

## Inventory Optimization - Impact of a Multi-Echelon Approach

What does Inventory Optimization mean in your Business? Even for supply chain professionals, the term "Inventory Optimization" conjures up many meanings depending on each individual's background, training, discipline and even type of business. For C-level executives, when they hear "optimization" they think "minimization". To a sales person, optimization means having enough of a product in stock. Manufacturing professionals would rather avoid inventory altogether because it means more capital employed, and that has a negative impact on the return on investment (ROI). Amongst these many and diverse views, the question is "what are you trying to accomplish with inventory optimization?"

There does seem to be some common ground that can be summed up in the following rules:

- Rule 1: Always have enough!
- Rule 2: Never have too much!
- Rule 3: Never let Rule 2 overrule Rule 1!!!

These simple rules capture the essence of inventory management and optimization. The goal of today's supply chain professional must be to find that fine point of balance between service and investment, while balancing all the moving parts in a given business. With this thought in mind, we take the direction that Inventory Optimization means "right-sizing" the inventory based on the service required and constraints affecting the business.

A second consideration is to define the scope of inventory optimization. A common approach is to look only at finished goods and the customer service level required at a given distribution center or ship from location, and set the model based on that. For most manufacturers, and some multiple step distributors, the single-level approach does not address the end-to-end challenge. With supply chain complexity increasing, the challenge of managing the end-to end responsibility will only continue to grow.

The preferred method is to take a holistic view of inventory optimization and consider all levels and all inventories within an enterprise, rather than just finished goods. This type of holistic view is referred to as a "multi-echelon" approach. The multi-echelon approach, properly executed, provides deeper insight into the challenges from top to bottom in the supply chain, including manufacturing, distribution centers, suppliers and "in transit" product. The value of this approach is to address the issues at each level, including demand variability from above and supply variability on the inbound side.

### Analyst Insight

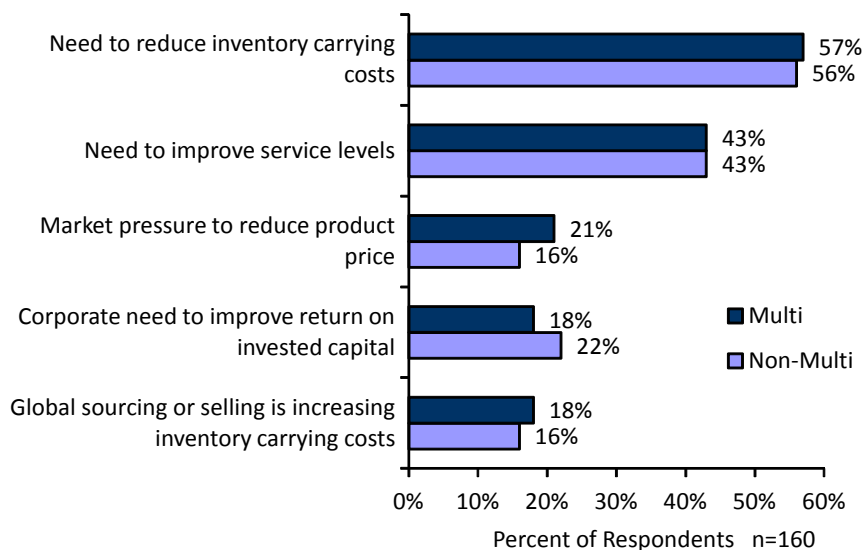
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The question then is whether a "multi-echelon" approach uses conventional applications or a specific "multi-echelon" solution to accomplish its mission. An advanced Multi-Echelon solution allows companies to evaluate inventory levels methodically, resulting in the shrinking of the "rule of thumb" buffers while identifying constraints that require critical buffers to be maintained. In this review, we will concentrate on the holistic view and divide the population of respondents into companies that have chosen a multi-echelon tool set and those that have not.

## Business Context

Our CSCO research identified Inventory Optimization as one of the top three actions to transform the supply chain (Jan 2011). This is likely driven by the increasing complexity of the supply chain and the need to maintain or improve service levels. Looking at inventory optimization specifically (Figure 2), we see that cost and service top the list. This report will show that, for multi-echelon users, service is the underlying key pressure behind their actions.

