

# Manufacturing IQ: Taking Manufacturing Intelligence To the Enterprise

Enterprise Manufacturing Intelligence

July 2007

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## Executive Summary

Aberdeen research shows that the top pressure driving manufacturers to pursue Enterprise Manufacturing Intelligence (EMI) initiatives is to increase productivity without additional capital investments. This benchmark report finds Best-in-Class companies more than two times as likely as other companies to have implemented EMI. These companies are more likely to integrate data across multiple nodes within the supply chain as well as provide automated alerts and escalation based on configurable business logic. Contextualization of factory floor data to drive operational intelligence differentiates EMI from simple reports, dashboards, and portal solutions. Best-in-class enterprises implement EMI across the supply chain network with real-time linkages to customers for order pegging and real-time visibility.

### Best-in-Class Performance

Aberdeen used three key performance indicators (KPIs) to determine the performance of Best-in-Class manufacturers. These enterprises demonstrated significantly improved performance over their competition and averaged the following:

- 88% Overall Equipment Effectiveness
- 95% On Time Delivery
- 92% Plant Throughput

### Competitive Maturity Assessment

- Best-in-Class are 46% more likely to use EMI initiatives to drive Continuous Improvement Programs.
- Best-in-Class are 57% more likely to provide visibility to customers with sales orders pegged to manufacturing orders
- Best-in-Class are 27% more likely to provide visibility to vendors and suppliers to demand and other plant floor events.
- Best-in-Class adopt remote access capabilities to provide visibility of critical data and to send alerts to key decision-makers.

### Required Actions

- To achieve Best-in-Class performance, manufacturers must:
- Implement EMI to integrate plant floor data from disparate sources with business content to provide operational intelligence
- Drive EMI initiatives under the sponsorship of plant floor management responsible for operational performance
- Deploy Role Based Dashboards throughout the Plant Floor

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#### Voice of the Manufacturer

Shop floor alerts in our company are visible to the production, engineering and quality assurance departments. Production and engineering provide operational support while quality assurance makes sure that any performance improvements does not break the integrity of the quality of the product

David Ewy  
Norac Pharma Inc.

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## Chapter One: Benchmarking the Best-in-Class

This benchmark study investigates the strategies driving companies to adopt the technologies and capabilities that deliver operational intelligence across the enterprise, including their supplier and customer base. Further, this report investigates what investments Best-in-Class manufacturers make in technologies, processes, and organizational capabilities to implement Enterprise Manufacturing Intelligence (EMI) capabilities and correlates these investments to elevated performance level gains.

The key benefit for end users is the ability to improve operational performance based on real-time intelligence, achieving key efficiencies from operations that enable business agility including: improved overall equipment effectiveness (OEE), improved throughput and increased complete and on time delivery.

### Maturity Class Framework

Aberdeen used three key performance criteria to distinguish Best-in-Class companies from Industry Average and Laggard companies:

- Overall Equipment Effectiveness
- On-time Delivery
- Plant throughput

**Table 1: Companies With Top Performance Earn “Best-in-Class” Status:**

Definition of Maturity Class	Mean Class Performance
<b>Best-in-Class:</b> Top 20% of aggregate performance scorers	<ul style="list-style-type: none"> <li>• 88% Overall Equipment Effectiveness</li> <li>• 95% On Time Delivery</li> <li>• 92% Plant Throughput</li> </ul>
<b>Industry Average:</b> Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> <li>• 78% Overall Equipment Effectiveness</li> <li>• 91% On Time Delivery</li> <li>• 85% Plant Throughput</li> </ul>
<b>Laggard:</b> Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> <li>• 43% Overall Equipment Effectiveness</li> <li>• 79% On Time Delivery</li> <li>• 80% Plant Throughput</li> </ul>

Source: Aberdeen Group, July 2007

A weighted average was defined and calculated based on these KPIs, and the market was segmented with Best-in-Class manufacturers (top 20%), Industry Average manufacturers (middle 50%), and Industry Laggard manufacturers (bottom 30%). The defined KPIs chosen for this study represent standard

#### Fast Facts

56% of Best-in-Class manufacturers are facing pressure to increase productivity without additional investments.

