



Aberdeen *Group*

Global Manufacturing: MES and Beyond Benchmark Report

May 2006



Executive Summary

Retaining market leadership requires not only continued performance improvements but also the ability to profitably marshal global manufacturing resources to effectively serve customers. Well positioned to respond to future market opportunities, today's leaders are evolving into global manufacturing enterprises united by business processes that connect remote plants, factories, customers, and supply chain partners. Future competitiveness will rely on forward-thinking strategies and the intelligent use of technology to fuel the continuous innovation of new products and processes.

Key Business Value Findings

85% of Best in Class companies report that they already have a strategy in place to unify processes and systems across locations. Their top action for realizing this strategy is business process improvement through standardization. Plants and factories are contributing by improving internal flexibility, implementing a common information platform, and delivering real-time information. The same pressures are driving enterprise level initiatives to standardize KPIs across locations, implement a cohesive technology infrastructure, and create a centralized knowledge repository.

Implications & Analysis

Global companies that have mature manufacturing KPI programs and are initiating enterprise level programs that incorporate multiple production facilities are more likely to be Best in Class. While the vast majority of companies rely on ERP and database management capabilities to accomplish enterprise tasks today, emerging technologies, such as next generation MES, manufacturing intelligence, and business analytics are playing an increasingly important role. The number of MES implementations is expected to double (35% to 71%) and more than one third will extend these functions into the supply chain. The continued adoption of manufacturing intelligence solutions, business analytics, and real-time KPIs will enable continuous improvement and provide the fuel for future innovation.

Recommendations for Action

Based on survey participants' responses, Aberdeen has divided manufacturers into three categories according to our competitive framework: best in class (those who have achieved operational excellence within the four walls and across facilities), industry average (companies that have achieved some level of excellence in manufacturing operations but have yet to achieve global operational excellence), and laggard (those who are just beginning their journey toward excellence). Here are our recommendations for each group:



- **Best in class:** Deliver real-time intelligence to the boardroom, continuously improve manufacturing for operational excellence, and leverage technology to fuel ongoing innovation.
- **Industry average:** Set global manufacturing standards; create strategic alliance between manufacturing and corporate IT; create value-focused metrics program.
- **Laggard:** Gain visibility and control over production; close the information gap between the plant and corporate; empower customer-focused teams to drive improvements.

Competitive Framework Key

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

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

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

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



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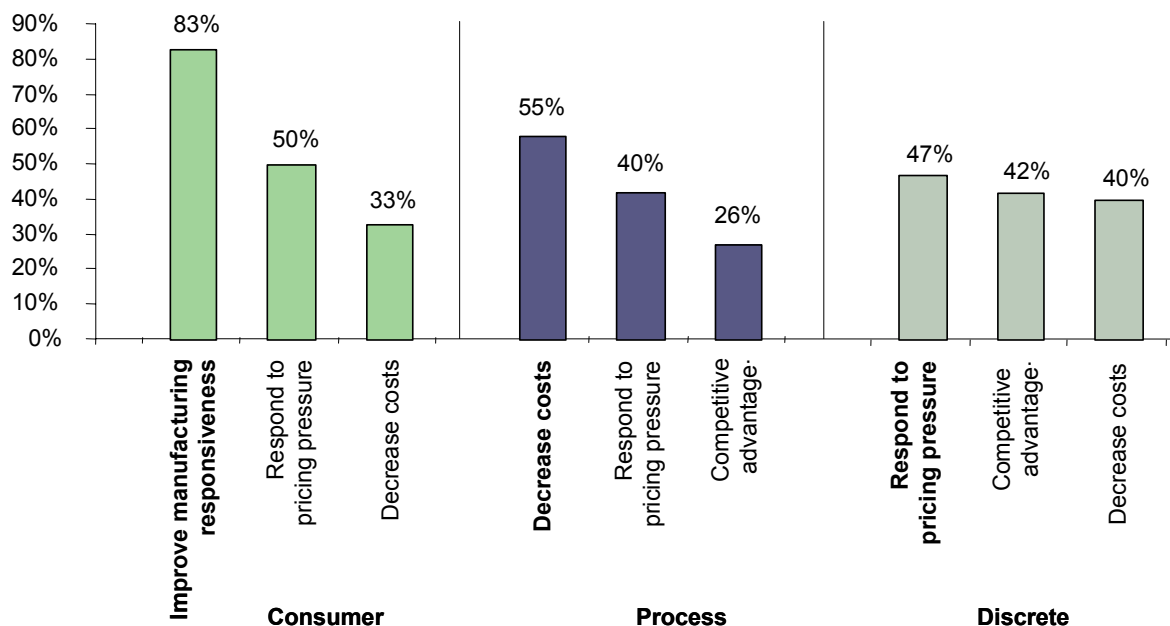
Chapter One: Issue at Hand

Key Takeaways

- Drivers for operational excellence vary by sector; responsiveness is top priority for consumer-oriented companies, decreasing costs tops the list for process manufacturers and responding to pricing is listed as a primary pressure for the discrete sector.
- The general lack of investment in manufacturing systems over the past decade is taking its toll; many companies have dozens of disparate systems, making it difficult to integrate shop floor data, communicate with ERP, or deliver timely information.

Manufacturers have reported significant progress over the past few years. Reports of hefty cost reductions, better customer response, and improved visibility into manufacturing operations top the list of accomplishments. Regardless of progress made, there is still much work ahead. Whether the goal is to retain a leadership position, leverage emerging market opportunities, or to simply continue delivering value to customers and shareholders, expectations will continue to increase over time. However, market drivers often vary by industry sector (Figure 1) as well.

Figure 1: Top Drivers by Industry Sector



Source: AberdeenGroup, May 2006



In the *consumer* sector, 83% of survey participants (Figure 1) report that *improving market responsiveness* is a top priority. Satisfying existing customers and pursuing emerging markets have driven the evolution from make-to-stock manufacturing environments to demand-driven Lean supply chain processes. For example, Bayer Healthcare recently made extensive changes to its internal processes so that it could better manage more frequent changes to product formulations and packaging configurations. As a result, the company has streamlined and automated many internal processes, including R&D, manufacturing, and the supply chain, enabling the worldwide distribution of Aspirin in many new packaging configurations to both traditional and emerging markets.

