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Lean Manufacturing

Five Tips for Reducing Waste in the Supply Chain

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Executive Summary

Reducing operational costs and meeting customer mandates are more important than they have been for years. Consumption across the board is shrinking, forcing companies to adapt and run as efficiently as possible. Interestingly, in Aberdeen's March survey of 117 companies, when companies consider Lean today they are more likely than ever to be considering the handoffs between manufacturing and supply chain. Improving this handoff translates into synchronizing manufacturing execution with customer demand and improving the collaborative processes for supply chain planning and manufacturing operations, both of which were identified as the top two strategic actions by the respondents. To help in the execution of these strategies, this report is a roadmap for professionals looking to implement Lean principles and extend them into the supply chain.

Research Benchmark

Aberdeen's Research Benchmarks provide an in-depth and comprehensive look into process, procedure, methodologies, and technologies with best practice identification and actionable recommendations

Best-in-Class Performance

Aberdeen used five key performance criteria to distinguish Best-in-Class companies. These metrics indicate the ability to manage supply chains for greater efficiency on the shop floor, with Best-in-Class companies achieving:

- 96% perfect order delivery
- 3% decrease in inventory carrying costs and 2% decrease in inventory write-off
- 4% decrease in customer lead times and 4% decrease in manufacturing cycle time

Competitive Maturity Assessment

Survey results show that the firms enjoying Best-in-Class performance shared several common characteristics. Compared to Industry Average and Laggard combined, Best-in-Class are:

- 2.4-times more likely to have a supply chain, where inventory is pulled from one stage to the next based on real-time demand
- 1.9-times more likely to have Lean-based supplier replenishment strategies

Required Actions

In addition to the specific recommendations in Chapter Three of this report, to achieve Best-in-Class performance, companies must:

- Extend continuous process improvement findings across the enterprise and into the supply chain organization in order to right-size inventories, even in hybrid manufacturing environments.
- Leverage Automated Lean Manufacturing and Supply Chain tools such as e-Kanban, Supply Chain Visibility, and Integrated Order Management

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Chapter One: Benchmarking the Best-in-Class

Business Context

The business climate of 2009 has forced companies to ask, "Where is the waste?" At a high level, companies decided to discontinue product lines in development, or make network changes, such as moving warehouses from China to developing countries, while others are vertically integrating a piece of production to remove the logistical costs. These reactionary changes are a testament to how company's expectations for future performance has shifted – all at once political, financial, and global.

These changes are short-term fixes that might satisfy investors or stakeholders, but don't address supply chain and manufacturing inefficiencies that lead to deflated working capital and dissatisfied customers. Aberdeen's March 2009 survey of 117 companies showed top performing companies are using Lean principles and software solutions as a long-term strategy for improving people, processes, and business results. In fact, the data shows that the further along in the Lean journey a company is, the more likely it is to be applying continuous improvement methodologies beyond the manufacturing plant. Lean companies are applying Lean principles to inventory buffers, collaborative processes between manufacturing and supply chain, and extending Lean into the supply base.

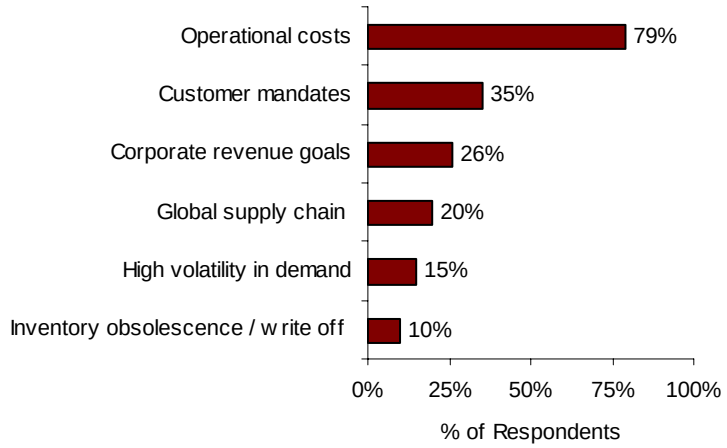
Fast Facts

- √ 44% of Best-in-Class companies maintain a cash conversion cycle time of 22 to 31 days, versus 32% of Industry Average and 23% of Laggards.
- √ Over the past two years, Best-in-Class decreased inventory write-offs by 2%, versus 0% change achieved by Industry Average and a 2% increase by Laggards

Pressures

The top pressures causing manufacturers to consider implementing or extending Lean principles include cost, customer service, and corporate revenue goals (Figure 1). This is consistent with past Aberdeen research that has shown that cost reductions are commonly driving the adoption of Lean initiatives.

Figure 1: Corporate Pressures to Implement Lean



Source: Aberdeen Group, April 2009

"Sonoco has focused on delivering value in each project while developing a long-term strategy and approach to developing our production system. Consistent with our corporate mission, we have always believed that People Build Businesses and we remain committed to actively developing a diverse, global workforce."

~ Jeff Slater, Operating Excellence, Leader, Sonoco

Lean calls for the modification of non-value added processes by transforming corporate culture into one that is committed to continuous process improvement (some of the challenges this brings will be considered later in this chapter). In addition to the shop floor there are areas outside the plant in which Lean can help companies significantly cut costs. The following short list of processes names areas of focus for continuous improvement to cut costs and meet customer mandates:

- Order-to-Delivery (quoting, order promising, sourcing, delivery, payment)
- Resource Planning / Supply Planning
- Manufacturing Scheduling and Execution
- Integrated Business Planning / Sales and Operations Planning
- Logistics Planning and Execution
- Supplier Collaboration for Just-in-Time Delivery or Replenishment

This report examines the processes listed above through a Lean approach looking at the capabilities that improve process outcomes (like cost reduction or customer satisfaction improvement). In order to do this, we've identified Best-in-Class companies by evaluating survey respondents' holistic performance across multiple Key Performance Indicators (KPIs). The metrics chosen are Supply Chain Operating Reference model metrics, which can be used to measure the processes identified above. Finally, it is important to note that the KPIs chosen are all interconnected by tradeoffs and that doing well in one KPI is not sufficient for improving overall business performance. Rather, top performance in multiple KPIs is the key to achieving lasting business results.

The next section shows the average KPIs performance for each maturity class, Best-in-Class, Industry Average, and Laggard. Where does your organization fit in Table 1?

The Maturity Class Framework

In order to determine how top manufacturers are successfully able to leverage a Lean manufacturing environment in order to achieve their business objectives, Aberdeen surveyed 117 enterprises in March 2009. Participating companies were benchmarked according to five key performance criteria. These criteria evaluated their ability to meet crucial Lean manufacturing targets, including the percentage of products meeting the following:

- Perfect order delivery
- Decrease in inventory carrying cost
- Decrease in customer lead times
- Decrease in inventory write off
- Decrease manufacturing cycle time

Using these metrics, Aberdeen categorized respondents into the top 20% (Best-in-Class), the middle 50% (Industry Average) and the bottom 30% (Laggard) of performers. Table 1 displays the performance gaps that define each category.