55% of Best-in-Class manufacturers are addressing the pressure by ensuring continuous improvement programs yield expected results.

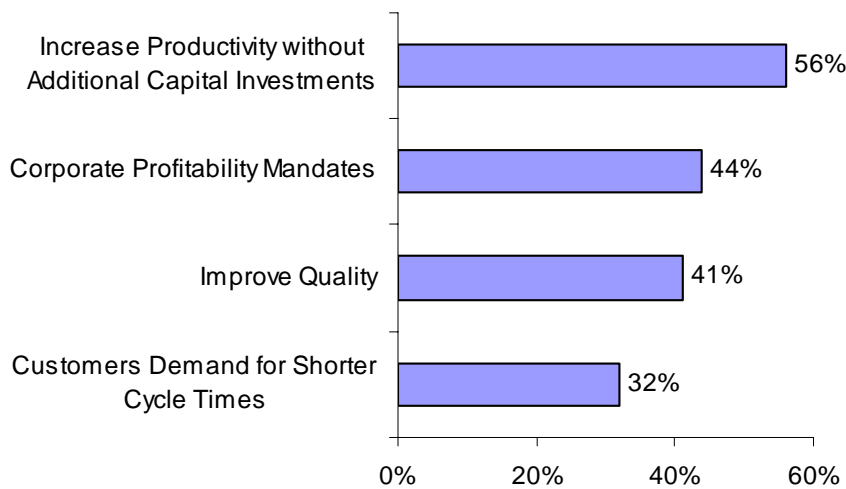
Best-in-class are four times more likely to measure first pass yield in real time and 55% more likely to measure it on a daily basis than Laggard manufacturers.

calculations used across the manufacturing industry to measure performance. Overall equipment effectiveness is an indicator referencing equipment availability, quality, and performance. Complete and on-time delivery measures how well demand management is connected to production execution. Plant throughput is the velocity of product through the manufacturing process. By looking at all three of these KPI measurements, one can assess the ability of the manufacturer to perform to demands, schedules, and quality.

## Addressing the Top Market Pressures

The market pressure to *increase productivity without additional capital investments* was reported as the top business driver by 56% of Best-in-Class manufacturers (Figure 1). Companies have been focusing for years on cost cutting and lean strategies, and have reduced or eliminated significant production capacity. With shifting market demands, manufacturers are looking for new ways to increase production without the luxury of time or capital.

**Figure 1: Market Pressures Faced by Best-in-Class Manufacturers**



Source: Aberdeen Group, July 2007

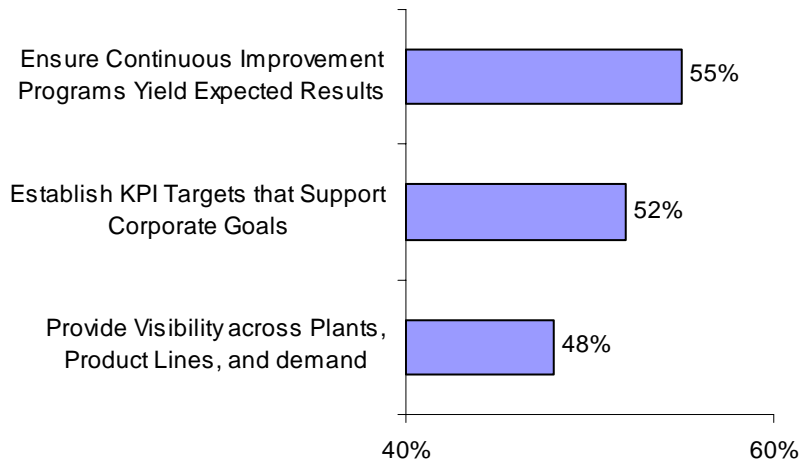
The next three pressures were relatively close: *corporate profitability mandates* (44%), *improve quality* (41%) and *customers demand for shorter cycle times* (32%). The survey allowed only the top two pressures to be selected by respondents. Properly addressing predominant market pressure can have direct and indirect impacts on other market pressures. For example, by improving quality a company can reduce non-conforming parts and therefore increase productivity, increase first pass yield, lower manufacturing costs, and increase profitability. In this study, Best-in-class are four times more likely to measure first pass yield in real time and 55% more likely to measure it on a daily basis than Laggard manufacturers.

