

Lean Operations:

Software Strategies for Manufacturing's New Normal

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Executive Summary

In the run up to the global economic downturn of 2008 and 2009, to a large extent manufacturers had given up on Lean. Initiatives were still prevalent but core principles had not been adhered to. A "build it and we can sell it" attitude had been adopted; with a narrow focus on pure output maximization. Since the collapse, manufacturers have responded with aggressive cuts to inventory and head count and we are now through the worst. This new research will examine what's changed and how we can intelligently ramp up production and inventory, with an eye towards recapturing core Lean principles while also adopting new technology.

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 four Key Performance Indicators (KPIs) to identify Best-in-Class performance, with the Best-in-Class averaging:

- 89% Overall Equipment Effectiveness (OEE)
- 98% on-time and complete shipments
- 86% successful new product introductions
- + 5% operating margin versus corporate plan

Competitive Maturity Assessment

Survey results show that the firms enjoying Best-in-Class performance shared several common characteristics, including:

- Best-in-Class manufacturers are over 50% more likely than Laggards to automate manufacturing data collection
- Best-in-Class manufacturers are over 50% more likely than the Industry Average to create real time, bi-directional visibility between manufacturing operations and customer orders
- Best-in-Class manufacturers are over 50% more likely than the Industry Average to provide executives with real time visibility into manufacturing operations

"One of the biggest benefits we realized after going Lean is the gain from an involved workforce. The employees now see a way to have an impact on the way things are done and we are getting many volunteers to be part of the team. We have seen several processes streamlined by over 30% within a month after adopting the Lean approach."

~ VP of Operations, Large
Pharma Company

Required Actions

To achieve Best-in-Class performance, manufacturers should:

- Focus on improving efficiency in manufacturing operations and reinvigorate Lean or other operational excellence initiatives - this includes extending Lean to the value chain and new products
- Deliver automated collected manufacturing data to executives and plant personnel as real time actionable intelligence
- Incorporate mobile devices into a natural extension of Lean manufacturing, think of it as an increased ability to "go and see" the manufacturing process in action

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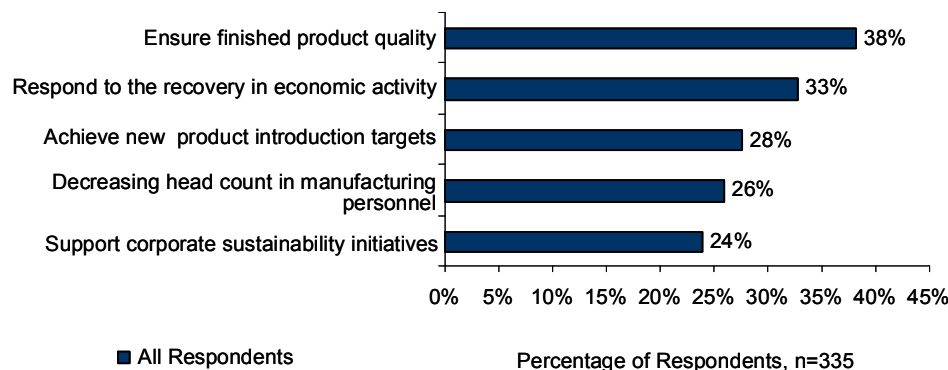
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Chapter One: Benchmarking the Best-in-Class

Business Context

In Aberdeen's 2008 Lean manufacturing survey, the number one pressure driving manufacturers was financial, with 79% of respondents focused on cutting operational costs. Interestingly, quality was a mere afterthought at the time, with only 16% of respondents being pressurized by finished product quality demands. In the new normal of 2010, manufacturers are facing a much more balanced set of pressures; with quality now in the lead and responding to the economic rebound coming in at second.

Figure 1: Top Two Pressures Driving Lean Initiatives



Source: Aberdeen Group, June 2010

There were also big upticks in the focus on decreasing head count and supporting corporate sustainability issues. In years past the focus around headcount was all on an aging workforce and preserving tribal knowledge in more automated workflows. With the recent cuts in employment, it is now all about learning to do more with fewer people by increasing flexibility, cross training, and ensuring safety requirements aren't sacrificed. With regard to sustainability issues, previously, organizations may have been more focused on products or marketing, as in making more fuel efficient cars or promoting brands as green. Today, manufacturers are more apt to walk the talk and improve the energy, carbon, or water intensity of operations in support of these initiatives.

Finally, hitting new product targets continues to drive decisions in manufacturing. Time, volume, and quality all impact a new product's success and with shrinking product development cycles more pressure is being put on the manufacturing organization in this regard. The link between product development and manufacturing operations will continue to be a key source of strategic differentiation and will prove to drive significant value for many companies. In the next section we will show how top manufacturers are

Fast Facts

Best-in-Class enterprises significantly outperform their competition. These manufacturers enjoy:

- ✓ 98% on-time and complete shipments
- ✓ 89% Overall Equipment Effectiveness (OEE)

When compared to Laggard manufacturers, this accounts for:

- ✓ 15% more on-time and complete shipments
- ✓ 51% higher OEE

performing in many of these areas and discuss how Lean is a common thread tying many of them together.