Table 1: Top Performers Earn Best-in-Class Status

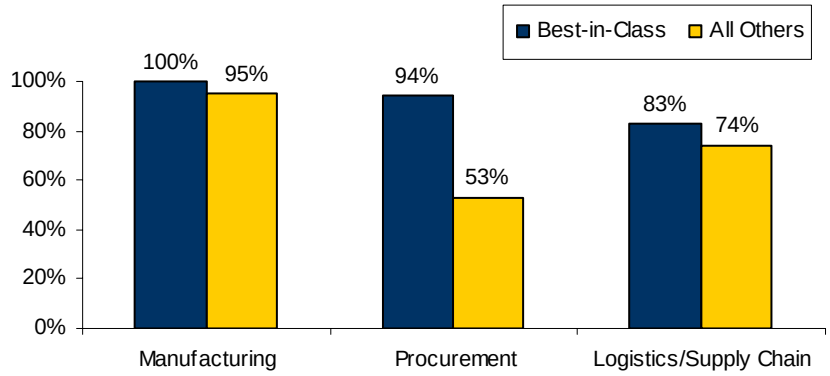
Definition of Maturity Class	Mean Class Performance
Best-in-Class: Top 20% of aggregate performance scorers	▪ 96% perfect order delivery ▪ 3% decrease in inventory carrying costs ▪ 4% decrease in customer lead times ▪ 2% decrease in inventory write off ▪ 4% decrease in manufacturing cycle time
Industry Average: Middle 50% of aggregate performance scorers	▪ 91% perfect order delivery ▪ No change in inventory carrying costs ▪ 2% decrease in customer lead times ▪ No change in inventory write off ▪ 1% decrease in manufacturing cycle time
Laggard: Bottom 30% of aggregate performance scorers	▪ 80% perfect order delivery ▪ 3% increase in inventory carrying costs ▪ 1% increase in customer lead times ▪ 2% increase in inventory write off ▪ No change in manufacturing cycle time

Source: Aberdeen Group, April 2009

Lean Manufacturing Strategies

What exactly are Best-in-Class manufacturers doing differently to achieve performance across multiple KPIs? First and foremost, the industry leaders are extending their Lean initiatives beyond their manufacturing walls. As shown in Figure 2, those companies that have been on the Lean journey for one year or more have initiatives in procurement and logistics or supply chain in addition to manufacturing (product development , information technology, and finance were other areas that had a high percentage of Lean application and a Best-in-Class trend).

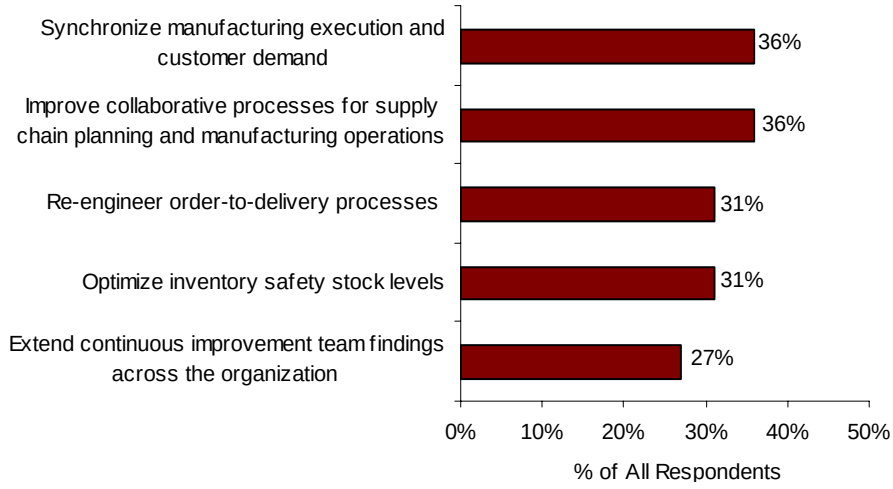
Figure 2: Lean Initiatives Go Beyond Manufacturing



Source: Aberdeen Group, April 2009

Interestingly, besides extending their Lean capabilities beyond manufacturing, there isn't a single strategy that emerges as more prominent than another. Most often, the success of Best-in-Class manufacturers isn't the strategy, but more so, the tactical execution of the strategy. In fact, plans for 2009 revolve around the processes that have intersections in both manufacturing and supply chain. The recent and surprising drop in manufacturing demand revealed the poor synchronization of the planning, sourcing, manufacturing, and delivery silos.

Figure 3: Strategic Actions Call for Internal Collaboration



Source: Aberdeen Group, April 2009

"In order to standardize Lean processes across the enterprise, the continued focus on continuous improvement is helping but we also set goals to reduce downtime, waste, etc., and we worked on keeping it to a couple of things which is driving performance."

~ Doug Olsem, VP of Supply Chain, The Schwan Food Company

The following insight box shows specific Lean strategies that can be adopted for different types of manufacturing environments.

Aberdeen Insights — Strategy for Hybrid Manufacturing Environment

Lean has grown into more than a set of principles for the plant floor of an automotive manufacturer. Survey respondents came from chemicals, industrial manufacturing, aerospace and defense, and food and beverage, among others. As a result, Lean is also in environments that vary from the high mix, high volume scenario that once characterized Lean.

How are these different manufacturing modes planning to utilize Lean tools?

High Mix, High Volume: The top strategic action of this group is to "optimize inventory safety stock levels." This is not surprising as companies strive for Vendor Managed Inventory programs. Safety stock optimization, however, requires a high functioning Lean value chain, from suppliers, through facilities and warehouses along the way, and into the customers' hands when they want it. The processes and the technology tools that are discussed in Chapter 2 are being used by the Best-in-Class, who are also closer to achieving optimized safety stock levels.

High Mix, Low Volume: The key agenda item for these manufacturers is to "re-engineer the order-to-delivery process." Findings from Aberdeen's February 2009 benchmark study, *Order-to-Delivery: Perfect Order, Happy Customer*, showed that it is largely the front-end of the order process – order quoting, order promising, demand and supply balancing – that those in the industrial equipment manufacturing industry, for example, are focusing on.

Low Mix, High Volume: The ability to "synchronize manufacturing execution and customer demand" is the top plan among these manufacturers. Process manufacturers make up a large majority of this group and their pressures, like their strategic plans, differ slightly from the group at large. While costs are an issue, inventory obsolescence and the pressure to meet shareholder financial expectations loom larger than for others. (For example, low mix, high volume manufacturers are 12.8-times more likely to be concerned with meeting shareholder expectations than the other two groups.) Sales in this mode revolve around annual contracts and competitive pricing.