### Voice of Manufacturer

Due to short product life cycle, capital investments can become obsolete over night. So while we want to maximize on the current opportunities, we do not want to be caught with excessive capital asset when product mix changes. So increasing productivity or equipment efficiencies is very important in our operations.

William Foo,  
Director  
LSI Technology

**Figure 2: Top 3 Strategic Actions of Best-in-Class Manufacturers**



Source: Aberdeen Group, July 2007

Figure 2 shows the top strategic actions Best-in-Class manufacturers are taking to address market pressures. Ensuring that continuous improvement programs yield the expected results helps to unlock hidden capabilities as well as allow for greater flexibility in altering schedule to meet shifting demands. It is essential that executives are provided visibility across plants, product lines, and demand when making decisions on delivery, discounts, and staffing. Many companies can manufacture the same product in multiple facilities and are continually evaluating the most cost effective location to manufacture based on a multitude of factors. Finally, establishing Key Performance Indicators mapped to corporate goals allows shop floor process across different plants to be standardized and aligned to the goals of senior management.

**PACE Key** — For more detailed description see Appendix A

*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

**Actions** — the strategic approaches that an organization takes in response to industry pressures

**Capabilities** — the business process competencies required to execute corporate strategy

**Enablers** — the key functionality of technology solutions required to support the organization's enabling business practices

### Aberdeen Insights – Market Pressures

The market pressures faced by manufacturers overall is consistent with what we see Best-in-Class manufacturers face. While this benchmark report provides insight to market pressures, strategic actions, and technology enablers for Best-in-Class manufacturers, the top market pressures faced by overall respondents are the same as those indicated by Best-in-Class.

With reduced production capacity, companies are looking externally for contract production capacity; with markets going global, companies are looking for contract manufacturers with proximity to consumption point for obvious reasons. Companies enjoying profitability, earned with above mentioned cost cutting efforts are not just yet ready to lose that edge in the investor's eyes. With the proliferation of supply networks it is not surprising that the companies picked corporate profitability mandates, customers demand for shorter cycle times, and improve quality as the next three business pressures.

## Best-in-Class PACE Model

Achieving Best-in-Class performance requires a combination of strategic actions, organizational capabilities, and enabling technologies that can be summarized as follows:

**Table 2: Best-in-Class PACE Framework**

Pressures	Actions	Capabilities	Enablers
<ul style="list-style-type: none"> <li>Increase productivity without additional capital investments</li> </ul>	<ul style="list-style-type: none"> <li>Provide visibility across plants, product lines, and demand</li> <li>Ensure continuous improvement programs yield expected results</li> </ul>	<ul style="list-style-type: none"> <li>EMI initiatives are driven by plant floor management</li> <li>Shop Floor Alerts are visible to planning and scheduling</li> <li>Standardize procedure for responding to exception based alerts</li> <li>EMI initiatives support continuous improvement programs</li> <li>Vendor visibility to demand, quality, and expected deliveries</li> <li>Customer visibility to order status</li> </ul>	<ul style="list-style-type: none"> <li>Role based dashboards with thresholds for alerts</li> <li>Integration to desktop productivity tools</li> <li>Remote access and monitoring through portable devices</li> <li>Automatic work flow triggered by alerts with persistent resolution</li> <li>Multiple time measures for trending and analysis</li> <li>Auto escalation of open alerts</li> <li>Vertical industry specific view of KPI, alert threshold, and reports</li> </ul>

### Maturity Framework Key

The Aberdeen Maturity Framework defines enterprises as falling into one of the three following levels of practices and performance:

*Best-in-Class (20%)* — practices that are the best currently being employed and significantly superior to the industry norm

*Industry norm (50%)* — practices that represent the average or norm

*Laggards (30%)* — practices that are significantly behind the average of the industry

Source: Aberdeen Group, July 2007

## Chapter Two: Benchmarking Requirements for Success

### Competitive Assessment

The aggregated performance of surveyed companies determined whether they 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 (ability to provide visibility to key operational metrics to customers and vendors); (2) organization (EMI initiatives driven by management); (3) knowledge (contextualizing transaction data and use of automated workflows to provide alerts and dashboards); (4) technology (selection of appropriate technology); and (5) performance management (ability to measure KPIs at the appropriate frequency and use the results to improve key processes further).