The Maturity Class Framework

In this study, Aberdeen uses four key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations:

- **On-time and complete shipments** are products delivered on time and complete as compared to total original commitment
- **OEE** is a composite metric accounting for availability, performance, and quality
- **Successful new product introductions** is measured as the average share of new product introductions that hit quality, time, and volume targets
- **Operating margin versus corporate plan** is measured as operating margin realized relative to the corporate goals established

Respondents were divided among three categories based on their aggregate performances in these four metrics. Table 1 displays the average performance of Best-in-Class, Industry Average, and Laggard organizations.

"We saw a greater than 30% reduction in top line revenue over the course of the last year. Being in Detroit, we actually felt lucky to not see it greater! We had a reduction in staff, focused on cross training, and deployed the remaining workforce towards product development. This retrenchment positioned us for the up turn. "

~ Director of Operations
 Mid-Size Contract
 Manufacturer

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	<ul style="list-style-type: none"> ▪ 86% New Product Introductions ▪ 89% OEE ▪ 98% On Time and Complete Shipments ▪ +5% Operating Margin vs. Plan
Industry Average: Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 75% New Product Introductions ▪ 80% OEE ▪ 91% On Time and Complete Shipments ▪ +1% Operating Margin vs. Plan
Laggard: Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 62% New Product Introductions ▪ 59% OEE ▪ 85% On Time and Complete Shipments ▪ -4% Operating Margin vs. Plan

Source: Aberdeen Group, June 2010

The Best-in-Class PACE Model

Ensuring finished product quality, responding to economic conditions, or successfully delivering new products to market can be a daunting task. Table 2 summarizes some of the strategic actions, business process capabilities, and technology enablers Best-in-Class companies have implemented to address these market pressures.

Table 2: The Best-in-Class PACE Framework

Pressures	Actions	Capabilities	Enablers
<ul style="list-style-type: none"> Ensure finished product quality 	<ul style="list-style-type: none"> Increase focus on Lean and other operational excellence initiatives Improve the efficiency of manufacturing operations 	<ul style="list-style-type: none"> Standardized measurement of KPIs across enterprise Dynamically update manufacturing business processes as best practices emerge Formal process in place to capture ideas from employees, customers, and suppliers Real-time visibility between manufacturing operations and customer orders Real-time visibility from manufacturing operations into supplier performance Scorecard for normalizing performance across operations 	<ul style="list-style-type: none"> Enterprise Resource Planning (ERP) Product Lifecycle Management (PLM) Supply Chain Management (SCM) Lean Enablement Software

Source: Aberdeen Group, June 2010

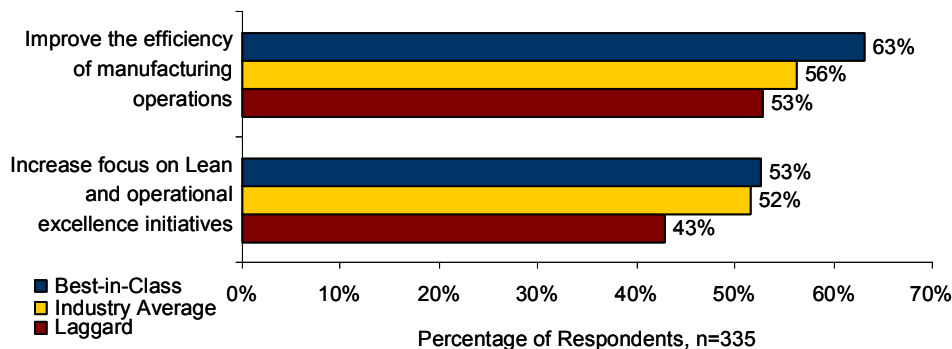
Best-in-Class Strategies

Regarding the strategic actions executives are taking in response to the market pressures faced, there are two strategic actions that are aligned with Best-in-Class performers. At the top of the list is improving efficiency in manufacturing operations and next is increasing focus on Lean or other operational excellence initiatives. Both of these are not new concepts in manufacturing and represent a "back to basics" approach that many manufacturers are adopting as they attempt to ensure the mistakes of the past are not repeated as we move out of the down turn and back to a state of growth.

"We have just initiated Lean in our organization by the use of 5S tools. One of the major challenges I faced was to get buy-in from the top executives as well as the shop-floor workers. Because Lean initiatives demand change in the manufacturing process, it is critical to get everyone involved to successfully reap the benefits."

~ Doug Melton Quality Assurance Manager, Dallas Group of America

Figure 2: Top Two Strategic Actions



Source: Aberdeen Group, June 2010

Aberdeen Insights — Strategy

Lean is not new, so an interesting question to ask is the following: Why is increasing focus on Lean one of the top two strategies being deployed across manufacturing today? The answer, however, may not be too hard to discern given what has happened in manufacturing over the past 10 years. Many of the pioneers of Lean, and even some that weren't, experienced an unprecedented expansion in production and corporate profitability over much of the 2000's. Accompanied with this growth was a new focus on just that - maximizing throughput and a slow migration away from the principles of Lean, including: demand driven manufacturing, a focus on eliminating waste, and strict controls on inventory explosion.

