

PROCESS OPTIMIZATION IN MANUFACTURING: THE KEY TO BEST-IN- CLASS SUCCESS

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During times of economic volatility, digital transformation is key to the survival of manufacturing organizations. Best-in-Class companies have already implemented the necessary technologies and capabilities to mitigate market disruptions, and are now leveraging those enablers to optimize process productivity. By relying on solutions that provide greater control on the factory floor and real-time visibility, top performers are setting the pace of innovation.

Digital Transformation in Manufacturing

Disruptions to normal business operations, while frustrating, are an ideal opportunity for change. Failing processes can be uprooted and optimized, and outdated technology can be modernized and strategically utilized. As one of the top business units to see massive disruption due to the COVID-19 pandemic, manufacturing divisions are a prime area for digital transformation.

Transitions to manufacturing PPE equipment, regulations to ensure the safety of factory workers, and requirements to reduce overall costs have been weighing on the minds of manufacturing leaders for the past year. According to Aberdeen's *Business Resiliency and Agility* survey (May 2020), 51% of manufacturers experienced a decrease in sales during the fluctuating downturns that plagued the worldwide economy in 2020. Analysis from Aberdeen's recent *MOM / MES and PIE in 2021 and Beyond* survey (April 2021) revealed that throughout the pandemic, digital transformation has become more of a priority for 67% of manufacturers. These organizations have recognized the importance of leveraging technology enablers to improve time-to-market, overall equipment effectiveness (OEE), and advanced innovation.

As manufacturing leaders assess their machine and employee productivity, there are several main drivers motivating them to improve manufacturing operations. At a high level, manufacturers are faced with the task of generating more complex products faster and at a lower cost.

The Aberdeen maturity class framework is comprised of three groups of survey respondents. This data is used to determine overall company performance. Classified by their self-reported performance across several key metrics, each respondent falls into one of three categories:

► **Best-in-Class**

Top 20% of respondents based on performance

► **Industry Average**

Middle 50% of respondents based on performance

► **Laggard**

Bottom 30% of respondents based on performance

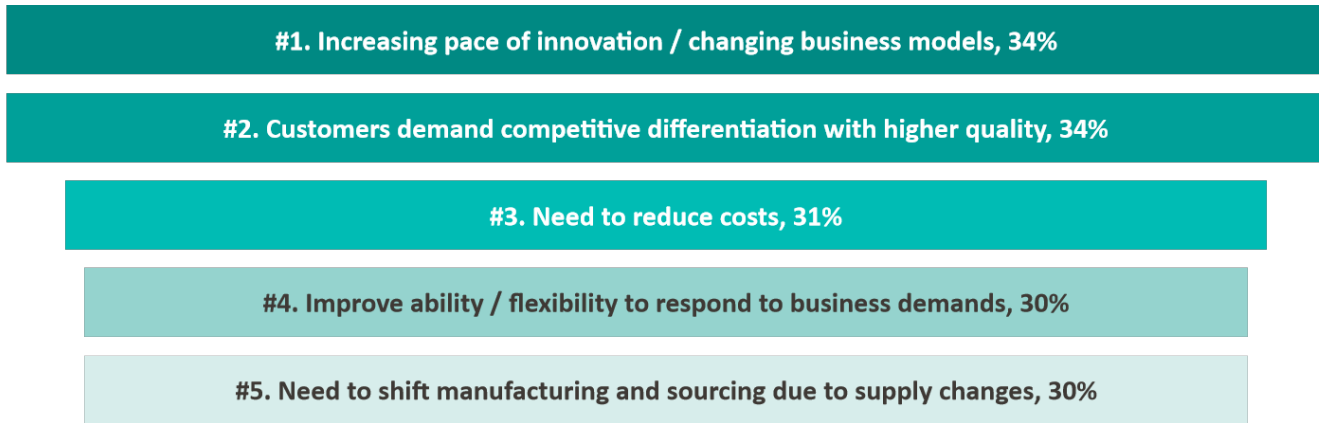
Average and Laggard are combined in this analysis to form the group **All Others**.