**Table 3: Competitive Framework**

	Laggards	Average	Best-in-Class
Process	Customer visibility to sales order status pegged to manufacturing orders		
	15%	21%	33%
Process	Vendor visibility to demand, quality, and expected deliveries		
	9%	22%	28%
Organization	EMI initiatives driven by plant floor management responsible for operational performance:		
	30%	41%	61%
Knowledge	Workflow triggered by alerts with persistent resolution		
	11%	14%	23%
Technology	ERP – 60% MES – 17% EMI – 6%	ERP – 61% MES – 30% EMI – 7%	ERP – 72% MES – 34% EMI – 16%
Performance	Frequency of measuring First Pass Yield		
	4% in real time 29% daily	14% in real time 30% daily	16% in real time 45% daily
	Frequency of measuring Plant Throughput		
	5% in real time 35% daily	11% in real time 39% daily	13% in real time 45% daily

Source: Aberdeen Group, July 2007

#### Fast Facts

Best-in-Class companies are:

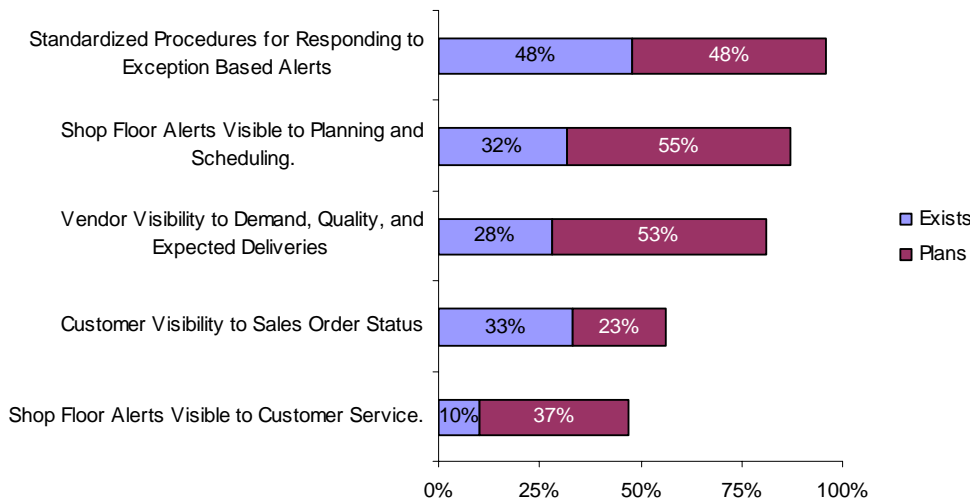
- Almost 45% more likely to have customer visibility to sales order pegged to manufacturing orders.
- Nearly twice more likely to have EMI initiatives driven by plant floor management.
- Nearly 55% more likely to have role based access to critical data through dashboards.
- Nearly 30% more likely to integrate EMI capabilities [output] with Desktop Productivity tools.

## Process and Organizational Capabilities

A crucial factor in implementing and sustaining the benefits of a technology solution or continuous improvement initiative is the direct involvement of executive level sponsorship. Change in the reporting structure of an organization often creates a major roadblock to achieving increased productivity. Aberdeen survey findings show that Best-in-Class companies are 48% more likely than Industry Average, and twice more likely than Laggards, to have plant managers with operational performance responsibilities lead EMI initiatives to address this obstacle.