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

An asset intensive industry, it is not surprising that 55% of *process manufacturers* point to *decreasing costs* as a top driver for achieving operational excellence. For instance, Coors Brewing went through a major program to reduce its manufacturing costs. Previously, ERP scheduled production across its many plants; however due to variable timing of some blending processes, it was difficult to maintain accurate resource availability data in ERP. The company has since implemented distributed finite scheduling systems across its manufacturing facilities. These systems keep lines operating at peak performance by not only maintaining an accurate picture of resources, but also enabling operators to proactively manage production.

Responding to customer and competitive pricing pressures was cited as a top priority by *discrete manufacturers*. As an example, the Energizer Battery division was recently put under pressure to improve competitive-

ness through labor productivity improvements, reduction of scrap, reduction of materials over-usage and improved asset utilization. Two years ago, collecting data was a manual and labor intensive process, making it difficult to detect and correct root-cause problems without slowing down processes in any of its 21 manufacturing and packaging plants. Recently, the company implemented dashboards that give operators and managers the ability to monitor production in real-time, enabling them to respond to and anticipate problems. In addition, this Citect Ampla solution is also providing managers the ability to target trouble spots, perform root cause analysis, and recommend corrective action. As a result, downtime has been reduced, and operational performance improved.

The Technology Challenge

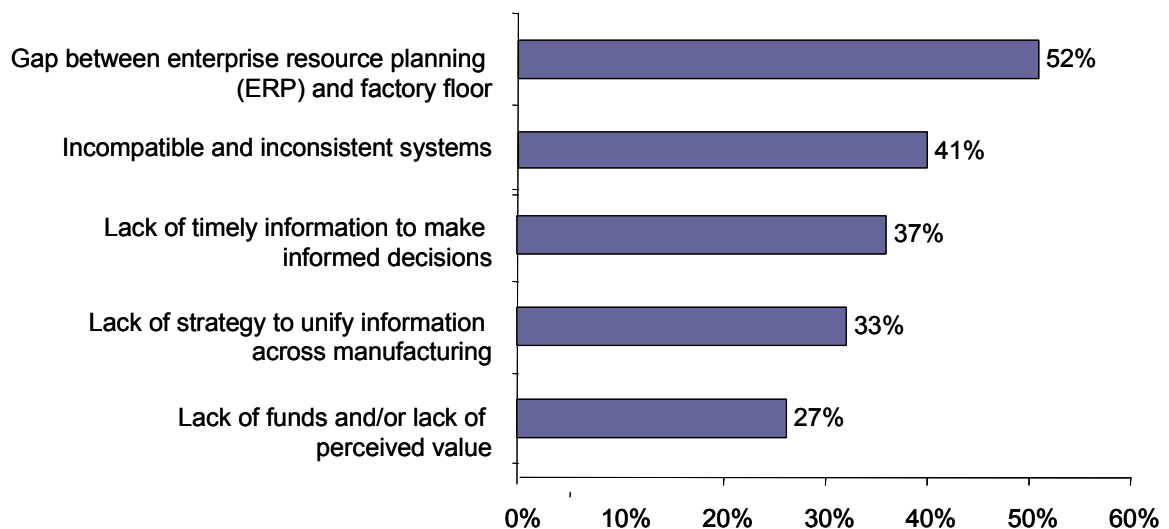
At the enterprise level, ERP systems manage global manufacturing business processes for 88% of the 137 manufacturers represented in this survey. While some companies purchased new ERP systems in advance of Y2K, many more relied on their existing vendors to make appropriate upgrades prior to the new millennium. As a result, many technology savvy companies have ERP systems that are less than ten years old; however, as these



companies reach across borders to acquire low cost or specialized production capabilities, they will either be partnering with or acquiring other manufacturers that rely on enterprise systems that are two or more decades old. Integrating enterprise manufacturing systems across a multitude of international operations is a common challenge among those companies that are expanding their businesses to enter new markets or take advantage of offshore capabilities.

At the factory and plant level, there have been relatively few technology investments in MES (manufacturing execution systems), either by manufacturers or technology providers, although this is rapidly changing. Previously installed MES (homegrown or modified packaged applications) have been customized to support unique manufacturing environments and many contain one-off integration links to ERP, control systems, and quality testing devices. As a result, many companies have a hodgepodge of systems and technologies in their plants which are costly to maintain and difficult to modify. This problem is compounded with the addition of each new facility (not uncommon to have dozens of systems) to the enterprise.

Figure 2. Internal Challenges (all performance categories)



Source: AberdeenGroup, May 2006

From the enterprise perspective, it is difficult to gain visibility into operations, which is why the proverbial *gap between ERP and the factory floor* (cited by 52% of respondents) continues to be the top IT-related challenge (Figure 2) in Aberdeen manufacturing surveys. Plant managers and operators alike are all too aware of this problem as shown by the 42% of respondents that report having dozens of *incompatible and inconsistent systems*. Finally, the disparate nature of systems within the four walls has greatly contributed to an executive top-of-mind issue—the inability to deliver *timely information to decision makers* which will be covered in more detail in Chapter 3.