67%

of manufacturers say **digital transformation became more of a priority** for them over the course of the COVID-19 pandemic.

The most prevalent pressures influencing this demand are the increasing pace of innovation and the competitive environment (Figure 1).

Figure 1. Pressures to Improve Manufacturing Operations



Ranking based on % of respondents rating each pressure as one of their top 3

n = 262, Source: Aberdeen, April 2021

Manufacturing and engineering teams are constantly searching ways to further optimize operations. Whether that be during product development, on the factory floor, or in the field, organizations need to keep up with the pace of innovation in order to remain competitive. Customer demand for competitive differentiation stresses the level of competition within manufacturing: Consumers expect the most complex, high-quality products available in the market today, and if manufacturers can't deliver against that demand, they risk losing their customer base. The ability and flexibility to respond to business demands and the impact of supply changes indicate that manufacturers are still recovering from the economic effects of the COVID-19 pandemic. They need to be prepared to pivot at a moment's notice without interrupting production efforts.

The need to reduce costs is also a top pressure influencing improvements to manufacturing operations. Complexity and quality may increase, but customers will still expect the same low price — pushing manufacturers to cut costs wherever possible without sacrificing quality. Maintaining product quality levels is the number one challenge within manufacturing operations (see sidebar). The rising cost of raw materials and operating costs are also top challenges, which proves that cost reduction efforts across organizations have been unsuccessful. Manufacturers need processes in place that maximize material and capacity utilization to reduce waste and follow Lean manufacturing initiatives. To better understand how manufacturers are responding to these pressures and

Most Prevalent Challenges Within Manufacturing Operations

- ▶ Maintaining product quality levels: **38%**
- ▶ Increasing pace of innovation: **34%**
- ▶ Rising cost of raw materials: **34%**
- ▶ Operating costs are too high: **32%**
- ▶ Managing multiple datasets: **26%**

% of respondents citing each as a current, past, or potential challenge

challenges, this report will focus on the actions and investments of Best-in-Class companies and how these strategies have led to superior business results.

Profile of Best-in-Class Manufacturers

Top performing companies set the pace of innovation with processes and technologies that prioritize efficiency and excellence. Best-in-Class companies are defined by their ability to develop the most complex products at the fastest rate and at a reasonable cost. They are ahead of All Others in their percentage of products that meet revenue targets, percentage of complete and on-time shipments, and year-over-year decrease in manufacturing cycle time (Table 1).

Table 1. Best-in-Class Maturity Matrix for Manufacturing

Reporting Metric	Best-in-Class Top 20%	All Others Bottom 80%
Average percent of products meeting revenue targets	88.2%	66.1%
Average percent of complete and on-time shipments	91.5%	66.2%
Average percent improvement (decrease) in manufacturing cycle time over the past year	+ 87.2%	+ 29.4%

Aberdeen’s research shows that many Best-in-Class companies are nearing the end of their digital transformation journey, allowing them to remain successful in today’s complex business environment. They have already implemented new systems and are now focused on properly leveraging their new processes and technologies to maximize their performance. In fact, Best-in-Class companies are more likely than All Others to say that digital transformation is not a current priority. Ahead of the pack, when the economic disruptions set in at the beginning of the COVID-19 pandemic, Best-in-Class organizations already had the necessary tools in place to effectively react to changes in the supply chain and customer demand. The same survey found that 70% of Best-in-Class companies were prepared for the disruption of normal business operations at the onset of the COVID-19 pandemic compared to only 55% of All Others.