From a process perspective, Best-in-Class companies are more likely to integrate EMI with business systems to provide visibility across the enterprise value chain to customers and vendors on key operational metrics (Table 3). Best-in-Class company adoption of integration across the enterprise value chain is not pervasive, but it is indicative of the direction these organizations are heading to better align customers and vendors to overall performance goals by providing visibility to key metrics.

**Figure 3: Best-in-Class Companies – Actionable Alerts**



Source: Aberdeen Group, July 2007

While it makes sense to provide operational intelligence to the extended supply chain node, not having established procedures to respond to these alerts could cause havoc. The survey response shows that Best-in-Class companies are well aware of this and are categorizing the need to establish standardized procedures for exception handling before rolling EMI capabilities across the enterprise value chain as a top priority.

## Technology Enablers

As mentioned above, one of the important differentiators for Best-in-Class performance is the ability to provide visibility of the data to different stakeholders (plant managers, customers and vendors). In addition to providing visibility, Best-in-Class manufacturers are more likely than average performers

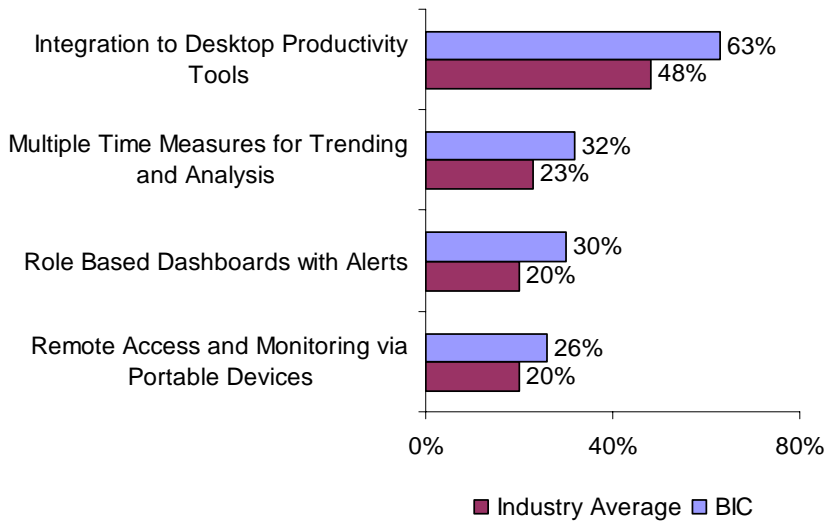
### Voice of the Manufacturer

In our organization, the Plant Manager leads the EMI initiatives through the assistance of different Process Managers who have specialized focus on the different facets of the organization. With regards to alerts, the entire operational group composed of Production Manager, Engineers, QA and Material group personals have visibility to shop floor alerts. Their visibility helps us shorten the reaction lag when an issue occurs that warrants stoppage of line, re-inspection and other rework activities.

Lim Vicson  
Manager, Manufacturing Operations  
Acbel Polytech Phils. Inc

to have invested in functionality to make data accessible through integration with desktops, dashboards and various other remote devices (Figure 4).

**Figure 4: EMI Functionality**



Source: Aberdeen Group, July 2007

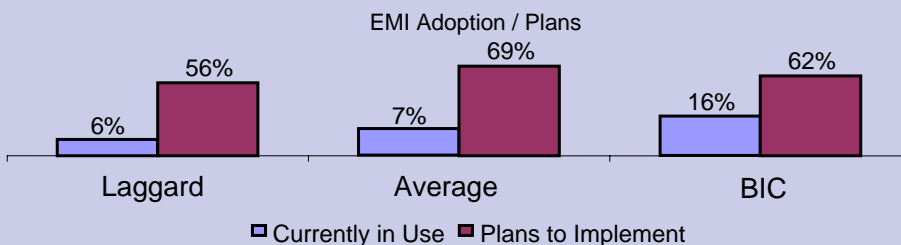
Roles based dashboards allow employees at different levels to have access to customized data and alerts according to their responsibilities. Best-in-Class manufacturers are 50% more likely to adopt this functionality. Another important functionality that has been rapidly adopted by manufacturers is the ability to access data remotely through portable hand held devices. This enables plant managers to monitor operations data after work hours and at remote locations. The adoption of all the above functionality in tandem is a key to Best-in-Class performance.