**Figure 1: The Top Pressures Driving Inventory Optimization**



Source: Aberdeen Group, December 2011

Cost is always a top pressure within all supply chains. Carrying cost is an element commonly referred to when discussing inventory, but this term is not always understood (see sidebar). Carrying costs do not represent the total cost of inventory since they typically do not include service and obsolescence costs. From a cost reduction perspective, most companies address carrying costs indirectly by concentrating on reducing the level of inventory investment, thereby reducing the borrowing cost of money.

## Carrying Costs

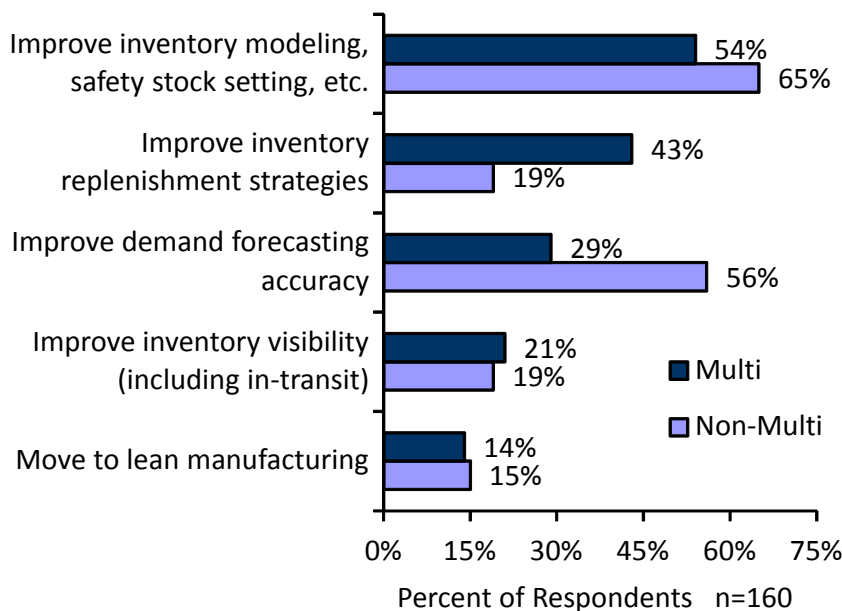
The expenses associated with having and maintaining the inventory. They are not the value of the inventory itself. Generally these costs are primarily the cost of money (interest expense) or opportunity costs associated with money being tied up in inventory. They can be significant when discussing the "brick and mortar costs" tied to inventory storage, but unless the physical reduction of inventory can eliminate storage assets entirely, such as closing a warehouse, carrying costs are more generally construed to be tied to the cost of money and the costs associated with maintaining and managing the inventory research surveys, interviews, and data analysis.

However, service improvement is often a more critical factor for the business overall, since it can mean market share gain or loss, and addresses the total cost of inventory issue. If service issues are not constantly addressed, companies will lose ground, because the competition never rests! In addition to market pressures, there are also hidden costs of reacting to service challenges that show up as part of operating variances. These hidden costs often outweigh the carrying costs by themselves.

### Actions to Improve Inventory Optimization

A review of the actions prioritized by the multi-echelon users (multi) vs. non multi-echelon (non-multi) show interesting differences (Figure 2). The fact multi users are focused on improving inventory replenishment strategies by a factor of 2.3 to 1 highlights their concentration on addressing service.

**Figure 2: The Top Actions**



Source: Aberdeen Group, December 2011

Interestingly, multi users are less likely to focus on improving demand forecasting accuracy than the non-multi users (52%). That may stem from several factors.

- Multi companies may have already addressed demand forecasting accuracy as part of their improvement process.
- Multi users are trying to focus on one initiative at a time as a priority that would impact a lot of the same resources.

- The solution addresses demand variability as part of the holistic view of the multi-user approach to optimization (most likely).

Conversely, non-multi users appear to be addressing the demand forecasting issue as the priority and are not nearly as driven by replenishment strategies (multi users are 2.3-times as likely to employ replenishment strategies compared to non-multi users). Their focus might indicate that demand volatility is a larger factor in their business, and requires more immediate attention, or they too are focusing on one broader initiative before moving to another.