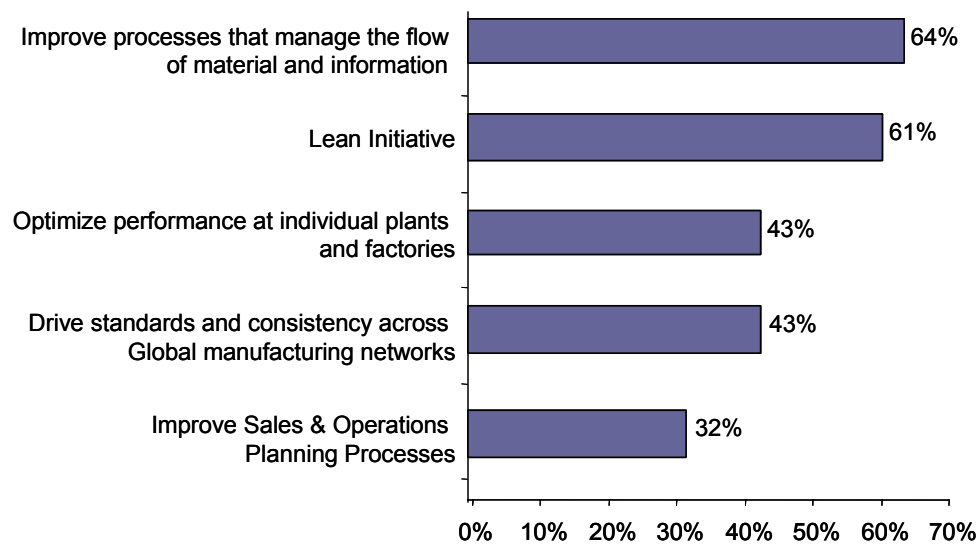
Chapter Two: Key Business Value Findings

Key Takeaways

- 85% of Best in Class companies have a strategy in place to unify manufacturing processes and systems. The top action for realizing this strategy is business process improvement.
- Plants and factories will support this strategy by improving flexibility, implementing a common information platform, and delivering real-time information.
- Unification approaches at the enterprise level include standardizing KPIs across manufacturing locations, implementing a technology infrastructure, and managing a centralized data repository.
- IT challenges include difficulty integrating systems, supporting multiple applications, and the lack of a unifying architecture.

According to the results of this study, 85% of Best in Class manufacturers already have a strategy in place to unify manufacturing processes and systems across multiple locations, versus 52% of lower-performing competitors (not shown). When asked to identify the most important actions for realizing this strategy, these Best in Class companies indicated that improving processes that manage the flow of material and information is their most important action for unifying processes and systems (Figure 3).

Figure 3: Best in Class Strategic Actions



Source: AberdeenGroup, May 2006

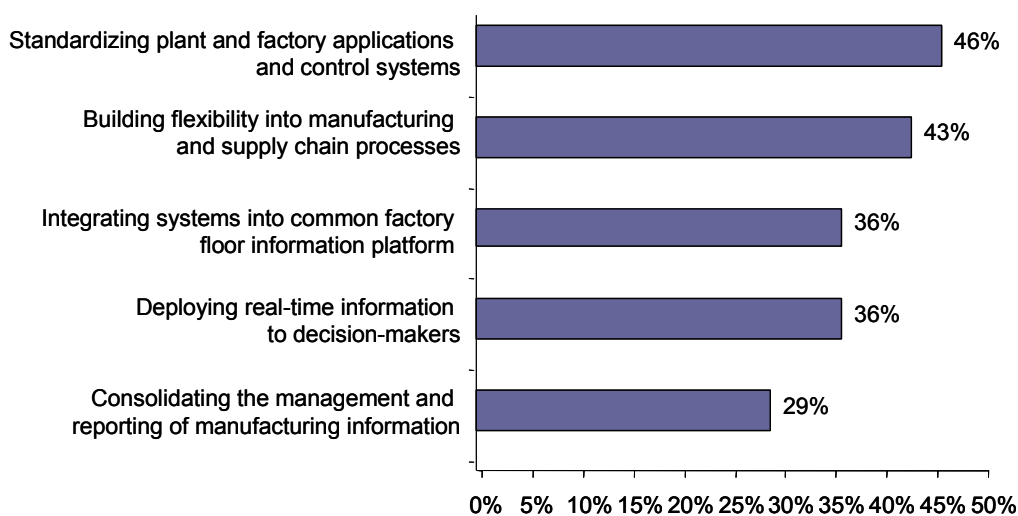


Typical enterprise processes, such as customer order management, procurement, and manufacturing are managed by ERP systems. However, effectively managing a global manufacturing enterprise will require the implementation of end-to-end processes such as order-to-delivery and cash-to-cash. Orchestrating these broader-reaching activities with today's systems often leaves gaps in time, information, and functional context. The promise of SOA (services oriented architecture) is to model and configure these cross-enterprise processes in a fashion that will leverage existing applications to create differentiating business and manufacturing processes. As SOA-based applications enter the market, toolkits and technologies will become available for companies to implement these capabilities. This need is reflected by the 64% that reported that *improving processes that manage the flow of material and information* is the most important priority. For more information, read [The SOA in IT Benchmark Report](#).

At the Plant: Standards vs. Autonomy

Traditionally MES have been implemented and maintained by either local IT staff or with the assistance of external consulting services. However, this is beginning to change as Best in Class CIOs integrate manufacturing domain and technology expertise directly into their organizations. As companies adopt a global perspective, local operations managers are more likely to work collaboratively with corporate IT to make joint buying decisions. This is why *standardizing plant and factory applications and control systems* (Figure 4) has become a top priority. Although this new partnership may elongate the requirements definition and buying cycle, it should result in more informed decision making, stronger technology platforms, improved support, and a lower total cost of ownership over time.

Figure 4: Top Approaches within the Four Walls (Best in Class)



Source: AberdeenGroup, May 2006



At the same time, Best in Class manufacturers must strive to strike a balance between imposing corporate standards and respecting local capabilities. Each location should retain some degree of autonomy relative to acquiring specialized technologies required to support unique manufacturing environments, MES, and other plant-level systems. Since *building flexibility into manufacturing and supply chain processes* ranked a close second on the list of strategic actions (at 43%), many survey participants are well aware of this need.

Tied for the third place priority is *integrating systems into a common factory information platform* and *deploying real-time data to decision makers* both at 36% (Figure 4). Systems can be integrated into MES, an independent database, or a plant-level architecture (typically offered by large controls vendors), each of which should provide a platform for managing information across the factory or plant. Deploying real-time data to decision makers can be accomplished with an information platform or directly from production systems, bypassing the need for an independent data source. Regardless of the solution, the goal is to collect and aggregate data from the plant or factory floor in real-time and make it visible to operators, managers, and other decision makers throughout the enterprise or supply chain. The pluses and minuses of each approach will be explored in Chapter 3.