**Definition**

**Multiple Time Measures for Trending and Analysis** is more than looking at a day or week. If a production line works outside the normal work hours the trend / analysis should be for the performance of the shift and / or production unit. This becomes vitally critical when a plant is on swing shifts which would have a crew work days one week, afternoons the second week, and midnights the third week in a rotation format. One can quickly see where the analysis of a crew would be impossible if the only options were date, time, or shift.

**Aberdeen Insights – Strategy**

Survey respondents in all three performance levels indicated plans for adoption of EMI solution. The findings from the survey provide compelling proof of increasing awareness of EMI capabilities and its direct benefits to operational performance. Early adopters of this technology stand a good chance to gain a competitive advantage in the market place by using EMI to arm their employees with the right data to make intelligent decisions for critical time sensitive manufacturing issues.



## EMI Adoption among Best-in-Class companies

Aberdeen analysis finds that Best-in-Class companies are twice as likely as Industry Average and Laggards to adopt EMI for operational improvements specifically to increase productivity without additional capital investments. Those not currently invested in EMI solutions are still gaining benefits from EMI capabilities through point integration across multiple applications. While providing visibility to data is essential in a complex global manufacturing environment, putting this data into operational and business context and leveraging this intelligence to drive business decisions in real-time is what provides true benefits to these manufacturing enterprises. Best-in-Class companies are doing just that.

### KeySpan Energy

KeySpan, New York's largest electric generator has approximately 6,600 megawatts of generating capacity and provides power to 1.1 million Long Island Power Authority (LIPA) customers. KeySpan also supplies approximately 25 percent of New York City's capacity needs.

The Electric Production Department of KeySpan Corporation employs a data historian to deliver performance data for generators, turbines and other equipment spread across six plants. Using the historian, KeySpan is able to constantly monitor vibrations, fluid pressure, temperatures, and other attributes that could indicate a problem. Engineers are able to access historian data anytime through plant PCs. However, with engineers spending most of their time in the field, access to critical information was not timely. Also important to KeySpan was the need to provide the right information (and only the necessary information) to the engineers in a timely manner.

KeySpan adopted a Web Based EMI solution in November 2006, by implementing a web server inside the firewall and integrating it with the historian for real time data extraction for KPI dashboards. The solution – a mobile, composite KPI engine – was also integrated to a SPC modeling engine.

The solution helped KeySpan create role-based access to the data. The information accessed by employees is customized by different roles, such as executives, operations managers, mechanics, and foremen. Employees at different levels are now able to easily access all vital operations information by simply using the browser on their cell phones. With the help of remote data accessibility, KeySpan is realizing the benefits of increased collaboration among team members across various departments. Additionally, with the help of the new solution, KeySpan was able to set up automated alerts based off of SPC exceptions.

John Ragone, Plant Process optimization manager at KeySpan states that "the key success factors for our EMI implementation was the ease of integration with the existing historian within our current infrastructure. With our EMI implementation leveraging cell phones to deliver key KPIs any time, all the time, our technicians and supervisors are able to get real-time information they need to do their jobs no matter where they are in the field. This results in significant cost savings by ensuring peak asset performance, savings from lost generation costs, and energy replacement costs."

### Key Case Study Takeaways

Some of the important benefits of EMI implementation for KeySpan energy:

- Role based access to data
- Integration with existing infrastructure (PI database and SPC modeling engine)
- Ability to access key data through cell phones
- Real-time updates and alerts of critical data
- Increased collaboration among employees

Best-in-Class companies recognize the need for EMI as a business critical tool that provides integration and contextualization of plant floor data with enterprise business data, resulting in operational intelligence around key performance metrics. These capabilities provide visibility to key metrics not just within the enterprise but across the enterprise supply chain. Best-in-Class companies are investing in processes and procedures as well as the organizational capabilities needed to take full advantage of their investment in EMI solutions.