### **Case Study: From Stalled Initiative to Better Service with Less Inventory**

The CDIY division of Stanley Black and Decker is slightly less than \$6 billion in size and is the largest division within Stanley Black & Decker, serving the Construction and Do-It-Yourself markets. Products range from hand tools to power tools, with several well-known brand names such as Stanley, Black & Decker, DEWALT, and Porter Cable.

Prior to the merger, the Black& Decker operation had an initiative to improve return on investment through inventory reduction, while maintaining or improving service. This initiative was stalled in 2003 due to resourcing issues, but rejuvenated in 2008. The approach was to start with finished goods, set targets statistically, and then go to the manufacturing operations and set targets for the raw material and component parts. Initially these targets were set using a statistical approach, and although targets were established at two different levels in the supply chain (finished goods and raw material), project manager Michael Martin was quick to point out that; "...you can clearly achieve great improvement from just formalizing the approach and using statistics to set your safety stock targets, but you cannot unlock all the benefits without the use of a multi-echelon solution, which allows you to see the end-to-end view and the linkages between the different levels in the supply chain. Modeling and running "what-if scenarios" taking into account service levels are huge improvements that are enabled by the features a multi-echelon tool provides."

The Black & Decker team continued their approach pre- acquisition until they had addressed 80% of the finished goods inventories and 50% of the manufacturing operations' inventories. Post-acquisition (March of 2010), they have continued to roll out the project across the CDIY division, to include 95% of the finished goods and 75% of the manufacturing plants through the end of 2011. They are aiming for 100% by year end of 2012. The team tackled North American sites initially, then rolled out the process internationally. When completed, the process will include the entire CDIY division, consisting of 30 manufacturing sites.

The results achieved are remarkable. Use of the multi-echelon solution led to a dramatic improvement in both inventory and service levels, including:

- 20% to 30% reduction in finished goods (varied by business unit)
- 17% to 20% reduction in raw material and component parts
- Improvement in service level (no negative impacts to service)

One of the key points from a structural perspective was that the analyses of all targets were performed by a core team that was well versed in the software, and were rolled out to planners and other stakeholders as customers of the process. This approach made the “buy-in” at the user level easier, since it did not require extra work and learning at various sites.

Mr. Martin said that there were many challenges and lessons learned along the way. There was clearly a need for management support - required in any enterprise wide project. Since inventory optimization is about “right sizing” the inventory and not just minimization, in several instances, the business units needed to add inventory to achieve the right service level and inventory level at each node in the supply chain and not just finished goods. This was sometimes in conflict with the business goals of the operating units. In one smaller, but high potential growth, market, the team recommended to add inventory in the short term, to manage service levels, and to work off excesses which would take more than a year to achieve. Because this conflicted with the financial targets that business unit was expected to achieve, the business unit pushed back and was reluctant to proceed. Fortunately management support provided “air cover” to ensure the necessary changes were implemented. Mr. Martin highlighted this support as a key to ensuring success.

Data presented another challenge. Before the acquisition, Black & Decker had two SAP instances and 2 advanced planning instances, and harmonization of the data was a challenge. Items that were initially different needed standardized names and part identifiers. Post-acquisition, even getting and harmonizing data was a challenge, due to the increased size, scope and complexity of systems.

The payoff was well worth the effort. In addition to the hard benefits of inventory reduction and improved service levels, there was tremendous value gained by having the ability to answer “what-if” scenarios quickly and show the impact on operating capital. The speed with which the team was able to respond to questions about, for example, facility consolidation, enabled them to be part of the strategic planning phase of a decision rather than reacting after the fact. Mr. Martin said:

“We utilized the Logility tool in our solution, which was a key enabler to our speed and success. It required little support from Logility in these 'what if' scenarios because of its ease of use.”