Challenges

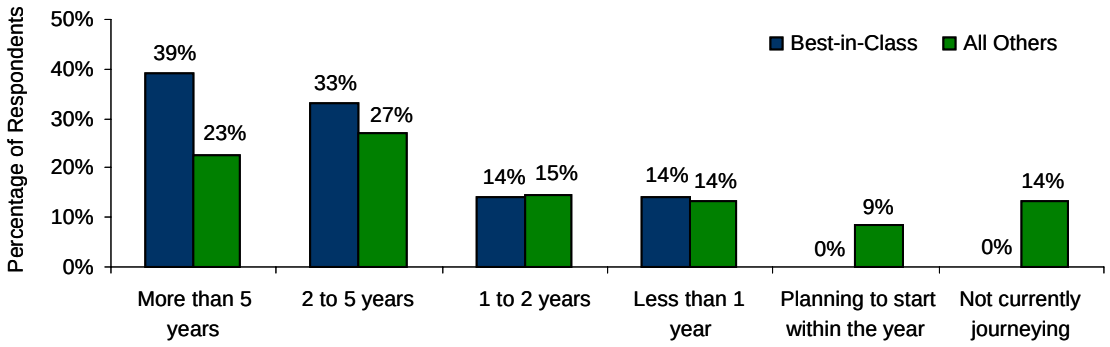
The primary challenge for companies looking to transform their enterprise into one that is devoted to continuous process improvement is the cultural change required at all levels, from corporate officers to the engineer in the plant, out to suppliers, and throughout finance and supply chain. Best-in-Class companies that are more likely to be training staff and leaving Lean management to the local level, like the plant, warehouse, or manufacturing cell.

That being said, however, the following fact bears stating: Best-in-Class companies know that a significant challenge also lies in the capacity constraint of internal resources. This is a truth that executives need to understand before forcing continuous improvement on employees that aren't trained, don't understand the corporate commitment to Lean, and don't feel like changing.

During that time devoted to process mapping, data analysis, process changes, and so forth, there is a pull on local resources that isn't being considered by Industry Average and Laggards, which is partially a result of their limited experience with Lean (52% have had a Lean initiative for two years or less) (Figure 4). It is also a combination of cultural change and local resources – many don't realize the local involvement and commitment rooted in Lean.

As companies look to implement Lean in order to achieve a level of synchronization and collaboration between manufacturing and supply chain or re-engineer processes that are adding an unnecessary level of waste, it is of great interest to understand how those who have come before succeeded in their journeys. It is clear from Figure 4 that Best-in-Class companies have generally been on the Lean journey for far longer than their underperforming counterparts and have subsequently weathered considerably more growing pains.

Figure 4: Best-in-Class Companies More Likely to Have Lean Initiative in Place



Source: Aberdeen Group, April 2009

By looking at the processes, organization, performance management, knowledge management, and technological enablers that Best-in-Class companies have a higher likelihood of using, this report acts as a guide to the Industry Average and Laggard companies so they may achieve Best-in-Class performance through their own Lean journeys.

The Best-in-Class PACE Model

Table 2 lists the Pressures, Actions, Capabilities, and Enablers (PACE) of Best-in-Class companies in order to identify the top business strategies as well as the Lean processes, tools, and structure that top performing

companies are implementing to achieve corporate goals. The Best-in-Class PACE Framework can be summarized as follows:

- A corporate strategy that plans to extend Lean findings across an organization and expand Lean initiatives across the value chain
- Business capabilities that emphasize the continuous flow of information and goods throughout the value chain
- The use of technology enablers to aggregate, update, and distribute optimal plans and schedules

Table 2: The Best-in-Class PACE Framework

Pressures	Actions	Capabilities	Enablers
▪ Operational costs	▪ Extend continuous process improvement team findings across the organization ▪ Extend Lean initiatives across the entire value chain	▪ Demand-driven supply chain (inventory pulled from one stage to the next based on real-time demand) ▪ Ability to manufacture products based on demand from the next stage in supply chain ▪ Time-phased view of inventory in kanban ▪ Level planning (schedule stability) ▪ Lean-based supplier replenishment (kanban) extended into multi-tiers ▪ Ability to quickly update process mapping ▪ Ability to standardize Lean processes across the enterprise ▪ Lean initiatives managed at the local level ▪ Executive ownership of Lean across the enterprise ▪ Lean Center for Excellence ▪ Real-time, product family finished goods inventory visibility ▪ Operational metrics are displayed in real-time where needed ▪ Shared Lean metrics between supply chain and manufacturing	▪ Automated Value Stream Mapping - Production process and value add activities documented ▪ Automated Supermarket Sizing - Inventory levels planned based on uncertainty of demand and attainments ▪ Automated Order management integration (visibility into manufacturing constraints when order promising) ▪ Automated Kanban Execution - Visible indicators controlling inventory levels and production authorization ▪ Automated Modeling and simulation ▪ Demand planning and forecasting ▪ Manufacturing execution system ▪ Advanced planning and scheduling ▪ Supply Chain Visibility ▪ Enterprise Manufacturing Intelligence

Source: Aberdeen Group, April 2009

In the next chapter, we will see what the top performers are doing to achieve these gains.

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Chapter Two: Benchmarking Requirements for Success

The implementation of Lean methodologies and tools to reduce costs and meet customer service levels involves change on many levels, including people, processes, and technologies. This Chapter examines the processes Best-in-Class are using to connect supply chain and manufacturing functions, as well as the organizational, management, and technological structure critical to a successful Lean initiative.

The case study below is an example of a company that unites IT with its Lean business goals, plans for the transferability of Lean initiatives into different regions, and extends Lean Manufacturing into a supply chain for a demand-based value chain, achieving cost and customer service improvements.

Case Study — WIKA USA

WIKA is a manufacturer of pressure and temperature instrumentation with operations in 27 countries and annual revenue of over US $500 million. The company's US subsidiary, WIKA USA, maintains a 210,000-square-foot manufacturing facility in Lawrenceville, Georgia, where it makes mechanical and electronic instrumentation for the oil and gas, water utility, ethanol production, and pharmaceutical industries. The US operation employs 600 people and generates $110 million in annual revenue.

In 2001, WIKA USA decided to pursue Lean Manufacturing principles to more effectively compete with low-cost, overseas competitors. "We realized that in order to move our operations to the next level, we needed to make some fundamental changes. That meant moving from a batch-oriented supply-chain and production process to a system based solely on customer demand," says Michael Gerster, President for WIKA USA.

Under the new system, specific orders pulled inventory and components through processes so that production was based on actual demand instead of estimates. There were a number of critical elements that comprised the Lean journey:

1. **Upgrade ERP to a system that supports Lean.** WIKA USA's management team knew that the company needed to fully align its Lean processes with its systems and material flows to continually improve operations. "The problem with many ERP software packages on the market is that they are built for batch-oriented manufacturing and support those types of complicated processes. As we progressed on our Lean Manufacturing journey, we needed a system that would enhance our Lean efforts and not constrain them," says Gerster.

continued

Fast Facts

- √ 84% is the mean measure for Overall Equipment Effectiveness among Best-in-Class companies, versus a 75% among Industry Average and 72% among Laggards.
- √ 61% of Best-in-Class rate their internal data accuracy as very good to excellent versus just 28% of Industry Average and 18% of Laggards.
- √ Best-in-Class are 4.8-times more likely to utilize automated kanban execution to trigger the pull of inventory.