Such a situation left many manufacturers vulnerable to the collapse in demand for their goods. Even so, the immediate pain that many organizations felt for the most part subsided. Inventory levels have been reduced, waste has been cut out, head-count was eliminated, and even in industries like automotive, many companies returned to profitability. Now, however, demand has begun to return, production and inventory levels have begun to increase, and there is a need to not repeat the mistakes of the past. In the next chapter we will discuss just how Best-in-Class manufacturers are re-invigorating beleaguered Lean initiatives with new strategies and new technologies.

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

Chapter Two: Benchmarking Requirements for Success

The way in which manufacturers implement the business processes and technologies designed to support Lean manufacturing is highly correlated to successfully responding to market pressures and the achievement of Best-in-Class performance.

Case Study — Grief Inc.

Greif (NYSE: GEF, GEF.B) is a world leader in industrial packaging products and services. The company creates competitive advantage for its customers through extensive experience in steel, plastic, fiber, flexible and corrugated containers for various industries. With more than 200 operating locations in more than 50 countries, Greif is positioned to serve local, national, or multinational customers where they do business.

In 2003 Greif launched its Operational Excellence (OpEx) initiative to help the company integrate the operations of two major acquisitions, dramatically cut costs, and drive profitability. Over the next five years Greif invested heavily in capabilities to support OpEx. Greif established support of the initiative from senior executives, created a Center of Excellence to support local initiatives, got local buy in from machine operators, used white boards and visual management to have operators report performance locally at the production line, and established a set of common metrics to compare performance across plants.

However, as the overall OpEx initiative matured, it became clear to Greif executives that current capabilities around data collection and data quality could only take them so far. So in 2008, management at Greif's Omaha Nebraska Multiwall Packaging facility began a Proof of Concept (PoC) to address these issues and improve OEE by focusing their efforts on perceived speed loss issues. The PoC included automated shop floor data collection, data aggregation, data analysis, and data visibility, which revealed that the line was actually running at higher than expected speeds but the plant was losing on downtime with their paper roll changes during shift.

According to Greif's manual data, roll changes averaged two minutes, but actual data showed that each roll change actually lasted from three to fifteen minutes per shift. After pinpointing the problem, Omaha nailed down the average roll change to two minutes. The plant floor data solution also detected registration problems with the plant's Pinchbottom machine, which seals bags. The registration problems totaled 140 per shift, lasting 30 seconds each, which added up to a significant loss of time. To date, the plant has eliminated over 100 hours of downtime per month.

To explore this technology, Greif's next step was to launch PoC's in six more plants in the first half of 2009. Three of these plants were in North America, two were in the EU and one was in Latin America; all experienced similar results to the Omaha plant when they were complete.

continued

Fast Facts

Compared to all competitors, the Best-in-Class are:

- √ 34% more likely to standardize measurement of KPI's across the enterprise
- √ 31% more likely to have real-time visibility between manufacturing operations and supplier performance
- √ 67% more likely to allow their executives have real-time visibility into the performance of global manufacturing operations

Case Study — Grief Inc.

Then, based on this success, for the second half of 2009 and first half of 2010, Grief has been deploying the solution company-wide in 90 plants across 20 countries. The enterprise solution collects real-time data across multiple lines, plants, and geographies, enabling standardization and comparison of efficiencies from job to job, plant to plant, and employee to employee. Now with the technology rollout just about complete, the OpEx team is focused on training employees world-wide on how to use this technology.

According to Travis Groff, Vice President of Operational Excellence Worldwide at Grief, “Using our shop floor data collection, aggregation, analysis, and visibility solution has increased the effectiveness of our OpEx initiatives as well as performance in OEE and run speed at a number of our plants. It is now up to us to help our people effectively use this technology worldwide.”

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 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 the appropriate tools and the effective deployment of those tools); and (5) **performance management** (the ability of the organization to measure its results to improve its business).

Table 3: The Competitive Framework

	Best-in-Class	Average	Laggards
Process	Formal process in place to capture ideas from employees, customers, and suppliers		
	54%	51%	46%
	Standardized measurement of KPIs across the enterprise		
	63%	54%	47%
	Manufacturing business processes are dynamically updated as new best practices emerge		
	40%	27%	14%
Automated work flows to manage non-conformance, non-compliance, and recall events across the enterprise			
	33%	22%	20%

Acronyms

- ✓ **MOM** Manufacturing Operations Management
- ✓ **MES** Manufacturing Execution Systems
- ✓ **MI** Manufacturing Intelligence
- ✓ **OI** Operational Intelligence
- ✓ **QMS** Quality Management Systems
- ✓ **PLM** Product Lifecycle Management
- ✓ **SCM** Supply Chain Management
- ✓ **ERP** Enterprise Resource Planning