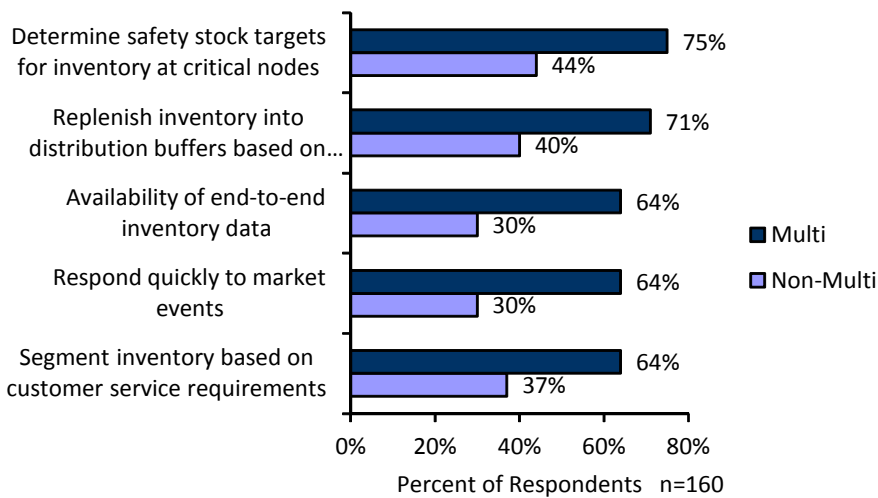
In addition to the “what if” benefits, the team could view their supply chain in ways they had not previously considered, which brought about further improvements. The ability to see moving bottlenecks and the benefits of postponement strategies added further gains to the bottom line of 2%-5%.

End users should be aware of the level of integration in deployment. Mr. Martin considered their solution to be “non-integrated,” which means that updates to targets were not automatic. This was a deployment decision to move the data from live systems into the solution tool, perform analyses, and then move the changes back to the tool after the fact. The benefit of this approach was to support the offline “what-if” analyses the team was asked to provide. The targets are updated monthly, as required.

## Capabilities

Multi-echelon users have very different capabilities at their disposal than non-multi echelon users. Knowing what the multi-echelon tools can deliver defines the capabilities the multi users have adopted. There are 5 capabilities identified as more than 70% more likely (Figure 3) to be employed by the multi users. The number of differences and the significant percentages are clear indicators the multi user view of the "inventory vs. service" challenge is much more comprehensive than the non-multi user view.

**Figure 3: The Top Capabilities**



Source: Aberdeen Group, December 2011

The insight gained from evaluating the capabilities identified in Figure 3 is that they all address challenges and issues surrounding service management and performance.

- Safety stock points at nodes help address response time. Properly sizing inventory at each node will improve (decrease) response time by shortening the lead time to pull inventory forward.
- Replenishment strategies are a service driven term - again aimed at decreasing response time. Replenishment is typically referred to only in the context of addressing service. The question being addressed is "how fast do I need to replenish my stock in order to

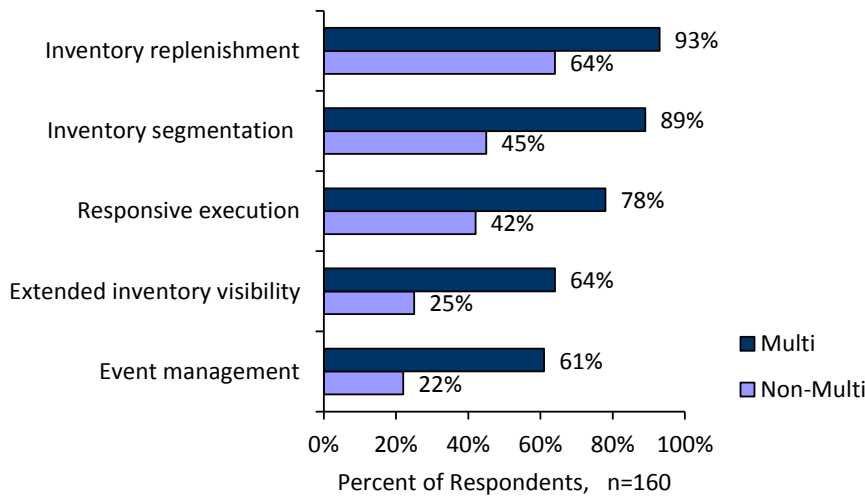
serve the customer? For example: If the product or service in question is a commodity, then availability must be almost immediate. If the product or service is somewhat unique or differentiated, then a customer might be willing to wait some amount of time to get that benefit. The answer will vary by company and even by product within a company.