Case Study — WIKA USA

2. **Extend Lean into the value chain.** After adjusting its manufacturing operations, WIKA focused on applying Lean methodology to the business processes that support manufacturing, such as payroll, order entry, planning, receiving and shipping, warehousing, and quality assurance.
3. **Support Lean methods with Lean technology.** WIKA USA selected a Lean ERP solution because of its support for Lean methods – the Lean processes were already built into the system. The solution combined Lean methodology with traditional manufacturing and distribution functions, and provided the metrics WIKA USA needed to support Kaizen processes – continuous improvement of its Lean efforts. And because the ERP system they chose was the corporate standard, WIKA USA can more easily transfer the Lean systems developed at WIKA USA to its other regional operations.

"With valuable Lean Manufacturing expertise from the vendor, WIKA USA completed the implementation in just seven months. The vendor team understands Lean Manufacturing, and they took time to understand our business case and create a solution that meets our needs. Their approach was refreshing in that they totally came behind what we were trying to do – helping us define best practices and integrate them into IT," says Gerster.

Previously, WIKA USA compensated for lack of Lean support in its ERP system with paper-based processes, which meant that the company's 25 manufacturing cells used visual cues, called Kanban cards, to indicate inventory levels. Now, when salespeople enter orders into the system, it automatically triggers a string of events throughout operations – from shipping and manufacturing to the warehouse and suppliers.

Communication between different operational elements is electronic, so production capacity and inventory levels are visible throughout the company. WIKA USA uses this operational visibility to allow customers and salespeople to easily forecast potential orders or return status on existing orders. WIKA USA built an Online Customer Center using a module of the ERP system and information available through the Lean Enterprise solution from the Lean system provider.

Taking advantage of the electronic data interchange (EDI) capabilities in the enterprise portal, the Online Customer Center lets customers check inventory, product availability, lead times, account history, purchase orders, invoices, and UPS and FedEx tracking without having to contact their WIKA USA sales representative. WIKA USA is considering adding a purchase capability to the site so that customers can place orders online as well.

continued

Case Study — WIKA USA

By adopting Lean Manufacturing methodology, WIKA USA quickly reaped rewards in terms of space reduction, increased productivity, and reduced inventory. WIKA USA enjoys numerous benefits extending Lean as well, including greater operational efficiency, more satisfied customers, new metrics for continuous improvement, and a more manageable IT system. "WIKA USA is at a stage where we are continually refining our manufacturing and business processes. [The Lean ERP solution] helps us drive continuous improvement to reduce costs and increase customer satisfaction," says Gerster.

Competitive Assessment

Aberdeen Group analyzed the aggregated metrics of surveyed companies to determine whether their performance ranked as Best-in-Class, Industry Average, or Laggard. In addition to having common performance levels, each class also shared characteristics in five key categories: (1) **process** (the approaches they take to execute their daily operations); (2) **organization** (corporate focus and collaboration among stakeholders); (3) **knowledge management** (contextualizing data and exposing it to key stakeholders); (4) **technology** (the selection of appropriate tools and effective deployment of those tools); and (5) **performance management** (the ability of the organization to measure its results to improve its business). These characteristics (identified in Table 3) serve as a guideline for best practices, and correlate directly with Best-in-Class performance across the key metrics.

Table 3: The Competitive Framework

	Best-in-Class	Average	Laggards
Process	Demand-driven supply chain (inventory pulled from one stage to the next based on real-time demand)		
	65%	33%	21%
	Ability to manufacture products based on demand from the next stage in supply chain		
	61%	44%	15%
	Time-phased view of inventory in kanban		
	55%	19%	15%
	Ability to standardize Lean processes across the enterprise		
	42%	26%	21%
Organization	Lean initiatives managed at the local level		
	92%	60%	56%
	Executive ownership of Lean across the enterprise		
	70%	60%	41%

	Best-in-Class	Average	Laggards
	Professionals trained in industry-specific Lean principles		
	70%	46%	41%
	Internal Lean Center for Excellence / a Lean organization team		
	63%	49%	44%
Knowledge	Real-time, product family finished goods inventory visibility		
	64%	47%	31%
	Operational data and metrics are displayed in real-time where needed		
	50%	34%	26%
Technology	Lean-enabling technology currently in use:		
	▪ 63% Demand Planning and Forecasting ▪ 43% Manufacturing Execution System ▪ 42% Advanced Planning and Scheduling ▪ 38% Automated Value Stream Mapping ▪ 38% Automated Kanban Execution ▪ 33% Supply Chain Visibility ▪ 25% Enterprise Manufacturing Intelligence	▪ 54% Demand Planning and Forecasting ▪ 41% Manufacturing Execution System ▪ 29% Advanced Planning and Scheduling ▪ 12% Automated Value Stream Mapping ▪ 9% Automated Kanban Execution ▪ 30% Supply Chain Visibility ▪ 21% Enterprise Manufacturing Intelligence	▪ 37% Demand Planning and Forecasting ▪ 18% Manufacturing Execution System ▪ 12% Advanced Planning and Scheduling ▪ 3% Automated Value Stream Mapping ▪ 7% Automated Kanban Execution ▪ 3% Supply Chain Visibility ▪ 6% Enterprise Manufacturing Intelligence
Performance	Shared Lean metrics between supply chain and manufacturing teams:		
	48%	23%	19%
	Ability to track Lean initiatives and measure results:		
	63%	49%	40%

Source: Aberdeen Group, April 2009

Capabilities and Enablers

Based on the findings of the competitive Framework and interviews with end-users, Aberdeen's analysis of the Best-in-Class demonstrates some of the processes and tools Best-in-Class companies are more likely to utilize in developing an integrated enterprise.

Process

Best-in-Class are 2.4-times more likely to have a demand-driven supply chain where inventory is pulled from one stage to the next based on real-time demand, compared to all others. And, Best-in-Class are 2.1-times more likely than all others to have the ability to manufacture products based on demand from the next stage in supply chain.

Best-in-Class are differentiating themselves by being demand driven. Part of this is being able to create a forecast that captures promotions, seasonality, and other events. With information on the next two months, Best-in-Class companies are able to take corrective action on supply and planned production. It isn't typical in Lean to hear about forecasts, because relying on forecasts is thought of as "push" activity. But without a good forecast that incorporates forward-looking events, operations are blind to the supply, labor, and up-time requirements that lie around the bend.