	Best-in-Class	Average	Laggards
Organization	Cross-functional continuous improvement teams are focused on improving manufacturing operations		
	65%	66%	59%
	Executive sponsorship for initiatives on improving manufacturing operations		
	79%	74%	63%
Knowledge Management	Manufacturing data is collected automatically		
	54%	37%	36%
	Real-time visibility between manufacturing operations and customer orders		
	46%	40%	33%
	Real-time visibility from manufacturing operations into supplier performance		
	21%	19%	16%
Performance Management	Executives have real-time visibility into the performance of global manufacturing operations		
	35%	34%	21%
Technology	Software applications currently in use:		
	<ul style="list-style-type: none"> ▪ 74% ERP ▪ 22% MOM ▪ 33% SCM ▪ 18% PLM ▪ 80% MOM Integrated with ERP ▪ 20% MOM Integrated with EMI 	<ul style="list-style-type: none"> ▪ 69% ERP ▪ 16% MOM ▪ 33% SCM ▪ 15% PLM ▪ 59% MOM Integrated with ERP ▪ 3% MOM Integrated with EMI 	<ul style="list-style-type: none"> ▪ 59% ERP ▪ 14% MOM ▪ 21% SCM ▪ 14% PLM ▪ 50% MOM Integrated with ERP ▪ 0% MOM Integrated with EMI

Source: Aberdeen Group, June 2010

Capabilities and Enablers

Based on the findings of the Competitive Framework and interviews with manufacturing executives, Aberdeen's analysis demonstrates that there are a number of different business capabilities and technology enablers driving Best-in-Class performance.

Process

To start, many Best-in-Class manufacturers are formalizing initiatives to capture ideas for improvement from key stake-holders including employees, customers, and suppliers. Initiatives like this can come from many different sources, sometimes it starts with a continuous improvement initiative, other times it could come from product development and market research. The important thing is that as these initiatives mature and that they don't stay

"We are just starting our journey of corporate wide process standardization but several benefits are immediately obvious. One is the change in culture. In the past it was OK to 'protect' some key tool or technology that benefitted your plant or division as it gave you a competitive edge 'internally,' as each manager is trying to compete with other managers. The standardization internally has forced those people who are protecting information or technology out of hiding and forced people to share their keys to success.

Second we are starting to see a focus on delivering results, not a focus on the how. The key here is that people are realizing it isn't how we get there that is important but actually achieving the goal."

~ Director of Operational Excellence
Large Packaging Manufacturer

confined to the areas where they start. Finally, an increasing number of manufacturers are beginning to formalize these programs through social networking mediums.

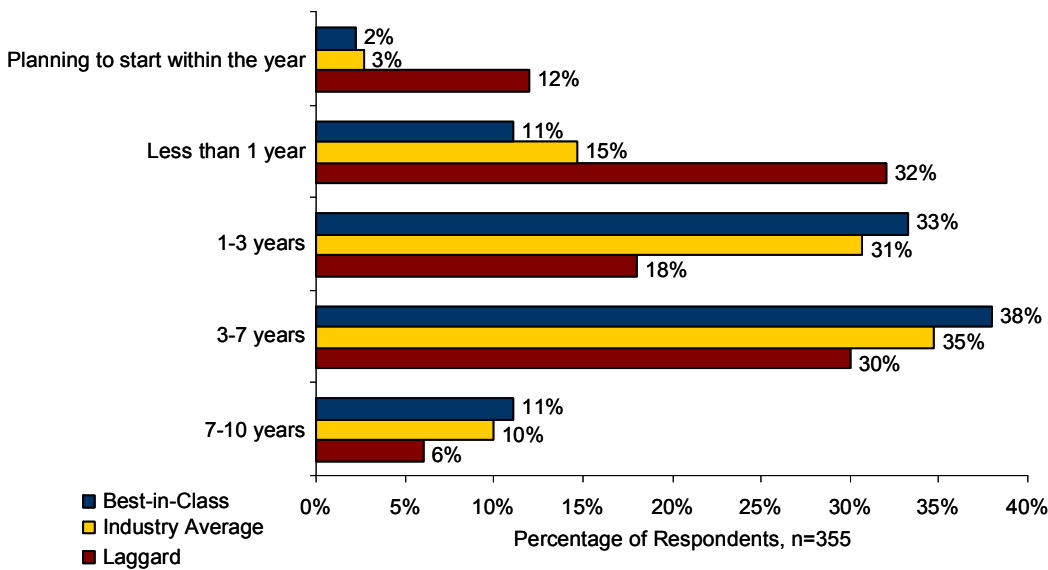
The Best-in-Class are also differentiating themselves by putting in place the ability to standardize and then update best practices across the entire manufacturing network. Examples of this standardization can include the ability to create and update KPIs across multiple facilities or establish best practices for optimizing production schedules or inventory levels. When put in the context of the top market pressures like ensuring finished product quality, it becomes clear that manufacturers can only accomplish this if best practices and standardized operating procedures are followed consistently and universally.

Organization

Having cross-functional teams focused on Lean and improving quality or the efficiency of manufacturing operations ensures that there is a balanced approach and any new initiative is not pulled too far in any one direction like supply chain, engineering, IT, or finance. Having cross-functional teams also makes it more likely to gain acceptance of such initiatives on the shop floor because such initiatives inevitably involve change regarding processes and technology, which can only be effective with such buy-in achieved first. Laggard companies need to focus on creating a culture of collaboration by establishing cross functional teams focused on improving manufacturing operations.