Since the Best-in-Class are past the technology and process implementation phases, they are not currently concerned with digital transformation — but they are concerned with integrating their new systems into workflows and utilizing them to optimize manufacturing

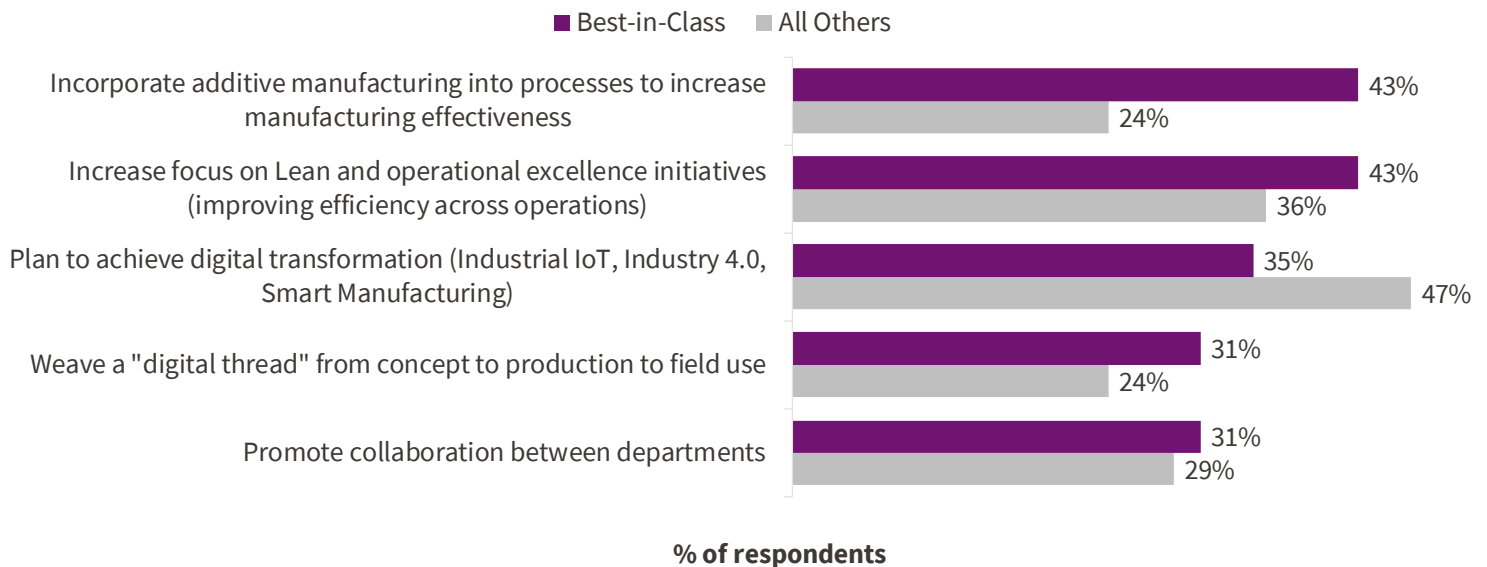
On average, Best-in-Class companies are seeing a

2x

greater year-over-year decrease in manufacturing cycle time.

operations. They are taking actions to increase manufacturing effectiveness, improve efficiency through Lean initiatives, and establish a “digital thread” to track product data throughout the product lifecycle (Figure 2).

Figure 2. Best-in-Class Actions Have Shifted from Digital Transformation to Digital Thread and Efficiency



n = 262, Source: Aberdeen, April 2021

Again, focusing on a plan to achieve digital transformation is a much higher priority for All Others than the Best-in-Class. Instead, top performers are looking to build additive manufacturing into their processes. From prototyping, to small-scale production, to volume production of spare and finished parts, additive manufacturing impacts many different areas of the factory. Greater customization, speed, and material productivity are the top benefits of leveraging additive manufacturing in production processes. The focus on Lean initiatives ties back to the challenge of the rising cost of raw materials. Best-in-Class manufacturers leverage their technology enablers to minimize waste and increase visibility into the product lifecycle by weaving a “digital thread” from concept, to production, to field use. With access to product performance in the field, engineers and manufacturers can quickly work to make product updates and establish a continuous cycle of improvement and innovation.