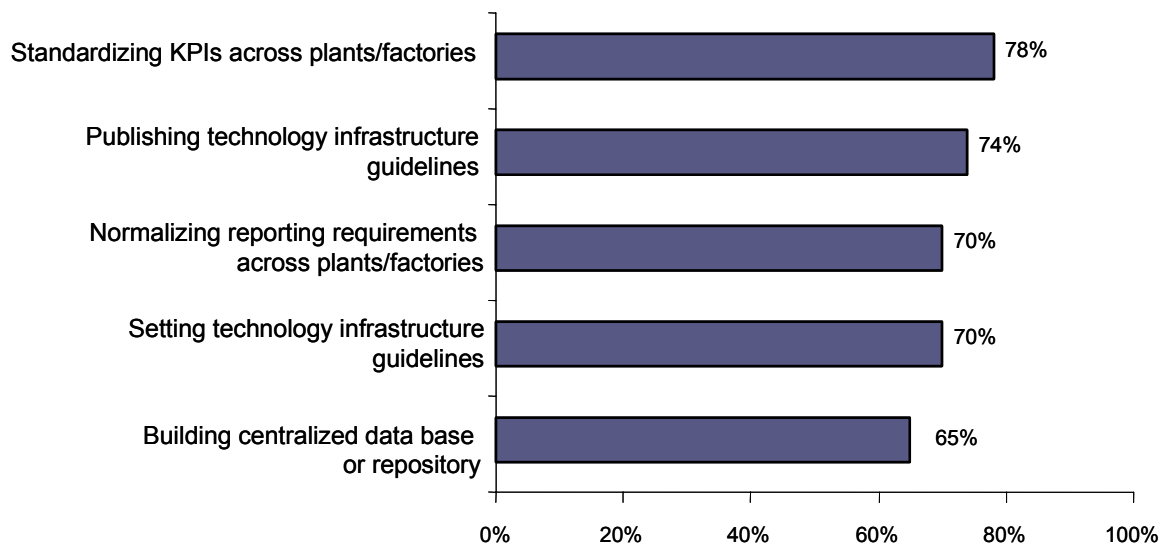
Corporate KPIs Driving Performance Standards

Geographically disbursed factories, varying production environments, and localized systems make it difficult for global manufacturing enterprises to compare relative performance of their manufacturing facilities. However, Best in Class companies are tackling this issue from the top-down by establishing standard KPIs, publishing technology infrastructure guidelines, and communicating information and reporting standards as shown in Figure 5. Although poorer performing counterparts report similar priorities, they place more emphasis on standardized reporting and less on technology guidelines, reflecting less emphasis on technology.

Arla Foods, one of the world's largest dairy producers, is a good example of a company that is benefiting from a global performance standardization program across its 70 European plants. Prior to recent changes, each plant was operating independently with its own unique configuration of MES, instruments, weighing systems, and SCADA systems. The lack of standardized systems, data, and processes across plants was both escalating costs and causing shipment delays. Today each plant maintains a standardized dairy database based on the Invensys ArchestA framework, which contains tracking, online quality assurance, downtime, maintenance, and environmental information. These dairy databases are integrated into SAP using ISA95 standards and manage batches, alarm reporting, traceability, OEE, SPS, and other data. Other key functions, such as managing recipe parameters and labeling have been centralized, ensuring consistency across the European market.



Figure 5: Top Approaches to Linking Plants and Facilities (Best in Class)

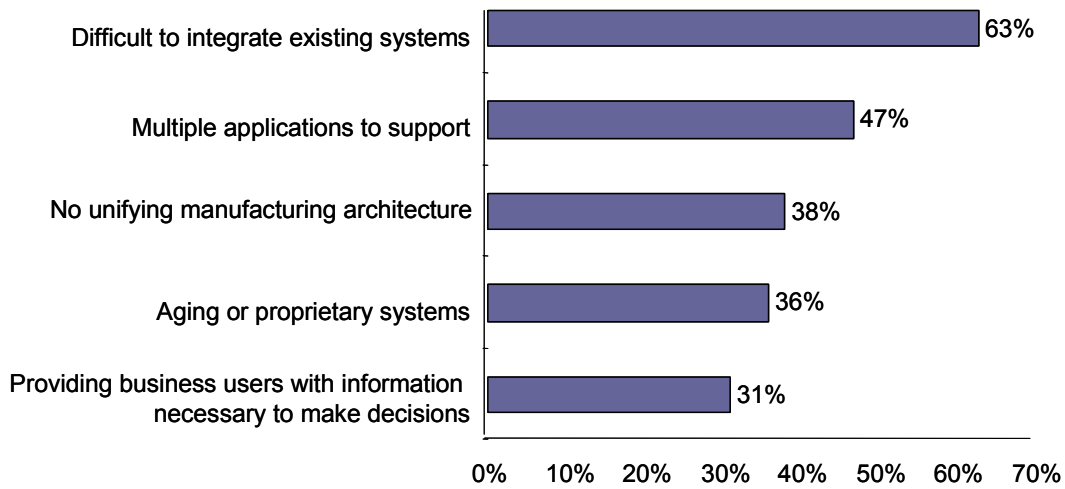


Source: AberdeenGroup, May 2006

Integration Remains the Top Challenge

The ability to confidently commit manufacturing capacity to customers, predict profitability to shareholders, and proactively manage supply and demand remains an elusive goal for most manufacturers. This requires a shared understanding of priorities, visibility into manufacturing operations, and the ability to commit to customers in real-time. Given the multitude of systems and technologies that most manufacturers own, it is no surprise that 63% report that they are having *difficulty integrating systems* (Figure 6) to provide this capability. In addition to dealing with integration challenges, local IT teams can be overwhelmed when it comes to both the number and technical nature of the *multiple applications that require support* (47%). Each was designed to support a specific function with its own unique data model, user interface, and development environment; any thoughts of integration came well after the design phase. Another promise of SOA is that each component application is designed with standardized integration links built into the component, which should greatly ease the integration burden that is so acutely felt throughout manufacturing.