It is also important that such initiatives have support at the executive level. Executive sponsorship can sustain such initiatives in times of adversity and help create a positive culture throughout the organization. Executives can also drive expansion of Lean to areas of the organization outside of manufacturing and sustain the Lean journey over time, which (as Figure 3 shows) aligns to Best-in-Class performance.

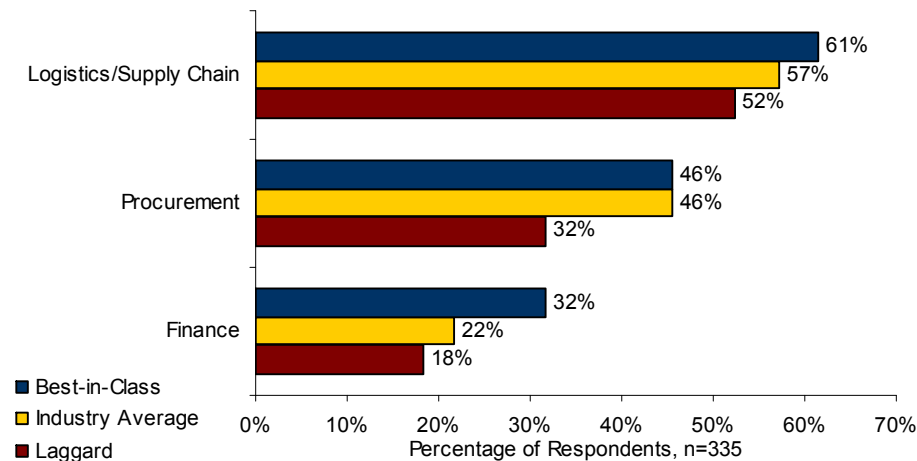
Figure 3: Maturity of Lean Program



Source: Aberdeen Group, June 2010

When the length of a Lean deployment is considered, it turns out that enterprises having focused on Lean for one year are almost three times more likely to be Laggards than Best-in-Class. Conversely, enterprises having focused on Lean for one to three, three to seven, and seven to ten years are all more likely to be Best-in-Class. The message heard is clear; if you haven't started Lean you better, if you have already started stay the course, it may take several more years before you achieve Best-in-Class performance, and if you are Best-in-Class and well into a Lean deployment; invest in the sustainment and reinvigoration of these programs. It is likely that they have been and will continue to be the key to your performance gains.

Figure 4: Scope of Lean Program



Source: Aberdeen Group, June 2010

Lean can also deliver value outside of manufacturing and this means going beyond just cross functional continuous improvement teams. It should mean focusing on waste reduction, visual management techniques, value stream mapping, and focusing on customer value creation across the business.

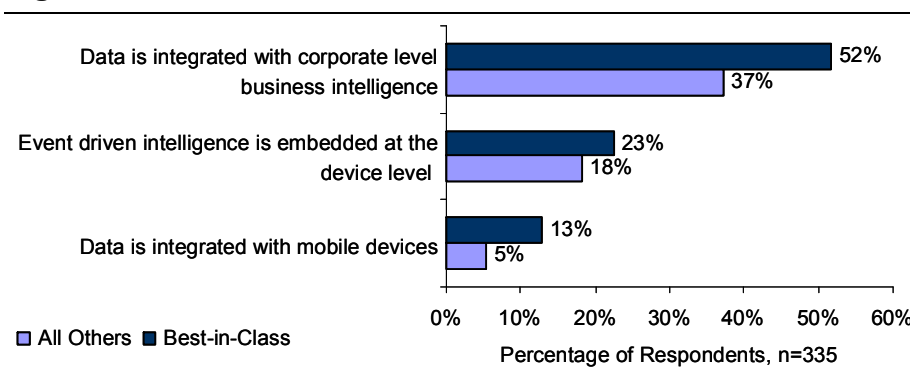
Knowledge Management

In order to make effective decisions, it is essential that manufacturing executives have the necessary knowledge regarding how the enterprise is performing. As a starting point for effective decision making, Best-in-Class manufacturers are investing in automated data collection across operations. This automated data collection can take many forms: increased Ethernet/IP on the shop floor networking intelligent devices, smart metering for energy consumption, third-party data collection appliances connected to Programmable Logic Controllers and more. Figure 5 shows how many Best-in-Class are using this data, which should be considered the corner stone to any modern Lean implementation and in the next section we will discuss how this data can improve performance.

Definition

Ethernet/IP (Ethernet Industrial Protocol) is a network communication standard capable of handling large amounts of data at speeds of 10 Mbps or 100 Mbps, and at up to 1500 bytes per packet.