"Pull" manufacturing execution requires certain triggers that are both plant floor and supplier based. Three of these processes include:

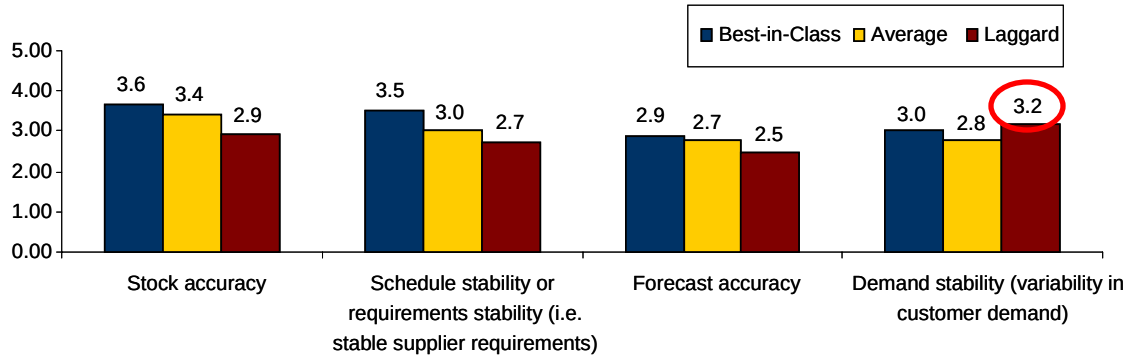
- *Time-phased view of inventory in Kanban, which Best-in-Class are 3.2-times more likely to have than all others.* This process is typically an automated process as a manual process would rely on a prediction and would be difficult to update. In an automated time-phased view, if one variable is updated, everything changes.
- *Lean-based supplier replenishment strategies extending into multi-tiers, which Best-in-Class are 1.9-times more likely than all others to have.* There are a number of ways to incorporate the supply side into the Lean equation. We spoke with manufacturers that worked with core suppliers to develop Vendor Managed Inventory scenarios (supplier manages replenishment of components or raw materials) and supplier relationship management programs that incorporated standards for lead times and perfect orders.

Figure 5 shows an interesting and, at first, misleading data point. Laggards rate their demand stability higher than their peers.

"IT is viewed as a key contributor to solutions design and business analysis. The business, however, views implementation of solutions through IT processes as a hindrance. This slowness to deploy becomes the struggle. The business often adopts solutions which are manual and / or not in alignment with our IT Roadmap and common global business processes. This creates issues throughout IT systems and often fosters new, non-Lean practices elsewhere to accommodate the non-integrated work-around solutions."

~ IT Solutions Architect, Large North American Designer, Manufacturer, and Distributor

Figure 5: Laggards Have a False Sense of Demand Security



Source: Aberdeen Group, April 2009

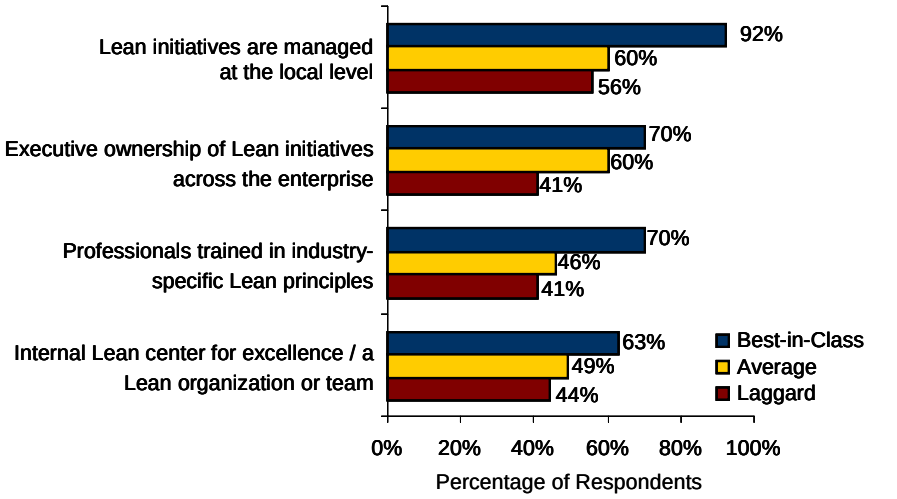
The measurement in Figure 5 is derived from a qualitative assessment from survey respondents. Survey respondents were asked to rate performance on a scale of 1 to 5 (1 being very low, 5 being very high).

In reality, however, Laggards also have lower stock accuracy, forecast accuracy, and schedule stability. The problem here is Laggards do not have the systems in place to the let the actual demand signal come in. They have an artificial demand stabilizer that gives them a false sense of security, so when they start looking at forecast accuracy the system appears broken. The takeaway is that Laggards should get visibility into real demand however volatile and uncertain it is and adjust their processes to be able to manage to it.

Organization

In past Lean manufacturing benchmark studies, the executive ownership of Lean has been a key differentiator for Best-in-Class companies. In this study, Best-in-Class excel in making Lean a local initiative in addition to focusing on the executive sponsorship. Recall in Chapter 1, Best-in-Class companies are more likely to recognize the challenge that exists in finding available resources for Lean initiatives.

Figure 6: Lean is Local and a Driver of Corporate Excellence



Source: Aberdeen Group, April 2009

The following case study illustrates Sonoco's multiple initiatives in training and standards to drive Lean awareness and support the local efforts throughout the enterprise, which came about as a result of a limited impact and success of the previous Lean initiatives.

Case Study — Sonoco

Sonoco is a manufacturer of industrial and consumer packaging products and a provider of packaging services, with 327 locations in 35 countries.

continued

Case Study — Sonoco

In addition to its services, some of the company's products include consumer packaging, rigid packaging, tubes and cores / paper, wire and cable reels, and molded and extruded plastics, among others.

Sonoco is steeped in history involving innovation and learning and its focus on shareholder value has also lead Sonoco's approach to the Lean Enterprise. Aberdeen spoke with Jeff Slater, Operating Excellence Leader, Sonoco. He explained, "Sonoco has focused on delivering value in each project while developing a long-term strategy and approach to developing our production system. Consistent with our corporate mission, we have always believed that People Build Businesses."

In the mid-1990s, Sonoco leaders were seeing its Lean projects return less than average results, with minimal tools outside of simple problem solving methods being utilized, and the Voice of the Customer indicating their recommendations were taking nine months to more than a year to implement.

Between 1997 and 2006 the company invested US $16.5 million and mentored 874 trainees and 580 Global Leaders in Lean methodologies. Today the company remains committed to actively developing a diverse, global workforce. All of its employees are held to the same high standards of excellence and are rewarded for personal performance.

Each of Sonoco's businesses and divisions has had to pave their own path to Operational Excellence and achieving true Customer Satisfaction. Slater discussed three points that drive the success of Sonoco's Lean projects.