Figure 6: Major IT Challenges



Source: AberdeenGroup, May 2006

Pressures, Actions, Capabilities, Enablers (PACE)

There is a clear relationship between the pressures companies identify, the actions they take, and their subsequent competitive performance. All participants should examine their prioritized PACE selections and determine whether they can glean valuable perspectives by comparing their PACE selections with those of Best in Class companies. The pace priorities outlined in Table 2 show the prioritized actions, capabilities, and enablers companies must embrace in response to pressures to move from Industry Norm and Laggard to Best in Class categories.



Table 1: PACE (Pressures, Actions, Capabilities, Enablers)

Priority	Pressures	Actions	Capabilities	Enablers
1	Respond to pricing pressures	Streamline order -to-delivery processes, eliminating waste throughout	Streamline customer focused cross functional processes	ERP to manage the Order-to-delivery process and coordinate production
2	Decrease costs: do more with less	Rationalize assets and resources; eliminate bottlenecks	Manufacturing Resources optimized	MRP, scheduling, and MES solutions with Integration links to Process control, Factory automation, Etc.
3	Competitive advantage	Capture and share best production practices	Best Practice SOPs (standard operating procedures) and standardize work processes	Electronic SOPs With business rules To drive triggers and alerts
4	Improve manufacturing responsiveness	Increase flexibility at plant and company level; enable mass customization and more frequent product launches	Support reconfigurable processes to tailor products and ramp-up quickly	Analytics and decision Support capabilities For informed decision making
5	Offset higher operating costs	Create economies of scale through Standardization & empowering decision makers	A single version of the truth to drive informed and consistent decision making	Common information platform supported by web-access (role Based), enabling holistic view across plants

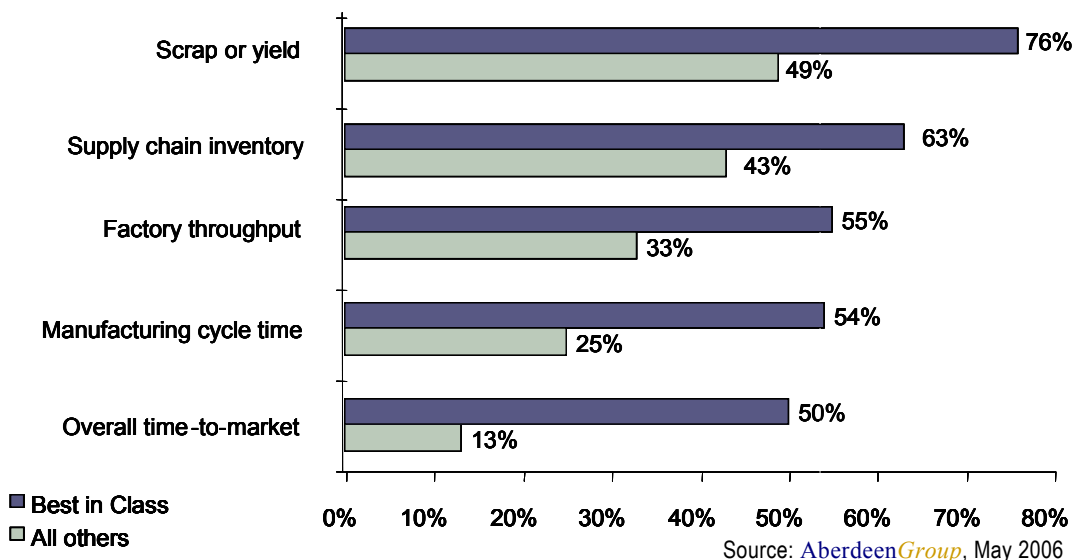
Chapter Three: Implications & Analysis

Key Takeaways

- Best in Class respondents are more likely to have mature KPI programs and are building linkages across the global manufacturing enterprise.
- Key technologies such as MES, manufacturing intelligence, and business analytics will play an increasingly important role in enabling the global manufacturing enterprise.
- The number of MES implementations is expected to double (35% - 71%) within 2 years additional more than one third will integrate these solutions into supply chain functions.
- Manufacturing intelligence solutions will enable companies to continuously improve operations and fuel innovation.

Companies that have been reporting against KPIs for five years or more are likely to have achieved Best in Class status today. As shown in Figure 7, better performing companies tend show more long standing measurement programs in place than their poorer performing counterparts. At least one third more Best in Class companies have monitored scrap or yield, factory throughput, and manufacturing cycle time for the past five or more years than their poorer performing counterparts. Figure 7 also shows a performance disparity between those companies that have been monitoring time-to-market (an important cross-functional metric) for several years (50% of Best in Class versus 13% of the others).

Figure 7: Mature Manufacturing Metrics (5+ years)