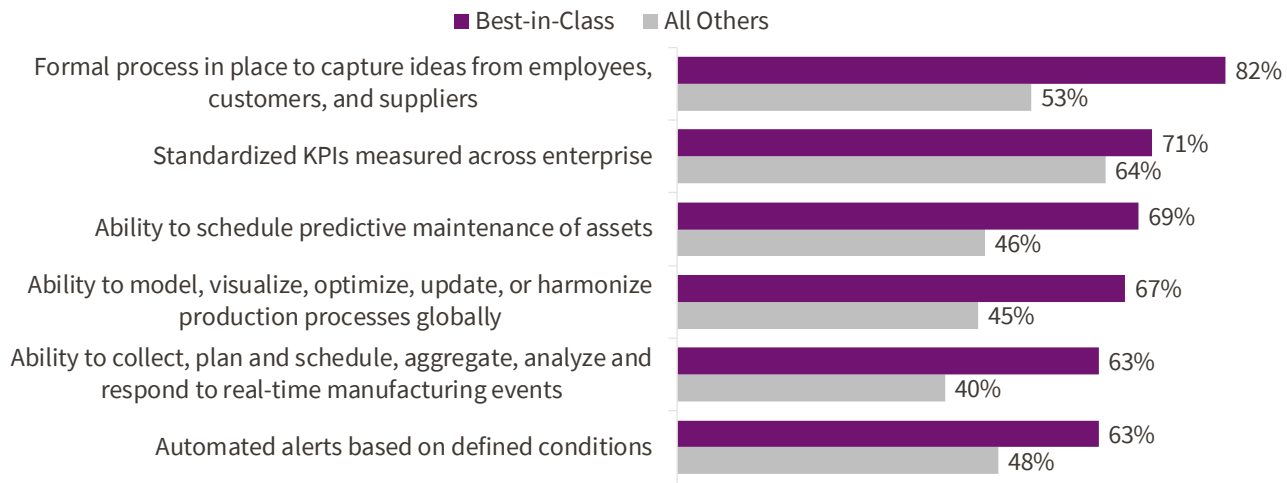
To put these strategies to work, the Best-in-Class have invested in comprehensive technology enablers and capabilities. They are prioritizing process optimization, adopting tools to gain real-time visibility across their organizations, and leveraging data management capabilities to promote

data-driven decision-making. Other companies can follow in the footsteps of the Best-in-Class to achieve similar levels of performance.

The Power of Process Optimization

Process optimization addresses many of the pressures and challenges affecting manufacturers today. Investigating processes to determine areas for improvement reveals opportunities to minimize waste, decrease production downtime, and increase quality. While both the Best-in-Class and All Others are likely to have standardized KPIs to track performance, Best-in-Class companies take process optimization further by scheduling predictive maintenance, modelling processes globally, and responding to real-time events (Figure 3).

Figure 3. Best-in-Class Process Optimization Capabilities



% of respondents with each capability “Currently Implemented”

n = 262, Source: Aberdeen, April 2021

With a formal process in place to capture ideas, Best-in-Class companies are better positioned to keep up with the increasing pace of innovation. They can efficiently turn an idea into a prototype, and a prototype into a finished product. Compared to All Others, the Best-in-Class generate 31% more new product introductions (NPIs) that meet production targets. The Best-in-Class also have systems in place to schedule predictive maintenance of assets. Predictive analytics within operations and execution systems allows workers to anticipate when maintenance will be required and address machinery issues before they arise. This ultimately reduces production downtime and costs associated with unplanned maintenance.

Best-in-Class companies generate

31%

more NPIs that meet production targets compared to All Others.

Global production process modelling is beneficial for standardizing and streamlining manufacturing operations across the enterprise, resulting in faster time-to-market and greater visibility at the executive level. Business leaders are better able to access and analyze data if it is stored the same way across all regions, and they can more easily determine areas for improvement when the production processes are being conducted the same way in all factories.

Greater visibility also contributes to the organization’s ability to respond to real-time manufacturing events. Systems that enable control over the entire data collection, organization, and analysis process help companies monitor external and internal processes. Manufacturing leaders can then quickly detect and react to disruptions on the factory floor, changes in demand, and roadblocks in the supply chain without slowing down production or sacrificing quality. Best-in-Class companies are seeing a 2.4x greater year-over-year decrease in production downtime as a result. Technology platforms with automated alerts make this process even easier for managers to identify and respond to certain conditions. With all of these capabilities in place, Best-in-Class companies are able to prevent and mitigate downtime events to optimize the manufacturing cycle and ensure shipments are completed on-time while minimizing operating costs.