- End-to-end views are required when making commitments. If a commitment is necessary, it implies the product is not readily available and a "promise date" must be given. It is possible to guess and be correct using a rule of thumb, but to be consistently correct, visibility to upstream inventories and constraints are a requirement.
- The ability to respond quickly to market events is a service driven issue. A market event could be many things, but would in some form result in an increase or decrease in demand or timing at the product or organization level. The more quickly the organization can adapt to the specific change at all levels, the better prepared they will be to capitalize on it if it is positive or minimize the damage if it is negative. This agility would translate into captured demand or minimization of costs due to a loss.
- Segmentation based on service requirements is clearly service related. The term "segmentation" refers to the policies around groups of products utilizing different criteria such as cost, size, margin, importance, etc. All of the capabilities above help address service activities or challenges, and demonstrate the focus of multi echelon users on resolving service related issues. This emphasis on these 5 key service capabilities is the clear differentiator between multi echelon users and non multi echelon users.

## **Inventory Optimization Enablers**

Multi echelon users adopt the capabilities identified in Figure 3 because they understand the capabilities of multi echelon tools. The technologies below are even more likely to be in place for the multi users compared to the non multi users than the capabilities identified in Figure 3. This commitment to put more robust tools in place to address the multi-echelon complexity reflects the maturity of an organization to address the "inventory vs. service" challenge.

**Figure 4: The Top Technology Enablers**



Source: Aberdeen Group, December 2011

The following bullet points referencing Figure 4 are indicative of the higher maturity of multi user organizations compared to the non-multi user organizations.

- 93% of the multi-echelon users have replenishment in place compared to the non-multi users (71% identified it as a capability and even a higher percentage have put the enabler in place)
- 89% of multi-echelon users have inventory segmentation, nearly 2 times the commitment rate of non-multi users. 64% of multi users have extended inventory visibility, nearly 2.6 times the adoption rate of non-multi users
- 61% of the multi-echelon users have event management capabilities, nearly 2.8 times the adoption rate of non-multi users

As in the capabilities section, multi users are clearly committed to these capabilities, being more likely than non-multi users to adopt them by a factor of greater than 2 to 1 in some cases. The sharp contrast suggests the non-multi users are addressing service issues almost entirely through improving forecast accuracy.

### Case Study: From “Rule of Thumb” to Strategic Analysis

One large multinational chemical company started more than 10 years ago on the journey to concentrate on inventory management to reduce their capital employed. The following points summarize their starting position as of 1998:

#### Best-in-Class Performance Definition:

- ✓ Cash to Cash Cycle - Best-in-Class companies had cash to cash cycle of 58.6 days
- ✓ Finished Goods Inventory Turns - Best-in-Class companies averaged 15.1 turns per year
- ✓ Change in perfect Orders - Best-in-Class companies increased their perfect order rate by 3.1%



- Little understanding of and experience with setting inventory target levels using scientific methodologies.
- Previous efforts only concentrated on finished goods, not a multi echelon approach.
- Complex supply chains - Some products move from South America, to the United States, to Asia, to Europe.
- Local stores along the way in each country.
- Thirteen instances of ERP systems.

After examining several options within their existing systems the company finally settled on a best-of-breed solution. As they began to implement, they immediately encountered challenges they needed to overcome.

- “Learning 101” – the company did not have the basics down in terms of what they were tackling and all the drivers behind it.
- Data quality
- Discipline and timeliness of input to provide system accuracy. Lack of discipline for cutoffs and planning created errors in the numbers.
- Resistance to change regarding the discipline. “Rule of thumb targets” were being used by the planning community.

They started with finished goods and set targets statistically, beginning with non-proprietary formulas from textbooks in an Excel spreadsheet. The initiative, “shined the light on the challenges and highlighted the discipline issues affecting the process and data.” Using the multi-echelon solution, the project team identified process areas that needed help, through the COPQ analysis (Cost of Poor Quality) offered by the best-of-breed solution. Unreliable suppliers and logistics providers were key culprits. Those situations were corrected, and as of two years ago the company has a fairly well balanced inventory across their network.

The actual results achieved once the multi-echelon solution was deployed were 20% inventory reduction initially, followed up by an incremental 17%. However, the ability to see their business in different ways and understand the linkages from end to end was just as important as the overall inventory reduction. The ability to evaluate “What if” scenarios via the multi-echelon solution has proven to be one of the solution's most valuable benefits.