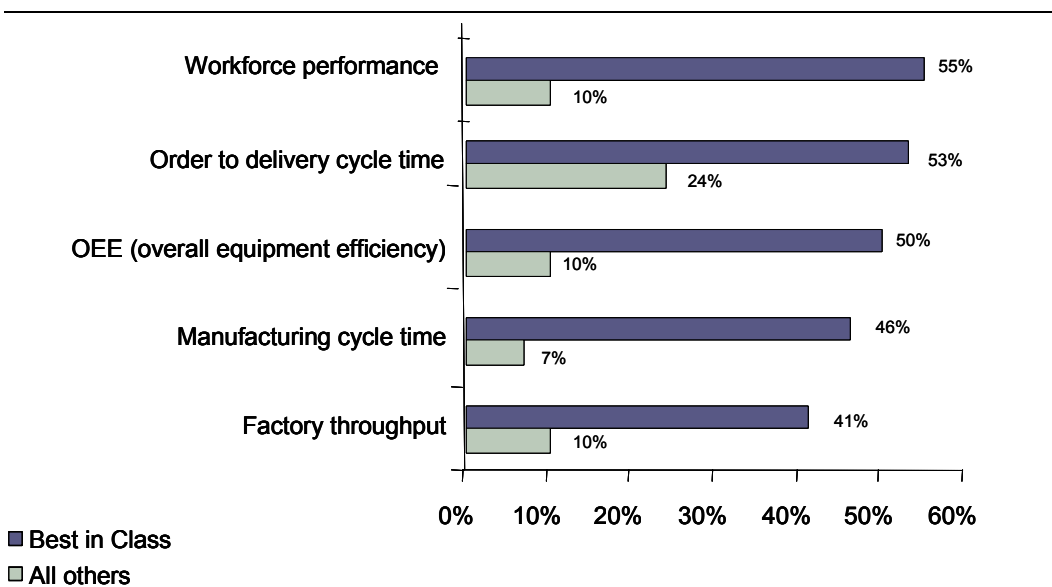




Metrics Linkage

As the global manufacturing enterprise emerges, the ability to consistently manage performance will be an important capability to have. Figure 8 shows that Best in Class companies are much further along in the development of metrics programs that span multiple locations than their lower performing counterparts. For instance, Best in Class companies are five times more likely to be monitoring OEE, workforce performance, or manufacturing cycle time across facilities than their poorer performing competitors. Additionally, order-to-delivery cycle time, scrap or yield, and factory throughput are being monitored enterprise-wide 3 and 4 times more frequently by Best in Class companies.

Figure 8: Corporate-Driven Manufacturing Metrics



Source: AberdeenGroup, May 2006



Technology-Enabling Global Manufacturing

- The vast majority (88%) of research respondents is reliant or will rely on their ERP systems to manage global manufacturing operations (Table 2). Additionally, 84% are using or intend to use independent database management systems to supplement these systems. While ERP systems provide the underpinnings for manufacturing enterprise processes, it is the strong interest in business analytics, MES, manufacturing intelligence and integration middleware that is most interesting in Table 2.
- Business analytics (43% growing to 82% in 2 years) and manufacturing intelligence solutions (35% growing to 71% in 2 years) will provide access to real-time information, empowering operators and executives alike to make better informed decisions. Additionally, MES (35% growing to 71% in 2 years) and integration middleware (33% growing to 64% in 2 years) are also key capabilities to watch.
- Combined, the technologies shown in Table 2 will enable companies to realize their full ROI on ERP investments, provide better technology to drive continuous improvements, and deliver real-time data into the hands of executives and operators alike, fueling innovation today and in the future.

Table 2: Technology Usage by Application Area

Technology Usage		
Technology Solution Area	Currently Using	Planned within 24 months
ERP	72%	16%
Database Management	61%	23%
Business Analytics	43%	39%
MES/Manufacturing Intelligence	35%	36%
Integration Middleware	33%	31%

Source: [AberdeenGroup](#), May 2006

MES and Manufacturing Intelligence Solutions

MES is comprised of a relatively mature group of applications designed to manage production workflow from beginning to end, operation by operation. These applications generate work instructions for operators, ensure the right materials are available, and communicate operator and setpoint instructions to factory systems. As specific tasks are performed, outputs and results are measured against parameters for quality, cycle time, and throughput. MES have evolved over time to become mission critical systems that maintain the bill of process, ‘as built’ bill of material, and full product genealogy. While suitable for many environments, MES delivers the largest dividends to those companies that build complex discrete products, process manufacturers that manage variable recipes/batches, plants or mills in the paper or steel industry, and those that have mass customi-



zation or complex packaging requirements. Factories and plants fully utilizing MES typically have it well entrenched in the culture and rely on it to drive the flow of work and information.

Alternatively, manufacturing intelligence solutions are relatively new entrants to the market. They were not designed to manage mission critical production processes, but rather provide visibility into selected tasks and pieces of equipment. Web portals provide direct access, enabling operators to monitor production and managers to manage by exception remotely. Manufacturing intelligence solutions are generally driven from existing ERP systems to provide visibility into plant floor operations.

Both MES and manufacturing intelligence solutions provide visibility and real-time insight into production. As a rule of thumb, MES have traditionally been driven at the plant level (although today's MES are largely being driven in partnership with manufacturing and corporate IT) and manufacturing intelligence solutions have been a top-down strategy for improving performance management. As an execution system, MES are highly reliant on building operating models and managing robust information both during and after production. As a real-time visibility and analytics tool, manufacturing intelligence solutions rely on collecting data directly from plant floor equipment to build 'in memory' data models that aggregate and deliver information to decision makers throughout the manufacturing enterprise.

MES Goes Global

As the global manufacturing enterprise emerges, many will extend their MES to other facilities and trading partners, enabling the smooth flow of product and information across the supply chain. A full 74% (Table 3) have either already integrated their MES into supply chain planning processes or plan to do so in the near future. Another 67% are planning to integrate MES into inbound materials processes and 48% into outbound material processes. From an enterprise perspective, links to R&D/Engineering are expected to double within the next two years to 56%. On the factory floor, the majority of companies either already has or is pursuing integration to factory automation, process control, LIMs and data historians.



Table 3: MES Extension and Integration Priorities

MES Extension/Integration Priorities				
MES integrated to..	Integration Project in Progress	Integration Up and Running > 1 year	Integration planned in the future	No plans to integrate
Supply Chain				
SC planning	17%	20%	36%	26%
Suppliers/inbound materials	13%	15%	37%	35%
Distributors/3PLs/outbound	8%	11%	30%	52%
Enterprise				
R&D/Engineering	13%	15%	28%	44%
ERP orders	24%	29%	30%	17%
Factory/Plant Floor				
Factory automation systems	17%	28%	30%	24%
Process control systems	19%	30%	25%	25%
LIMS or quality systems	12%	26%	32%	30%
Data historians	15%	23%	27%	36%
SCADA	11%	20%	23%	46%

Source: [AberdeenGroup](#), May 2006



Real-Time KPI Monitoring is Taking Center Stage

Delivering KPIs and real-time results to operators, managers, and executives is a top technology priority for the majority of manufacturers that participated in this study. 41% of the companies represented currently have this technology in place or are in the process of implementing (Table 4); these efforts will close to double to 80% of this survey population within the next two years. The second most popular way to get real-time KPIs is through SCADA systems. 29% either have or are implementing; this will substantially increase as 27% of respondents have plans to add this functionality to their SCADA systems within the next two years. While currently only 18% of the population are leveraging manufacturing intelligence solutions to deliver real-time KPI data, this is expected to increase by 150% within the next 2 years to 47% of the population. On the flip side, it is also worth noting that a relatively large percentage of respondents (53%) indicate that they have no plans to take advantage of this technology; reasons include they are delivering intelligence in some other way, no knowledge of this technology, or no need to deliver real-time KPIs. Regardless of which technology base is chosen, the real-time data can and should become a source of both continuous improvement and innovation.