- Leadership Involvement – Sonoco leaders are trained and well versed in Lean Six Sigma tools and processes. They understand the value and how to support and recognize the work being accomplished. This leadership experience and knowledge allows Sonoco teams to "suspend disbelief" and focus on the results, which must be "fact based" and measurable.
- Secondly, Sonoco continues to improve and develop ways to recognize individual and team projects and accomplishments dedicated to and involving the customer – CSTE Awards "Customer Satisfaction through Excellence." In addition, other projects have the potential honor of presenting their results and achievements to the Executive Committee.
- Finally, Sonoco is applying the strategy and tools with a "pull strategy," utilizing tools and resources when requested by the business. A piece of this work deals with Leadership Waste and Standard Work for Leaders, sharing with leaders how to "walk the talk."

continued

Case Study — Sonoco

Slater points out, "As people, facilities, and divisions hear of the success stories and achievements, others have come to the drink from the fountain." One foundational success for Sonoco has been its focus on mentoring and networks that allow people to share best practices. "We aren't there yet, and if it is a true journey, our path will continually change. However, we are making great strides in developing a learning organization," said Slater.

Knowledge Management

Knowing inventory, having the data, and making the metrics meaningful to extending Lean beyond the manufacturing plant are Best-in-Class differentiators.

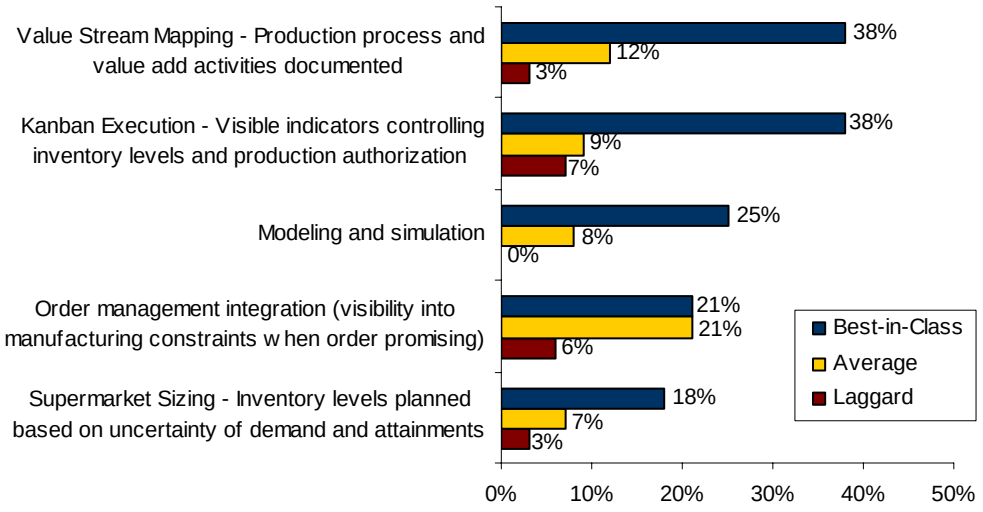
- *Best-in-Class are 1.4-times as likely as Industry Average and 2.1-times more likely than Laggards to have real-time, product family finished goods inventory visibility.* Aberdeen consistently sees among manufacturers disparate ERP or WMS systems preventing finished goods inventory visibility. While this report discusses Lean at a plant or local (i.e. warehouse, region) level, Lean from an enterprise standpoint requires visibility that prevents unnecessary orders or production.
- *Best-in-Class are 1.5-times as likely as the Industry Average and 1.9-times more likely than Laggards to have in place operational data and metrics displayed in real-time where needed.* Companies find the real-time display of operational metrics helps to maintain performance within acceptable standards.

Technology

Up to this point, the report cites the processes, organizational structure, and knowledge management practices utilized by Best-in-Class companies. And as much as Lean initiatives are developed with these capabilities, the Best-in-Class have also evolved their IT roadmap to be an integral part of their Lean journey.

Figure 7 depicts Best-in-Class Lean automation, showing the large utilization gap between them and the Industry Average and Laggards.

Figure 7: Lean Automation



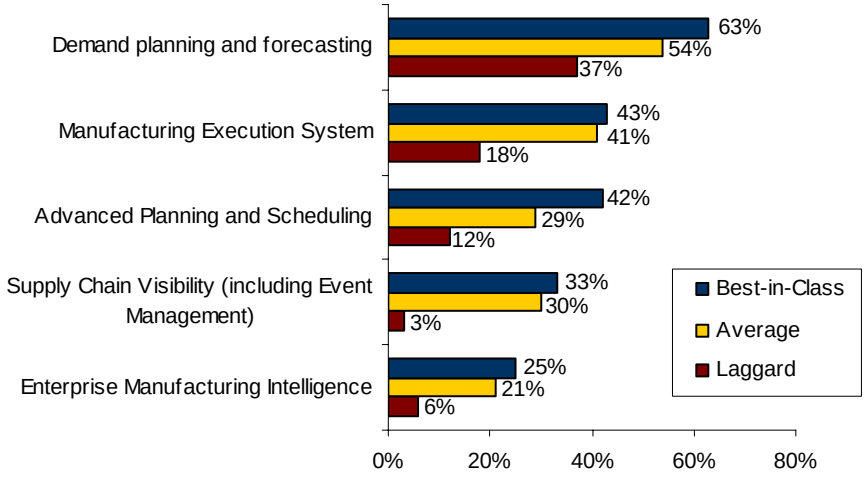
Source: Aberdeen Group, April 2009

The following list is a short description of each of the Lean tools in Figure 6.

- **Value Stream Mapping.** A process at the tactical level most likely has an almost simultaneous data flow. There are multiple systems involved in collaborative processes, which also beckons IT involvement in a Lean project.
- **Kanban Execution.** The system triggers a visual demand signal to pull raw materials or work-in-process inventory forward, into the next phase. And a kanban system can be extended into suppliers. Kanban automation connects the system so that an update in one place is an update across the system. Ideally, this ensures a manufacturing cell is never unnecessarily experiencing downtime.
- **Modeling and Simulation.** These are solutions that enable the ability to model supply chains all the way to resource level details and then create discrete event simulation models. It requires a level of flexibility in data relationships in order to model costs alongside resource planning, production, or shipping schedule changes. As much as costs need to be incorporated into a model, consider the impact beyond the process being studied.
- **Order Management Integration.** Here is a key collaborative opportunity between a key supply chain management process (order-to-delivery cycle) and demand planning and resource planning.
- **Supermarket Sizing.** Is a key enabler that provides automated optimization of WIP inventory buffer levels to smooth production, minimize in process stock-outs, and create flexibility in responding to uncertainty in demand, supply, or quality issues.

In addition to the Lean tools outlined above, Aberdeen also gauged the use and differential among Best-in-Class, Industry Average, and Laggard companies using enterprise applications. It is important to note that the solutions highlighted in Figure 8 are more likely to be used in tandem with the Lean tools in Figure 7.

Figure 8: Enterprise Applications Enabling Lean



Source: Aberdeen Group, April 2009

The following list discusses the applications referenced in Figure 8.