Best-in-Class companies are seeing a

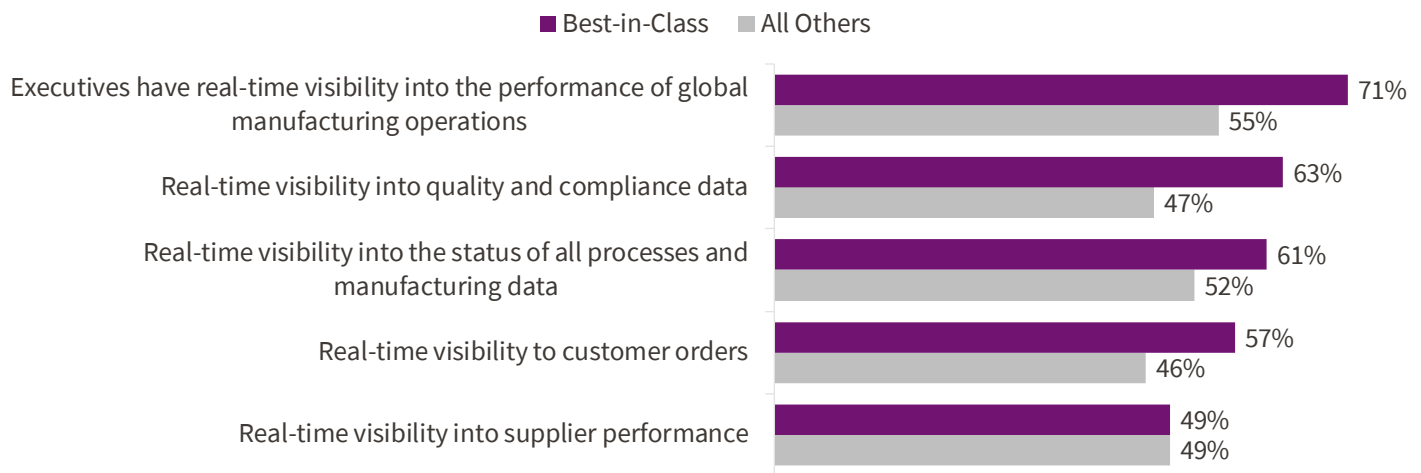
2.4x

greater year-over-year decrease in **production downtime** compared to All Others.

Leverage Real-Time Data for Smart Decision-Making

Global process standardization is only beneficial for executives if they actually have access and visibility into performance data on a real-time basis. Best-in-Class companies are far more likely than All Others to provide real-time visibility into the performance of global manufacturing operations at the executive level (Figure 4).

Figure 4. Adoption of Real-time Visibility



% of respondents with each capability “Currently Implemented”

n = 262, Source: Aberdeen, April 2021

Visibility at the executive level allows decision-makers to see exactly what is going on when it is happening. If a problem arises, they can quickly make changes to processes across the business, or they can implement changes in one region to see how they affect performance before rolling out those changes to the entire organization. This has resulted in a 1.4x greater year-over-year decrease in time-to-decision for Best-in-Class companies. Making data-driven decisions from a top-down structure ensures the standardization of manufacturing operations across the enterprise and allows business leaders to see how their decisions impact the organization as a whole.

Best-in-Class companies don't just have a vertical reach from global to factory levels with their real-time data — they have a horizontal reach across all manufacturing areas. With systems that enable visibility into real-time quality and compliance data, manufacturers catch defects early and prevent them from reaching later stages of production. A 360-degree solution for quality ensures a greater number of products meet quality targets upon design release and contributes to greater profitability by reducing the cost of non-quality and improving customer satisfaction (see sidebar). Real-time visibility into customer orders also improves customer satisfaction and process productivity. Insight into fluctuations in customer demand allow manufacturers to prepare for an influx of orders or shift priorities during a downturn. It also allows them to monitor perceptions of their products in the market and determine the success of NPIs.