Table 4: Real-Time KPI Monitoring

Real-Time KPI Monitoring				
Emerging Technology	Technology project in progress	Technology up and running > 1 year	Technology planned in the future	No plans for this technology
Real-time KPI monitoring (w/MES)	18%	23%	39%	21%
Real-time KPI monitoring (w/mfg intell)	9%	9%	29%	53%
Real-time KPI monitoring (w/SCADA)	14%	15%	27%	44%

Source: [AberdeenGroup](#), May 2006

Competitive Framework

Aberdeen used the framework in Table 5 to place survey respondents into one of three categories – laggard, industry average, or Best in Class – based on the characteristics of their enterprises in these five key categories:

- **Process:** the coordination of customer orders, product flow, manufacturing and distribution processes among factories, plants, suppliers, and value added service providers;



- Organization: the degree of focus in developing customer-focused business process teams;
- Knowledge: level of insight into cross-site global manufacturing processes and in-plant manufacturing and customer order related processes;
- Technology: level of integration of systems within a single manufacturing site and/or across manufacturing sites;
- Performance management: the focus, maturity, and level of coordination of key supply chain metrics.

In each category, survey results confirm that the firms exhibiting Best in Class characteristics also enjoy year-over-year revenue growth.

Table 5: Global Manufacturing Competitive Framework

	Laggards	Industry Average	Best in Class
Process	Individual plants and factories operating as autonomous units; little to no cross-site coordination	Some best operating practices standardization; limited opportunity to share and collaborate	Best operating practices captured and leveraged across facilities and potentially contract manufacturers.
Organization	Functional departments within plants and factories; little coordination across departments or partners.	Some adoption of customer-focused business process teams; some coordination between local functions and across sites.	Strong manufacturing leadership; plants and factories urged to adopt best practices, but local autonomy respected
Knowledge	Factory and plant level data managed locally; operational information not shared beyond local facility.	Most critical operator instructions and production data captured electronically; available to others upon request.	Corporate-wide data dictionary published to encourage conformance; best practices captured locally and shared across the global manufacturing network.
Technology	Plants and factories partially automated; little to no coordination between departments or partners	Operations are partially to fully automated at best; some degree of integration with enterprise and across facilities.	Operations generally automated and integrated and processes extend back to supplier and forward to customer.
Performance Measurement	Plants and factories measured on basics such as throughput and unit cost.	Facilities measured on own performance and contribution to selected business processes (e.g. order-to-delivery)	Cascading metrics from corporate finance through to the plant operations; focus on core business processes.

Source: AberdeenGroup, May 2006



Chapter Four: Recommendations for Action

Key Takeaways

- Laggard companies should start by gaining visibility and control over production, close the information gap between the plant and corporate, and empower customer-focused teams to drive improvements.
- Industry average companies should establish global manufacturing standards, take stock of current IT landscape, and create value-focused metrics program.
- Best in class companies should deliver real-time intelligence to the boardroom, continuously improve manufacturing for operational excellence, and leverage technology to fuel ongoing innovation.

Driven by the need to improve operational excellence and marshal global manufacturing resources, the era of the global manufacturing enterprise is being ushered in. Appropriate strategic actions, capabilities, and enabling solutions can help Laggards overcome competitive barriers, help Industry Norm companies to reach the next plateau of performance, or enable the Best in Class to retain their leadership positions. The following actions should help spur necessary performance improvements.

Laggard Steps to Success

Companies that fall behind in their operational performance have a large opportunity for improvement. By gaining better control over manufacturing, lagging companies will create an opportunity to reduce costs and improve customer satisfaction. Gaining business process knowledge and a better understanding the capabilities of enterprise and manufacturing systems should provide laggard companies with an opportunity to leapfrog the average performers.

1. *Gain visibility and control over production*

Integrate systems across the plant or factory; begin by linking factory automation, process control, and data historians into MES or a plant level framework; and/or leverage emerging manufacturing intelligence solutions to access systems directly. Leverage real-time KPI technology capabilities to drive manufacturing performance.

2. *Close the information gap between manufacturing and the enterprise*

Integrate enterprise and manufacturing systems. Begin by directly downloading customer requirements directly into production schedules. Leverage MES and manufacturing intelligence solutions to make manufacturing information directly accessible to decision makers and others in the enterprise and across the supply chain.



3. *Empower customer-focused teams to drive improvements*

Empower teams to collaboratively design value stream maps (begin to map business processes beginning with the customer, through production, and back to the supplier) with stakeholders. Appoint customer-focused or value stream leaders to manage business core business processes and customer satisfaction.

Industry Norm Steps to Success

Companies reporting average performance results also have an opportunity to improve operating performance and gain a competitive advantage by leveraging and expanding their current knowledge and capabilities. Prepare to set standards and build integrated KPI programs.

1. *Set global manufacturing standards*

Establish a common language and enterprise standards for managing products, processes, and to communicate governance policies. Define a broad based performance program that communicates corporate objectives and incorporates manufacturing operations and locations.

2. *Create strategic alliance between manufacturing and corporate IT*

If not in place, initiate partnership between manufacturing and corporate IT partnership. Work collaboratively to take stock of current manufacturing systems environment and begin to set standards for integration, data management, and the future purchase of technology solutions.

3. *Create value-focused metrics programs*

Automate and integrate continuous improvement programs by working to drive corporate metrics down to the plant; and to capture production KPIs in real-time.