Figure 5: How Automated Data Collection is Used



Source: Aberdeen Group, June 2010

Best-in-Class manufacturers are also differentiating from the competition by investing in visibility capabilities. Two major areas of visibility associated with Best-in-Class performance include bi-directional visibility between customer orders, manufacturing operations, and supplier performance. Creating this visibility allows for a timely response to interruptions in supply or spikes in demand, and should be considered another cornerstone for both inventory optimization and Lean manufacturing. In the following technology section the necessary enablers for achieving this visibility are discussed in detail, including Manufacturing Operations Management (MOM) interoperability with ERP.

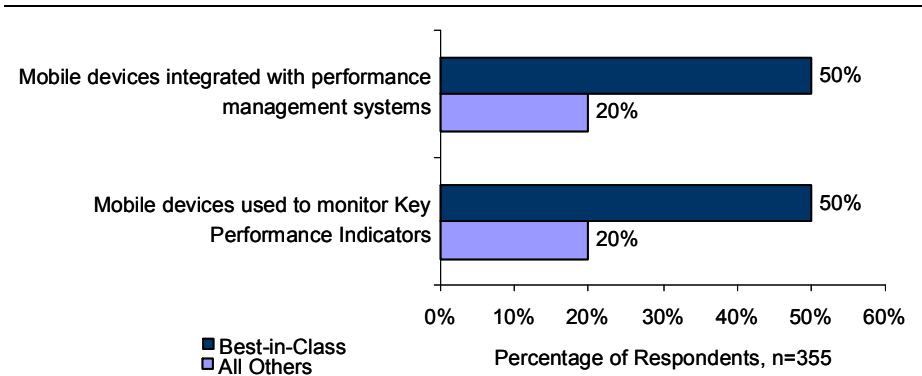
Performance Management

Effectively managing performance is arguably the most important part of any initiative regarding Lean, operational excellence, or MOM. To help accomplish this, the Best-in-Class are providing visibility into manufacturing operations for executives. This allows for better decision making in the

areas of balancing supply and demand across the manufacturing network, more effectively understanding the impact of new product introductions on operations and the success of continuous improvement initiatives.

Best-in-Class manufacturers are also beginning to integrate mobile devices into their overall Lean strategy to help manage performance. One of the main tenets of Lean is to "go and see" what is happening on the production line. It is true that there is no substitute for such an approach, but real time visibility through mobile devices should be seen as a beneficial complement to this, not an excuse to not "go and see." There are many situations where virtual visibility is better than no visibility at all. Figure 6 shows examples of how the Best-in-Class are using mobility today.

Figure 6: Mobile Devices in Lean



Source: Aberdeen Group, June 2010

Technology

There is a strong correlation between adopting the technologies spanning the ISA-95 technology stack and achieving Best-in-Class performance; starting at the controls layer, moving up through manufacturing operations management, and ending with enterprise applications focused on the interdependent functional areas of product development, engineering, inventory management, distribution, and production planning. By adopting such a technology strategy, Best-in-Class manufacturers are able to better implement strategies around Lean and efficiency and address the market pressures they face, including the need to ensure finished product quality, quickly ramping up to demand, and effectively introducing new products.

The Best-in-Class have also invested in interoperating between ERP, MOM, and EMI which allows manufacturers to accomplish many different capabilities. First, it enables a seamless connection between the enterprise systems managing inventory, customer orders, supplier deliveries and more with the systems that provide detailed manufacturing execution capabilities. It also allows for aggregation of automatically collected data from a number of different real time manufacturing data sources. Enabling manufacturers to display and contextualize this data in native EMI dashboard technology or

Definition

ISA-95 is the international standard for the integration of enterprise and control systems. For more information please visit <http://www.isa-95.com/>

integrate the data with Business Intelligence (BI) solutions that may already be deploying dashboards and analytics at the enterprise level.