For example, after deploying the multi-echelon solution, the company faced the closing of several manufacturing locations in their global network. Rather than just looking at the differences in cost and transit rates, the team could model the incremental working capital required to support the new supply chain for the markets served.

Another benefit of the new system was the 'total view,' which let the company see the benefits of postponement strategies and tradeoffs between stocking finished goods or stocking more product at a raw material level at a lesser cost.

The company currently considers itself a “non-integrated” solution—analyses are done offline and fed back into the planning tools. This was a deployment decision, not a requirement, motivated by the benefits gained from the “what-if” capability and the continued need to cleanse and normalize data inputs. Targets are set annually, but monitored and reviewed monthly as part of the S&OP process. Adjustments are made on an exception basis. After implementation, the company has continued to challenge their target levels and their network assumptions through “what-if” analysis.

In summary, the multi-echelon solution provided a robust inventory evaluation across their supply chain network plus a scenario modeling tool that did more than mere inventory reduction. The insight into their business and scenario modeling has continued to deliver value. The capabilities this company employed, and the results they demonstrated, are consistent with the Best-in-Class results in our research.

## Performance Metrics

Three metrics clearly show a higher level of proficiency for the multi-echelon users.

**Table 1: Performance Metrics**

Performance Metrics	Multi	Non-Multi
Cash to Cash Cycle	65.4 days	76.9 days
Finished goods inventory turns	12.8 turns	10.0 turns
Change in Perfect order percentage (on time and complete) to customers	3.1% increase	1.0% increase

Source: Aberdeen Group, December 2011

The 3.1% improvement in service among multi users is equal to Best-in-Class performance. This 3.1% improvement is significant when reviewed in the context of big box retailers like Wal-Mart and Home Depot, which are in the high 90's as far as acceptable service level requirements are concerned.

The cash-to-cash cycle is 11.5 days better (a 15% reduction), a strong indicator of the total inventory turnover. Given the 28% improvement in finished good turns, sellable items are turning over faster, and therefore invoicing more frequently. One might ask why the cash-to-cash cycle improvement is not as great as the finished goods improvement. This is easily reconciled when considering that the multi-echelon approach concentrates on "right sizing" the inventory across all levels. Finished goods might well be reduced, but due to strategies such as "postponement", more inventory might be kept upstream at a lower value.

### Cash to Cash Cycle Defined

Cash to Cash Cycle is the time from when you pay a supplier to the time you collect cash from a customer

Carrying cost was slightly higher (0.7%) for multi users than non-multi users. This is strictly a cost measure, not directly related to service, so the right-sizing behind the multi user approach may have led to some upward adjustments. However, given the cash-to-cash improvement, other factors could be affecting this metric.

Taken collectively, these performance improvements indicate the value of a multi-echelon approach: a Best-in-Class level of service improvement, and a reduced inventory investment.

## Key Takeaways

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1. The multi-echelon approach presents a holistic view of inventory optimization. Multi-echelon users have identified the need for robust capabilities and have made the commitment to implement them.
2. Multi-echelon provides deeper insight into the service impact and replenishment strategies of inventories at various nodes. Multi echelon users achieve a Best-in-Class service level improvement of 3.1% while reducing overall inventory investment, as indicated by the 15% reduction in cash-to-cash cycle.
3. Multi echelon users are:
  - Twice as likely to tie target-setting to S&OP process (48% - 22%)
  - Three times more likely to review targets quarterly or better (64% to 27%)
  - Twice as likely to set targets statistically rather than relying on a rule of thumb (44% to 22%)
  - More likely to have targets driven by service requirements (89% to 58%)

Inventory optimization is a matter of right-sizing inventory investment for a given service target. For multi-echelon users, the performance improvement over non-multi users is significant: they can turn finished goods 28% faster, and achieve Best-in-Class service improvements. Multi-echelon inventory optimization drives better service performance, while reducing inventory and providing a better capability to manage market and supply chain changes via modeling. As supply chains become more complex, companies will need to address end-to-end challenges with multi-echelon solutions. This research demonstrates that multi-echelon users have captured the balance suggested by the three rules; they have enough - but not too much - and, as the service results indicate, they don't let Rule 2 overrule Rule 1!

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