All companies have prioritized real-time visibility into supplier performance — most likely arising from the need for agility to respond to supply chain disruptions. The top pressure to improve manufacturing operations amidst the COVID-19-related downturn was to avoid the risk of interruptions in the supply chain. As manufacturers seek greater flexibility on the supply chain front, systems that provide real-time data on inbound shipments and material costs are essential. Predictive and prescriptive analytics capabilities further improve agility by helping leaders quickly identify and respond to disruptions in the supply chain and maintain production schedules. Real-time visibility from all angles has helped Best-in-Class companies in their process optimization efforts and boosted their performance in complete and on-time shipments and manufacturing cycle time.

Data Management Enables Actionable Insights

It is not enough to have real-time manufacturing data available — companies need to have tools in place to properly analyze that real-time data to derive actionable insights. Best-in-Class companies have key data management capabilities in place that enable them to maximize the value

Compared to All Others, Best-in-Class companies are seeing

1.4x

greater year-over-year decrease in **time-to-decision**

37%

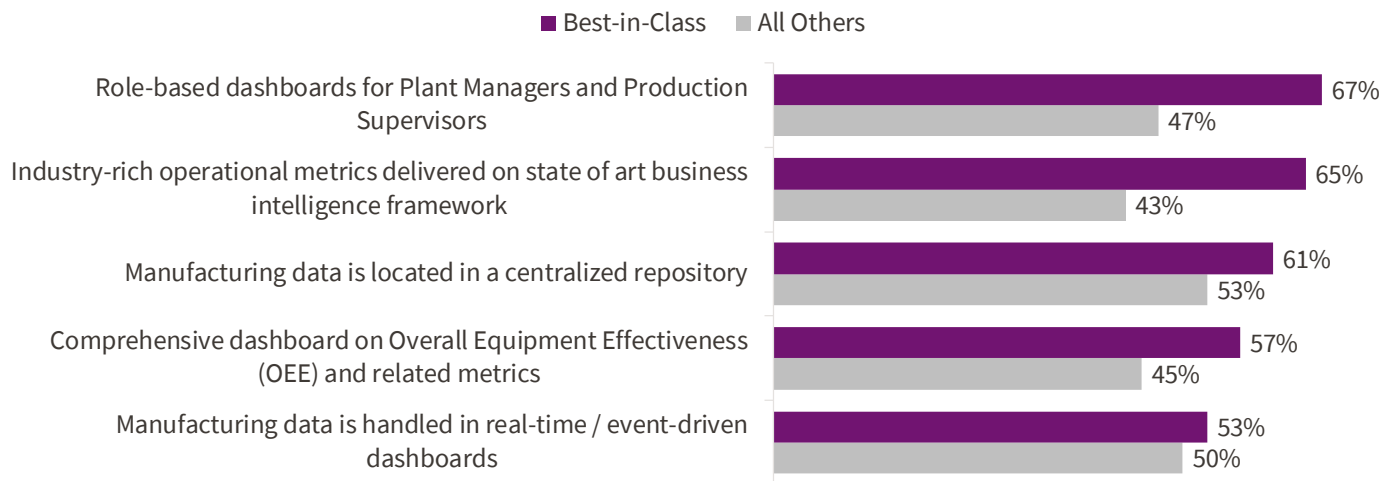
more products meeting **quality targets upon design release**

1.7x

greater year-over-year decrease in the **cost of non-quality (warranties, recalls, etc.)**

of their real-time data. Comprehensive dashboards and rich metrics are two of the most common data management capabilities among Best-in-Class companies that contribute to their high levels of performance (Figure 5).