#### Aberdeen Insights – Technology

Although only 16% of Best-in-Class companies have adopted formal EMI solutions, they are addressing the needs through integrating existing applications on a need basis. Aberdeen Group believes the emergence of EMI solutions will allow these companies to move to a more packaged, integrated suite of solutions without the need to develop these capabilities on their own.

It is important to note that Best-in-Class manufacturers are more likely to adopt EMI capabilities, through point integration today, to provide visibility to data across the enterprise with their existing applications. Through this custom integration Best-in-Class companies are ensuring the right data is available to the right people at the right time.

With more pure play EMI vendors now in the market, the adoption of EMI will increase (as indicated by plans for adopting EMI by survey respondents). The key driver for adoption of EMI solutions will be ease of implementation to existing infrastructure, ease of configuration, and ROI measured in weeks rather than months.

Additionally, for those companies looking at implementing new technologies (and there are quite a few still in this category from all three performance groups), Aberdeen recommends combining the requirements for EMI as part of the evaluation process.

## Chapter Three: Required Actions

Whether a company is trying to move its operational performance 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

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- **Move From Manual to Automatic Data Collection**

Manual / paper based data collection systems result in at least two issues for manufacturers: (1) lack of immediate visibility to production states; (2) manual data entry is inherently prone to errors and misinterpretation. Avoid both these issues by transitioning from manual to automatic data collection.

- **Integrate data collection with business system**

Once automated, production data can be quickly made available to key systems and personnel to monitor key operational metrics. The data collected need to be contextualized within the business framework to provide actionable intelligence to decision makers. Another often overlooked benefit is a view of the scrap and yield results that can impact delivery promises and raw material issues with a specific vendor or vendor lot.

- **Acquire Education on EMI**

EMI is an emerging technology. Leverage solution providers who have implemented these solutions by partnering with them for education, definition, deployment, and realization. EMI solution providers have expertise in the industries they serve and can be a valuable source of knowledge. Manufacturers should leverage this knowledge to derive the greatest benefit from an implementation.

### Industry Norm Steps to Success

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- **Execute Plans on Implementing Technology**

Secure the budget and timeframe for implementation. EMI is flexible enough to allow you to start small and subsequently expand on initial successes. The key to success is rapid deployment without disruption to the manufacturing operations. Work with your solution provider both to establish and meet your implementation goals.

- **Secure a Plant Management Position to Drive the Initiatives**

Increasing productivity without additional capital investment can span all areas within manufacturing as well as throughout the enterprise. Real-time access to manufacturing data is a key to the process of improvement through root cause analysis of the manufacturing alerts.

#### Fast Facts

To achieve Best-in-Class status manufacturers must:

- Automate Data Collection
- Integrate EMI with Business Systems
- Utilize Role based dashboards
- Provide visibility of critical data to different stakeholders.
- Adopt Technology for Speed and Agility

- **Deploy Role Based Dashboards Throughout the Plant Floor**

Accelerate visibility throughout the plant floor in a systematic approach to maximize the impact in each area of the operation without major disruptions. Utilize experts with domain knowledge in your industry to assist in the impact analysis and expected benefits.

- **Adopt remote access capabilities to provide visibility of critical data to key decision-makers.**

Deploy EMI functionality in order to provide visibility of processes to key individuals from operators to executives. Adopting capabilities for remote monitoring of critical performance and asset data allows companies to send immediate shop floor alerts to appropriate decision maker on their call phones, hence reducing the reaction time.

## **Best-in-Class Steps to Success**

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- **Implement EMI to Supplement Continuous Improvement Initiatives**

Seventy-two percent (72%) of the survey respondents who have implemented EMI use it to support their continuous improvement programs. Speed and agility are essential for improvements in those plant floor performance that have far reaching impacts to the rest of the business in areas, like customer satisfaction and time to market for new product introductions.

- **Expand the Scope of EMI Implementations Across the Supply Chain**

The plant floor can be running at optimal performance and still not meet the goals of the corporation. The plant floor must be tied into the enterprise level data to evaluate the effectiveness of other areas of the operation. The plant floor is only one piece of the puzzle for a highly successful business to compete as a market leader. Allow your trading partners visibility into their area of influence and capitalize on multiple resources to ensure your success.