Enablers

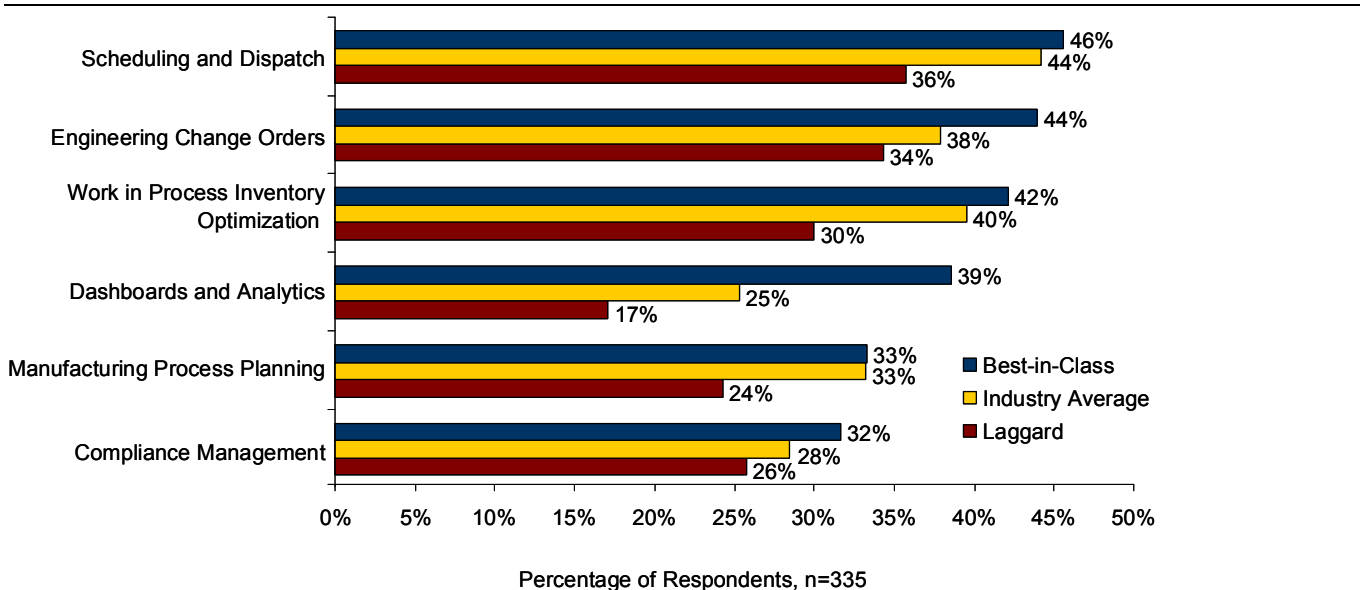
In general, the technology enablers that are more likely to be used by the Best-in-Class transcend those that were traditionally delivered by a Manufacturing Execution System (MES) like scheduling and dispatch and Work in Process (WIP) inventory optimization for example. When the set of functionalities shown in Figure 7 is looked at holistically it turns out that it spans all aspects of manufacturing operations, including: maintenance, production, quality, and inventory.

Furthermore, it also extends out beyond manufacturing operations to support an extension of Lean beyond manufacturing to begin synchronizing manufacturing operations with the supplier and customer networks and helping to close the loop between design and manufacturing; further highlighting the need for interoperability between enterprise applications like SCM, PLM, QMS, ERP, and MOM.

"We have created a semi-balanced flow schedule based on the use spreadsheets and statistical software. We have also used technology for process and value stream mapping. Once we are comfortable with our supermarket system, both for leveling the pace of production and establishing proper buffer levels, we will complete the transition to automation.

~ Bill Eberhardt, Manager,
Manufacturing
TruSeal Technologies

Figure 7: Delivering Lean Capabilities



Source: Aberdeen Group, June 2010

Aberdeen Insights — Lean and Technology

Companies have been traditionally oblivious of the use of technology in Lean programs. There has been a long documented gap between Lean practitioners and the use of technology. However, this most recent research shows that this gap is starting to close. As technology becomes increasingly pervasive in our everyday lives, the same is true for how we choose to work and use technology in the manufacturing industries. However, the technology that is most supporting Lean initiatives and Best-in-Class performance is not the technology that is automating traditional Lean tools.

Many of these traditional tools are widely adopted across manufacturing. But, many manufacturers that have automated Lean tools like value stream mapping, poka-yoke, 5s, kaizen or others have not yet enjoyed any sustained benefits towards Best-in-Class performance. Aberdeen research shows that the real value is in automating interoperable business processes that follow standards laid out by the likes of ISA-95.

Chapter Three: Required Actions

Whether a company is trying to move its performance in Lean manufacturing 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

- **Focus on reinvigorating Lean or other operational excellence initiatives.** Organizationally, focus has to start right at the top. Industry Average manufacturing organizations are over 20% more likely than Laggard organizations to be focused on Lean or other operational excellence initiatives as a top strategic action. Focusing on these initiatives will help organizations avoid making the same mistakes made in the run up to the economic crisis and will refocus the organization on efficiency, quality, and customer satisfaction.
- **Standardize manufacturing KPIs across the enterprise.** There are a lot of different ways to measure OEE, on time and complete shipments, or new product introductions. Are specified or optimal machine speeds used? Are promise or re-promise dates used? Does time to quality matter for achieving new product targets? All of these questions should be answered and answered uniformly across all manufacturing sites. The Best-in-Class are 20% more likely than Laggards to have already standardized these metrics across the organization.
- **Establish cross-functional continuous improvement teams focused on manufacturing operations.** To help shape the enterprise vision for manufacturing operations, executives should create cross functional continuous improvement teams focused on manufacturing operations. Cross functional teams improve the likelihood of change taking place and taking hold. Best-in-Class manufacturers are over 25% more likely than Laggard manufacturers to have such teams in place.

Industry Average Steps to Success

- **Extend Lean initiatives across the enterprise.** Best-in-Class manufacturers are extending the scope of Lean initiatives. This translates into staying the course and remaining Lean for five years or more, extending Lean to all manufacturing facilities, to all levels of the organization, and to multiple functional groups within the enterprise.
- **Leverage MOM as part of your Lean initiative.** At the functional level, focus on spanning the full suite of manufacturing operations management. Best-in-Class manufacturers differentiate by going beyond scheduling and dispatch or WIP optimization, which are by the way key components of Lean, to also focus on advanced engineering, maintenance, and quality capabilities.