Best in Class Next Steps

Companies that have been able to differentiate themselves still have the opportunity to continuously improve and extend their lead even further. These companies should look to take further advantage of their leadership status through both continuous improvement programs and breakthrough thinking.

1. *Deliver manufacturing intelligence to the board room*

Harness manufacturing information and technology to provide executives with the right information in the right format at the right time; enable analysis with drill down capabilities and business analytics tools.

2. *Continuously improve manufacturing to maintain operational excellence*

Leverage Six Sigma and other quality techniques to continuously target improvement opportunity areas; make improvements and then target the next highest priority area. Enroll employee participation through ideas management programs.



3. *Leverage technology to fuel ongoing innovation*

As MES, manufacturing intelligence, and business analytics solutions unlock data across manufacturing, put critical information in the hands of executives, employees, and partners; challenge all to innovate new products, processes, and services.



Author Profile

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Jane Biddle leads Aberdeen research efforts in the global manufacturing sector. Through benchmarking studies, best practice reports, and tailored research projects, she remains focused on helping clients understand and anticipate the impact of business and technology on their organizations. Jane has been at the forefront of technology since implementing MRP systems for Hewlett-Packard customers. This experience led her to become MRP/ERP product manager and industry solution manager for Hewlett-Packard's CIM marketing organization. In the mid-1990s, she established the manufacturing practice for Benchmarking Partners before she joined SAP to initiate and manage its Industry Centers of Expertise for the Americas.

Prior to joining Aberdeen, Jane was an independent consultant providing strategic advisory services to technology and service providers in the supply chain and manufacturing sectors. Jane is a frequent speaker at industry conferences and has published a number of articles. She is currently serving as APICS West Jersey president. Jane received her BS in Computer Science and MBA from Rivier College in Nashua, N.H., and maintains her APICS CPIM certification status.



Appendix A: Research Methodology

During the month of April 2006, **AberdeenGroup** with MESA and *Manufacturing Business Technology* examined the global MES philosophies, techniques, and technologies of 137 enterprises in high tech, industrial equipment and machinery, chemicals, consumer packaged goods, and other industries.

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

- What strategic actions are market leaders deploying relative to structuring and managing the deployment of MES at one location? Across the company? Around the world?
- Which solutions and technology enablers are favored to orchestrate the movement of materials and information between manufacturing factories, plants, and suppliers?
- Are manufacturers able to strike a balance the need to optimize local manufacturing capabilities with conformance to corporate standards? How are metrics being used to drive performance across the general manufacturing process?

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

The study aimed to identify emerging best practices for global MES provide a framework by which readers could assess their capabilities.

Responding enterprises included the following:

- **Job title/function:** The research sample included respondents from the following functional areas: information technology (32%), manufacturing (29%), logistics/supply chain (10%), and others.
- **Industry:** The research sample included respondents predominantly from manufacturing industries: high tech (22%), industrial equipment manufacturers (14%) chemical (13%) and consumer goods (13%). Other sectors responding included.....
- **Geography:** Plant locations included 83% in North America, 55% in Asia Pacific, and 51% in Europe.
- **Company size:** About 44% of respondents were from large enterprises (annual revenues above US\$1 billion); 34% were from mid-sized enterprises (annual revenues between \$50 million and \$1 billion); and 22% 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 *Global Manufacturing: MES and Beyond Benchmark report*. Their sponsorship has made it possible for **AberdeenGroup**,

MESA, and *Manufacturing Business Technology* to make these findings available to readers at no charge.

Table 6: PACE Framework

PACE Key
<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> <ul style="list-style-type: none"> <i>Pressures</i> — external forces that impact an organization’s market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, competitive) → <i>Actions</i> — 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) → <i>Capabilities</i> — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products/services, ecosystem partners, financing) → <i>Enablers</i> — 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: [AberdeenGroup](#), May 2006



Table 7: 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: [AberdeenGroup](#), May 2006

Table 8: Competitive Framework

Competitive Framework Key

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

Laggards (30%) — FIELD SERVICES practices that are significantly behind the average of the industry, and result in below average performance

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

Best in class (20%) — FIELD SERVICES practices that are the best currently being employed and significantly superior to the industry norm, and result in the top industry performance.

Source: [AberdeenGroup](#), May 2006



Appendix B: **Related Aberdeen Research & Tools**

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

- [*The Lean Benchmark Report*](#), March 2006
- [*The Asset Management Benchmark Report*](#), April 2006
- [*The Product Quality Benchmark Report*](#), December 2005
- [*Manufacturing Transparency*](#), December 2005
- [*Winning with Global Manufacturing Networks*](#), September 2005
- [*Best Practices in Lean: The Momentum Builds*](#), July 2005

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



About AberdeenGroup

Our Mission

To be the trusted advisor and business value research destination of choice for the Global Business Executive.

Our Approach

Aberdeen delivers unbiased, primary research that helps enterprises derive tangible business value from technology-enabled solutions. Through continuous benchmarking and analysis of value chain practices, Aberdeen offers a unique mix of research, tools, and services to help Global Business Executives accomplish the following:

- IMPROVE the financial and competitive position of their business now
- PRIORITIZE operational improvement areas to drive immediate, tangible value to their business
- LEVERAGE information technology for tangible business value.

Aberdeen also offers selected solution providers fact-based tools and services to empower and equip them to accomplish the following:

- CREATE DEMAND, by reaching the right level of executives in companies where their solutions can deliver differentiated results
- ACCELERATE SALES, by accessing executive decision-makers who need a solution and arming the sales team with fact-based differentiation around business impact
- EXPAND CUSTOMERS, by fortifying their value proposition with independent fact-based research and demonstrating installed base proof points

Our History of Integrity

Aberdeen was founded in 1988 to conduct fact-based, unbiased research that delivers tangible value to executives trying to advance their businesses with technology-enabled solutions.

Aberdeen's integrity has always been and always will be beyond reproach. We provide independent research and analysis of the dynamics underlying specific technology-enabled business strategies, market trends, and technology solutions. While some reports or portions of reports may be underwritten by corporate sponsors, Aberdeen's research findings are never influenced by any of these sponsors.



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