- **Collaborate with your technology partners for future enhancements**

As your business changes and competition creates new challenges, your technology partners are in a unique position to evaluate the changes throughout their customer base and the market. Through collaboration with your technology partner, you can influence the roadmap of your solution by adopting EMI functionality to improve visibility of data throughout the enterprise.

### Aberdeen Insights – Summary

Enterprise Manufacturing Intelligence is an emerging solution that is becoming increasingly critical to the efficient operation of a manufacturing enterprise in today's globally dispersed, highly competitive and complex supply network environment. Aberdeen analysis of the survey responses indicates that companies that have already implemented EMI have done so to improve their ability to:

- Reduce resolution times to problems **(90% of respondents)**
- Escalate alerts for alternate resolution paths **(80% of respondents)**

Manufacturers implementing EMI solutions are looking beyond their factories and providing visibility and linkage to the supplier and customer base, a Best-in-Class characteristic.

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## Appendix A: Research Methodology

Between April and May 2007, Aberdeen Group examined the use of EMI in the manufacturing industry, the experiences, and intentions of more than 230 enterprises in a diverse set of manufacturing enterprises.

Responding manufacturing executives completed an online survey that included questions de-signed to determine the following:

- The degree to which EMI is deployed in their manufacturing operations and the operational implications of the technology
- The structure and effectiveness of existing EMI implementations
- Current and planned use of EMI to assist in operational improvement activities
- The benefits that have been derived from EMI initiatives

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

The study aimed to identify EMI usage in manufacturing and provide a framework by which readers could assess their own manufacturing performance.

Responding enterprises included the following:

- **Job title/function:** The research sample included respondents with the following job titles: CxO or President (9%); Vice-President (4%); Director (12%); Manager (32%), Staff (12%), Consultant (17%), other (11%).
- **Industry:** The research sample included respondents from multiple industries. High Technology was the largest segment with 29% of the sample followed by Automotive (22%). Industrial Equipment accounted for 21% of respondents, Food and Beverage and Consumer products group (21%), Aerospace / Defense (12%) Pharmaceutical (10%) and Chemicals (10%). Other sectors responding included Metals, Mining / Oil / Gas, Plastics and Utilities.
- **Geography:** The majority of respondents (57%) were from North America. Remaining respondents were from the Asia-Pacific region (15%), EMEA (28%).
- **Company size:** About 31% of respondents were from large enterprises (annual revenues above US\$1 billion); 36% were from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 33% of respondents were from small businesses (annual revenues of \$50 million or less).

Solution providers recognized as sponsors of this report were solicited after the fact and had no substantive influence on the direction of the Enterprise Manufacturing Intelligence Benchmark Report. Their sponsorship has made it

possible for Aberdeen Group to make these findings available to readers at no charge.

**Table 4: PACE Framework**

**PACE Key**

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, July 2007

**Table 5: Maturity Framework**

**Maturity Framework Key**

The Aberdeen Maturity Framework defines enterprises as falling into one of the following three levels of practices and performance:

**Best-in-Class (20%)** — Manufacturing practices that are the best currently being employed and significantly superior to the industry norm, and result in the top industry performance.

**Industry norm (50%)** — Manufacturing practices that represent the average or norm, and result in average industry performance.

**Laggards (30%)** — Manufacturing 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, July 2007

**Table 6: Relationship between PACE and  
Competitive Framework**

**PACE and Competitive Framework How They Interact**

Aberdeen research indicates that companies that identify the most impactful 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.

Source: Aberdeen*Group*, July 2007

## Appendix B: Related Aberdeen Research

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

- [The Manufacturing Intelligence Benchmark Report:: Bridging the ERP and Shop Floor Divide](#); October 2006
- [Enterprise Manufacturing Intelligence – Implementation Strategies](#); October 2006
- [The Enterprise Value of Plant Floor Visibility: Empowering Executive Decision Makers](#); March 2007

Information on these and any other Aberdeen publications can be found at [www.Aberdeen.com](http://www.Aberdeen.com).

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