Fast Facts

To improve performance, organizations should consider taking the following steps:

- √ Executives need to focus on reinvigoration Lean or other operational excellence initiatives
- √ Extend Lean best practices across the enterprise
- √ Establish an executive vision for Lean operations
- √ Leverage technology such as MOM, automated data collection and mobility to support Lean initiatives
- √ Leverage other enterprise applications such as PLM, SCM, ERP, and EMI - and use this technology stack to improve real-time visibility for executives into manufacturing operations and between manufacturing operations, customers, and suppliers

- **Invest in automated data collection and mobility to support Lean initiatives.** Best-in-Class manufacturers are over 50% more likely than Industry Average manufacturers to automatically collect manufacturing data. They then use this data to drive performance management systems which delivers real time actionable intelligence to executives via mobile devices

Best-in-Class Steps to Success

- **Focus on creating visibility across suppliers, manufacturing operations, and customers.** From a strategic perspective, visibility will be one of the cornerstones of improvement for your organization. Many of the higher level business capabilities differentiating Best-in-Class performance presuppose visibility across manufacturing operations. Less than 50% of Best-in-Class companies have visibility into manufacturing operations and have visibility into both customer orders and supplier performance.
- **Adopt a technology strategy that spans the ISA-95 stack.** With an enterprise-wide MOM solution in place, begin to leverage other enterprise applications such as PLM, SCM, ERP, and EMI. Use this technology stack to improve real-time visibility for executives into manufacturing operations and between manufacturing operations, customers, and suppliers. Two points of important interoperability for Lean is MOM - ERP and MOM - EMI. Both of which are highly aligned with Best-in-Class performance
- **Begin to incorporate Lean and sustainability initiatives.** Many manufacturers today struggle with defining the scope of sustainability initiatives but it doesn't change the fact that there has been a definite increase in the pressure faced to address the issue. Regardless of how your company decides to define the scope, a robust set of cross-functional continuous improvement will be critical to long term success, which is a capability most manufacturers have already developed within Lean manufacturing initiatives.

Aberdeen Insights — Summary

Executives face numerous challenges in effectively navigating the new normal in manufacturing. To help capture some of the opportunity that accompanies any change, Best-in-Class manufacturers are reinvigorating Lean initiatives and focusing on automated data collection, creating visibility, leveraging mobile devices, and investing in technology that spans the ISA-95 technology stack. The coming months will be a test of both manufacturers resolve as well as their preparations, but the research shows that those manufacturers that have implemented systems for improving Lean manufacturing are better positioned for continued success.

Appendix A: Research Methodology

Between February to May 2010, Aberdeen examined the use, the experiences, and the intentions of more than 335 enterprises from a diverse set of manufacturing enterprises.

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

Responding enterprises included the following:

- *Job title:* The research sample included respondents with the following job titles: Upper Management (C-Level, President, SVP, VP) (29%); Director (18%); Manager (34%); Staff (6%); and other (13%).
- *Industry:* The research sample included respondents from the following industries: High Tech (17%); Automotive (15%); Aerospace/Defense (13%); Industrial Equipment Manufacturing (13%); Chemicals (9%); Food/Beverage (8%); Medical Devices (8%); Consumer Packaged Goods (7%); Consumer Durable Goods (7%); Other Manufacturing (6%)
- *Geography:* The majority of respondents (62%) were from North America. Remaining respondents were from the Asia-Pacific region (10%) and Europe (21%).
- *Company size:* Twenty-three percent (23%) of respondents were from large enterprises (annual revenues above US \$1 billion); 43% were from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 34% of respondents were from small businesses (annual revenues of \$50 million or less).
- *Headcount:* Thirty-seven percent (37%) of respondents were from large enterprises (headcount greater than 1,000 employees); 39% were from midsize enterprises (headcount between 100 and 999 employees); and 24% of respondents were from small businesses (headcount between 1 and 99 employees).

Study Focus

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

- √ The degree to which lean operations is deployed in their manufacturing operations and the financial implications of the technology
- √ The structure and effectiveness of existing lean operations implementations
- √ Current and planned use of lean operations to aid operational and promotional activities
- √ The benefits, if any, that have been derived from lean operations initiatives

The study aimed to identify emerging best practices for lean operations usage in manufacturing, and to provide a framework by which readers could assess their own management capabilities.

Table 4: The PACE Framework Key

Overview
<p>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:</p> <p>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)</p> <p>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)</p> <p>Capabilities — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing)</p> <p>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)</p>

Source: Aberdeen Group, June 2010

Table 5: The Competitive Framework Key

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

Source: Aberdeen Group, June 2010

Table 6: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
<p>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.</p>

Source: Aberdeen Group, June 2010

Appendix B: Related Aberdeen Research

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

- [*Lean Manufacturing: 5 Steps for Eliminating Waste*](#), April 2009
- [*A Platform Approach to Manufacturing Operations Management*](#), March 2009
- [*The Cost of Quality: Defining the Value of Enterprise Quality Management*](#), August 2008
- [*Event Based Manufacturing Intelligence: Creating Closed Loop Performance Management*](#), May 2008

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

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