Order Management (DOM), and stand alone inventory visibility tools

6. Event Management

This is a key enabler for linking the planning and execution phases of the process. This is an alert based system that automatically alerts on two main areas: (**Exception management**)

- a) Execution personnel - gap between actual and predicted on outputs (like inventory levels)
- b) Planning personnel - changes in input parameters (like forecast error, lead times)

This way not only can short term responsive execution be enabled but also the system corrects itself by rapidly changing the input parameters that feeds the entire process.

Infor is an example of a company that provides event management capabilities as part of their best of breed Supply Chain Planning suite that also has an inventory planning module.

Technology enablers include event management modules.

7. Responsive Execution

This refers to the flexibility of the execution process to adapt to changes and being able to respond effectively. The upstream event management process and execution processes are tightly coupled and may run multiple times iteratively.

Some of the approaches that companies can adopt for responsive execution are DOM (being able to fulfill from multiple distribution centers), allocating of in-transit goods to orders, direct shipment to customers, adopting non-standard routes for fulfilling orders, DC to DC transfer of inventory, etc.

Red Prairie and **Manhattan Associates** are examples of companies that tie the planning to the execution and provide best of breed WMS capabilities.

Technology enablers include DOM, transportation management, and warehouse management.

Vendor Managed Inventory

Vendor managed inventory is a long-established practice that continues to grow in popularity. Fully 84% of respondents at companies with more than \$1 billion in revenue indicate that they have suppliers manage consignment inventory for them, as do about two-thirds of mid-market respondents.

Pull-Based Replenishment with Suppliers

In the traditional consignment vendor managed inventory model, the supplier builds product to a forecast and pushes product to an inbound VMI hub or other location. In this model, the supplier still owns the inventory at the hub until the buyer pulls product down.

This creates higher inventory carrying costs for the supplier, as it has to own an additional bucket of inventory – and higher inventory risk.

Buyers always want more than enough inventory in the hubs. As a result, when a buyer provides a forecast, and when the forecast is off, the hub is typically left with excess inventory, which is the supplier's liability. Moving to a pull-based (rather than a forecast based) replenishment process, as used by Lean operations, can reduce that liability. Forecasts should still be shared, but suppliers build to actual demand pulls instead.

Even though the aforementioned practice is better from an inventory working capital standpoint, it is risky from a customer service level perspective (at least in the retailer's mind). The report will explore trade-offs that has to be made with respect to different kinds of inventory strategies like VMI.

WebConcepts is an example of a point solution provider for VMI solutions in the media and entertainment sector and is looking to move into the managed services market for VMI.

Solution Snapshot

Solution providers can range from ERP solution providers, best-of-breed supply chain planning solution providers, best-of-breed supply chain execution providers and inventory management niche solution providers.

Important points to note when reading Table I:

- Demand Solutions is a special case because of its mid-market focus. Its strength is in the \$750 Million USD and below range. So it may not have the best functionalities in the areas but it has a strong customer reference base with an end to end supply chain solution for inventory management.
- SmartOps goes to market with SAP as an endorsed business solution partner
- Infor has a broad suite of solutions with the acquired Mercia Links application and the SSA applications and hence wins mentions across the board.
- JDA should be looked at only in the retail/CPG space and not in the manufacturing sector.
- Manhattan associates is strong in the retail sector with respect to closed loop inventory management. The mentions in Table I should be looked at in the context of its retail sector only. Manhattan does not go to market in other sectors.
- Synchron has specific strengths in the heavy industries – construction equipment, automotive, aerospace and defense, mining etc. In addition their primary focus is on the spare parts planning part of the business. Synchron provides a Business Process Management (BPM) platform to create order management workflows in large enterprises where multiple ERP platforms are embedded.

- Waer Systems specifically focuses on the A&D sector and their solutions provide usage based replenishment for VMI suppliers.
- WebConcepts specifically focuses on the media entertainment sector and provides VMI solutions on the customer side.
- Terra Technology is known mainly for their short term forecasting solutions but recently they have made a foray into the inventory optimization space. Their solution is only suitable to the large CPG manufacturers
- Supply Chain Consultants provides a SCM suite for the process industry segment with an S&OP focus
- OneNetwork has to be looked in the context of supporting a multi-enterprise collaboration that allows companies to implement some aspects of closed loop inventory management

Table 1: Vendor Landscape for Closed Loop Inventory Management

Company	Demand Analysis	Segmentation	IO	Replenishment	Visibility	Responsive Execution	Event Management
Adexa	√	√	◇				
Demand Management	√√	√	◇	√			
i2 Technologies	√	√	◇◇		√		√
IBM DIOS	√	√	◇	√			
ILOG (LogicTools)	√	√	◇◇				
Infor	√√	√	◇	√	√	√√	√
JDA	√	√	◇	√			
John Galt Solutions	√	√	◇	√			
Just Enough	√	√	◇				
Lead Time Technology	√	√	√	√			
Logility	√√	√√	◇	√		√	√
Manhattan Associates	√	√	◇◇	√√	√	√√√	√
Optiant	√	√	◇◇				
OneNetwork				√	√	√	√√
Oracle	√√	√	◇◇	√	√	√	√
Red Prairie		√	◇	√√		√√	√
Rockysoft	√		◇	√			
SmartOps	√√	√√	◇◇◇	√	√		√
SAP	√	√	Partners with SmartOps	√√	√	√	√√
Smart Software	√	√	◇				
Supply Chain Consultants	√	√	◇				

Company	Demand Analysis	Segmentation	IO	Replenishment	Visibility	Responsive Execution	Event Management
Synchron	√	√	◇	√	√√	√	√√
TCLogic	√		◇				
ToolsGroup	√	√	◇◇	√√			
Tradebeam					√		√
Wær Systems				√			
WebConcepts				√√			

Source: Aberdeen Group, June 2008

Table I Legend:

Diamond (◇) is only applicable to the IO column where an attempt is made distinguish between standard IO and solutions that provide multi-echelon planning capabilities.

◇ - Best of Breed SCM suite with embedded IO capabilities

◇◇ - Inventory Optimization pure play with Multi-echelon planning capabilities in distribution

◇◇◇ - Inventory Optimization pure play with Multi-echelon planning capabilities and has demonstrated strengths across discrete, distribution and process

√ - Enterprises should consider this solution as part of an RFI as a player in the space

√√ - Strong player with multiple customer references and should definitely be considered as part of an RFI

√√√ - Category leader with industry recognition of strength in an area

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Related Research	
Consumer Industries Strategies for Demand Management: Sensing, Shaping and Pricing; Nov 2006	Working Capital Optimization: Improving Performance With Innovations and New Technologies in Inventory Management and Supply Chain Finance; June 2007
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