- **Demand Planning and Forecasting.** By way of algorithms and stochastic modeling, these solutions determine forward-looking inventory targets by product, customer, location, and so forth, for production planning and scheduling.
- **Manufacturing Execution Systems.** Allow manufacturers to more efficiently track and trace production across the organization, optimize production schedules given real constraints, and improve the quality from both a process and finished product perspective. To learn more please see Aberdeen's March 2009 benchmark, *A Platform Approach to Manufacturing Operations Management*.
- **Advanced Planning and Scheduling (APS).** The result is a creation of production plans at different levels of granularity (monthly, weekly, daily, or near real-time) using a variety of approaches, such as theory of constraints, optimization algorithms, takt time scheduling, and heuristics.
- **Supply Chain Visibility and Event Management.** Consider supply chain visibility to be an enterprise capability that lies in the background of many, if not all, supply chain processes. Decision making becomes semi-automated to automated as items like customer demand, shipments, orders, production, and inventory are monitored and measured. If, for example, items dip below or above

a lower or upper limit, the event is either automatically handled or sent to the appropriate manager.

- **Enterprise Manufacturing Intelligence.** Aggregates data from across disparate plant level sources, abstracts this data to an enterprise level manufacturing data model, and then provides contextualized, role based analytics and dashboards, in real-time, to key decision makers.

Aberdeen Insights — Right-Sizing Inventory (Just-in-Time and Buffers) Across the Enterprise

As companies look to right-size inventories there is a common fatal error they make. They view Lean through a myopic lens and the result of a poorly planned Lean implementation turns into exactly what they were looking to avoid: excess inventory levels. Plant managers continuously try to implement Lean locally, reducing inventory at the plants without considering the impact on the order-to-delivery process from suppliers to customers.

Moving to a cell manufacturing approach or reducing batch sizes, for example, should include a revamp of forecasting, production scheduling, and inventory management processes. Without considering these critical supply chain steps, demand and supply become out of synch. The result is the pile up of components or raw materials inventory at the beginning of one line and the delay of materials on another line.

The reality is that today's businesses have conflicting goals. Companies are trying to decrease inventory and meet volatile customer demands or reduce total setup investments while striving for smaller lots.

Pure Lean principles need to be looked at in tandem with industry leading best practices in supply chain, such as intelligent inventory management, response management, and demand management, in order to create the ideal Lean plant. Also, the approach of avoiding software is no longer realistic in today's environment due to the simple fact that there are too many constraints, which cannot be handled manually with ad hoc tools. Of course black box approaches will not be able to handle the day-to-day exceptions that happen and hence the solution should arm the plant personnel to make informed decisions by providing visibility to operational information and exceptions.

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Chapter Three: Required Actions

Whether a company is trying to move its performance in its Lean projects from Laggard to Industry Average, or Industry Average to Best-in-Class, the following actions will help spur the necessary performance improvements:

Laggard Steps to Success

- **Institutionalize Lean locally.** Best-in-Class are 1.6-times more likely to manage Lean locally. What this implies is that organizations should look at making sure that Lean initiatives are implemented at the shop floor before expanding into the supply chain.
- **Level planning.** Best-in-Class are 5.3-times more likely to have level planning process capabilities. Level planning is critical in order to allow reliable schedules to be sent out to the supplier base. However level plans should not be created at the expense of demand variability.
- **Shared Lean metrics between supply chain and manufacturing.** Best-in-Class are 2.5-times more likely to share Lean metrics between supply chain and manufacturing teams. Decide the metrics that will measure the performance of your Lean initiatives (for example, take a balance scorecard approach and select metrics for learning, finance, customer, and business) and collect as much data as possible around these metrics, regardless of quality and quantity in the beginning. This will show the weakest and strongest points, revealing a standard and chasms to cross before achieving those standards.

Industry Average Steps to Success

- **Extend Lean across the enterprise and establish corporate Centers for Excellence.** Forty-nine percent (49%) of Industry Average companies have extended Lean into the supply chain and the enterprise through creating a center of excellence, versus 63% of Best-in-Class companies. Lean Centers of Excellence are critical for both allowing the executive team to drive focus on Lean as well as providing the necessary resources for grass roots initiatives to gain strength and extend from the shop-floor through the supply chain.
- **Implement Advanced Planning and Scheduling (APS) but don't forget Lean.** Forty-two percent (42%) of Best-in-Class companies have implemented APS versus 29% of Average companies. Traditional applications of APS have been mutually exclusive of Lean considerations and have generally only been an extension of MRP systems. It is important to use APS for consideration of actual manufacturing and supply chain constraints,

Fast Facts

√ 42% of Best-in-Class companies watched inventory write-off costs decrease by more than 3% over the past two years.

√ 67% of Best-in-Class achieved a decrease in manufacturing cycle time of 3% or greater over the past two years.

√ 92% of Best-in-Class reported their customer service levels to be high to very high, with an average perfect order of 96%.

but do this within the context of a pull production and supply chain system and not an extension of flawed MRP forecasts.

- **Demand driven supply chain.** Twenty-three percent (23%) of the Industry Average indicate that they have a demand driven supply chain versus 65% of Best-in-Class companies. This means a significant portion of the Industry Average still need to connect their production decisions to real demand, sensed at the point of consumption in the supply chain. Not doing so will only allow the Best-in-Class to further increase their competitive advantage.

Best-in-Class Steps to Success

- **Define performance measurements and track performance through the extended supply chain.** Forty-eight percent (48%) of Best-in-Class companies have managed to create shared Lean metrics across manufacturing and supply chain. The challenge for enabling this is the siloed nature of manufacturing and supply chain organizations where metrics such as OEE & inventory carrying costs may act in opposing ways. For instance, if the focus is to improve equipment utilization then inventory levels might rise resulting in increased inventory carrying costs. Creating a balanced scorecard across these metrics and focusing on synchronizing the entire supply chain, including manufacturing, to actual demand will help to address these hurdles.
- **Time-phased view of inventory in kanban.** Fifty-five percent (55%) of Best-in-Class companies indicate that they have a time phased view of inventory through kanbans. Only 17% of all others have the capability. The reason why it is important to have a time phased view of inventory across a longer time horizon is to make the Lean principles work across a strategic time horizon. Another point that has to be noted is that in order to enable a time phased view of inventory, it is essential to have a technology enabler such as Lean scheduling and execution in place.
- **Lean-based supplier replenishment (kanban) extended into multi-tiers.** Forty-eight (48%) of Best-in-Class companies indicate that they have Lean based supplier replenishment extended into the multi-enterprise supply chain. The challenge of Lean supply chains becomes compounded in environments that are truly multi-enterprise in nature where there is a need for visibility across two or more tiers. This is true in cases of outsourced manufacturing environments. Demand volatility becomes a major concern for suppliers unless customer demand is accurately considered while creating replenishment signals to customers.

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Lean and Inventory Management: How to do the Tradeoff?