Figure 5. Data Management Process Optimization Capabilities



% of respondents with each capability “Currently Implemented”

n = 262, Source: Aberdeen, April 2021

Role-based dashboards reduce the time spent searching for information and allow manufacturing leaders to focus on production. Plant managers and production supervisors with applicable metrics at their fingertips to identify decreases in performance can address production issues before performance levels drop too low. This decreases time-to-decision and improves process productivity. Industry-rich operational metrics also improve productivity by tailoring the data to fit the needs of the organization. Highly regulated industries such as Medical Devices and Aerospace and Defense are required to report specific quality and compliance metrics. The ability to accurately track these metrics, especially at the executive level, is essential for the reputation of these businesses.

Having a centralized repository for manufacturing data enables integration and process efficiency. Decision-makers only need to access one database to gain the knowledge they require, which improves time-to-decision. A single source of truth for manufacturing data prevents issues with outdated or poor-quality data and provides a single platform for data analysis. Dashboards built from this centralized repository can visualize metrics from across the organization for leaders to monitor and compare performance at the factory, regional, and global levels.

Dashboards visualizing OEE and related metrics in particular improve process optimization by allowing leaders to easily view data tied to productivity. Plant managers can utilize the second-by-second data to build models of the factory floor and determine the most efficient process for optimizing equipment utilization. They can detect systems that could be running more quickly and with fewer resources, and alerts can notify them when certain machines or processes are not running properly. Best-in-Class companies are seeing a 34% greater year-over-year increase in OEE compared to All Others, showing that access to production data contributes to greater process efficiency, and thus OEE. By optimizing processes on the factory floor with insights from comprehensive dashboards, Best-in-Class companies are better able to reduce operating costs and deliver complete and on-time shipments.

Best-in-Class companies are seeing a


34%

greater year-over-year increase in **OEE** compared to All Others.

Key Takeaways and Recommendations

The Best-in-Class actions laid out in this report provide manufacturers with an ideal model to follow — they are in the later stages of their digital transformation journeys and have shown that prioritizing process optimization is essential for establishing global business agility. By investing in manufacturing systems with real-time visibility and data management capabilities to enable data-driven decisions, companies can achieve Best-in-Class levels of performance. When reflecting on Best-in-Class manufacturing strategies, there are three key points to highlight:

- ▶ **Technology enablers are critical for keeping up with the increasing pace of innovation.** Innovation and competition are the most prevalent market pressures affecting manufacturers today. Technology solutions can help manufacturers identify areas for improvement and quickly make changes to keep up with market demands.
- ▶ **Efficiency is the key to cutting costs while maintaining quality.** Through greater visibility into manufacturing processes and a 360-degree view of quality and compliance, organizations can find areas to increase efficiency and prevent production downtime, thus reducing operating costs without sacrificing quality.
- ▶ **Digital transformation doesn't stop after implementation.** Although Best-in-Class companies aren't actively prioritizing digital transformation initiatives, their journey isn't complete. After the adoption of new technologies and processes, manufacturers need to be constantly looking for areas to reduce costs, promote innovation, and improve time-to-market.



As the world moves into the post-pandemic era, manufacturers need to be ready to take on whatever comes next. Visibility into the entire product lifecycle — from supplier performance, to product development, to production, and even into the field — will aid companies in their pursuit of lower costs, higher quality, and greater product complexity. By enacting strategies that optimize production processes and improve business agility, manufacturers will be better positioned to make data-driven decisions and implement strategic initiatives that contribute to the overall growth and success of the organization.



Related Research

- ▶ Manufacturing Intelligence: Transform Factory Data into Actionable Insights; February 2021
- ▶ Manufacturing Resilience: A View of Best-in-Class Preservation and Performance; December 2020
- ▶ Building Business Resilience and Agility in Manufacturing: How Innovation Breeds Success; September 2020

About Aberdeen

Since 1988, Aberdeen has published research that helps businesses worldwide to improve their performance. Our analysts derive fact-based, vendor-neutral insights from a proprietary analytical framework, which identifies Best-in-Class organizations from primary research conducted with industry practitioners. The resulting research content is used by hundreds of thousands of business professionals to drive smarter decision-making and improve business strategies. Aberdeen is headquartered in Waltham, Massachusetts, USA.

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