The following are five actionable recommendations for plant managers as well as to extended supply chain teams to achieve Best-in-Class performance through Lean manufacturing and inventory management performed in tandem:

1. Develop standardized information flows from supply chain organization to manufacturing and visa versa. The Sales and Operations Planning (S&OP) process should be collaborative, where plant and supply chain managers meet on a periodic bases or where plant managers share the plant's ability to support customer demand (takt time).
2. Establish a bi-directional information flow between the supply chain and the manufacturing organizations. For instance, weekly customer forecasts as well as monthly S&OP plans from the corporate supply chain group to manufacturing; weekly delivery schedules and monthly adherence to S&OP plans from manufacturing to supply chain.
3. Determine optimal inventory levels to ensure reduction of wasted inventory through usage of inventory management solutions that can set up optimal safety stocks at the various buffers within the supply chain. Instead of keeping excessive work-in-process inventory at the plants, a sufficient amount of finished goods inventory must be kept in order to meet excessive demand.
4. Incorporate demand and production variability, inventory levels and supplier lead-time as part of the level plan creation process. The goal of the level plan / schedule is to consider inventory targets, demand volatility, supply process variability to create a level plan which satisfies order due dates and inventory targets.
5. Develop Lean techniques that can support various kanban variations suitable for supplier and internal operations. The traditional Lean assumption that the demand and mix is constant and doesn't vary more than ±10% is inadequate for most environments across all industry's sectors. Simple manual and visual controls are not sufficient to handle demand and mix variation in today's environment. Software solutions that allow the ability to model various kanban variations should be explored. In addition, presentation of time-phased view of inventory and kanbans for advance warning and exception management is possible through software solutions.

In summary, create a responsive supply chain and not a clogged supply chain. Management should ensure that there is an effort to create a truly responsive supply chain that allows dynamic balancing of supply and demand. Management should also provide tools and corporate process to gain visibility to potential exceptions between demand, supply and financials in order to execute effective corrective action.

Appendix A: Research Methodology

In March 2009, Aberdeen examined the use, the experiences, and the intentions of 117 enterprises with and without Lean initiatives in a diverse set of enterprises.

Aberdeen supplemented this online survey effort with telephone interviews with select survey respondents, gathering additional information on Lean strategies, experiences, and results.

Responding enterprises included the following:

- *Job title / function:* The research sample included respondents with the following job titles: manufacturing, procurement, supply chain, or logistics manager (34%); senior management (19%); director (18%); IT manager or staff (8%); engineering and analyst staff (9%).
- *Industry:* The research sample included respondents from multiple industries, including: general manufacturing (13%); industrial equipment (10%); health, medical dental devices or services (8%); aerospace and defense (7%); consumer packaged goods (6%); automotive (6%); chemicals (5%); food and beverage, pharmaceutical manufacturing, metals and metal products (4% each); apparel computer equipment and peripherals, consumer electronics, consumer durable goods, engineering, transportation (3% each).
- *Geography:* The majority of respondents (71%) were from North America. Remaining respondents were from the Asia-Pacific region (7%), EMEA (20%), and South / Central America (2%).
- *Company size:* Forty percent (40%) of respondents were from large enterprises (annual revenues above US $1 billion); 34% were from midsize enterprises (annual revenues between $50 million and $1 billion); and 26% of respondents were from small businesses (annual revenues of $50 million or less).
- *Headcount:* Eighteen percent (18%) of respondents were from small enterprises (headcount between 1 and 99 employees); 30% were from midsize enterprises (headcount between 100 and 999 employees); and 52% of respondents were from large businesses (headcount greater than 1,000 employees).

Solution providers recognized as sponsors were solicited after the fact and had no substantive influence on the direction of this report. Their sponsorship has made it possible for Aberdeen Group to make these findings available to readers at no charge.

Study Focus

Responding manufacturing and supply chain executives completed an online survey that included questions designed to determine the following:

- √ The length of experience in Lean deployments and the performance improvement garnered from Lean projects that had been extended into the supply chain
- √ The structure and effectiveness of existing Lean initiatives
- √ Current and planned use of Lean scheduling and execution tools, and enterprise applications to aid operations

The study aimed to identify emerging best practices for Lean usage in extending Lean into the value chain, and to provide a framework by which readers could assess their own management capabilities.

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Table 3: The PACE Framework Key

Overview
Aberdeen applies a methodology to benchmark research that evaluates the business pressures, actions, capabilities, and enablers (PACE) that indicate corporate behavior in specific business processes. These terms are defined as follows: **Pressures —** external forces that impact an organization's market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, competitive) **Actions —** the strategic approaches that an organization takes in response to industry pressures (e.g., align the corporate business model to leverage industry opportunities, such as product / service strategy, target markets, financial strategy, go-to-market, and sales strategy) **Capabilities —** the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing) **Enablers —** the key functionality of technology solutions required to support the organization's enabling business practices (e.g., development platform, applications, network connectivity, user interface, training and support, partner interfaces, data cleansing, and management)

Source: Aberdeen Group, April 2009

Table 4: The Competitive Framework Key

Overview	
The Aberdeen Competitive Framework defines enterprises as falling into one of the following three levels of practices and performance: **Best-in-Class (20%) —** Practices that are the best currently being employed and are significantly superior to the Industry Average, and result in the top industry performance. **Industry Average (50%) —** Practices that represent the average or norm, and result in average industry performance. **Laggards (30%) —** Practices that are significantly behind the average of the industry, and result in below average performance.	In the following categories: **Process —** What is the scope of process standardization? What is the efficiency and effectiveness of this process? **Organization —** How is your company currently organized to manage and optimize this particular process? **Knowledge —** What visibility do you have into key data and intelligence required to manage this process? **Technology —** What level of automation have you used to support this process? How is this automation integrated and aligned? **Performance —** What do you measure? How frequently? What's your actual performance?

Source: Aberdeen Group, April 2009

Table 5: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
Aberdeen research indicates that companies that identify the most influential pressures and take the most transformational and effective actions are most likely to achieve superior performance. The level of competitive performance that a company achieves is strongly determined by the PACE choices that they make and how well they execute those decisions.

Source: Aberdeen Group, April 2009

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Appendix B:
Related Aberdeen Research

Related Aberdeen research that forms a companion or reference to this report includes:

- *Demand Driven Manufacturing*; November 2007
- *Transforming the Lean Enterprise*; September 2007
- *Lean Scheduling and Execution*; May 2007
- *Extending the Lean Enterprise*; February 2008
- *Supply Chain Executive's Strategic Agenda 2008: Managing Global Supply Chain Transformation*; January 2008
- *Supply Chain Innovator's Technology Footprint 2008*; March 2008
- *Technology Strategies for Closed Loop Inventory Management*; April 2008
- *Sales and Operations Planning: Aligning Business Goals with Supply Chain Tactics*; June 2008

Information on these and any other Aberdeen publications can be found at www.aberdeen.com.

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