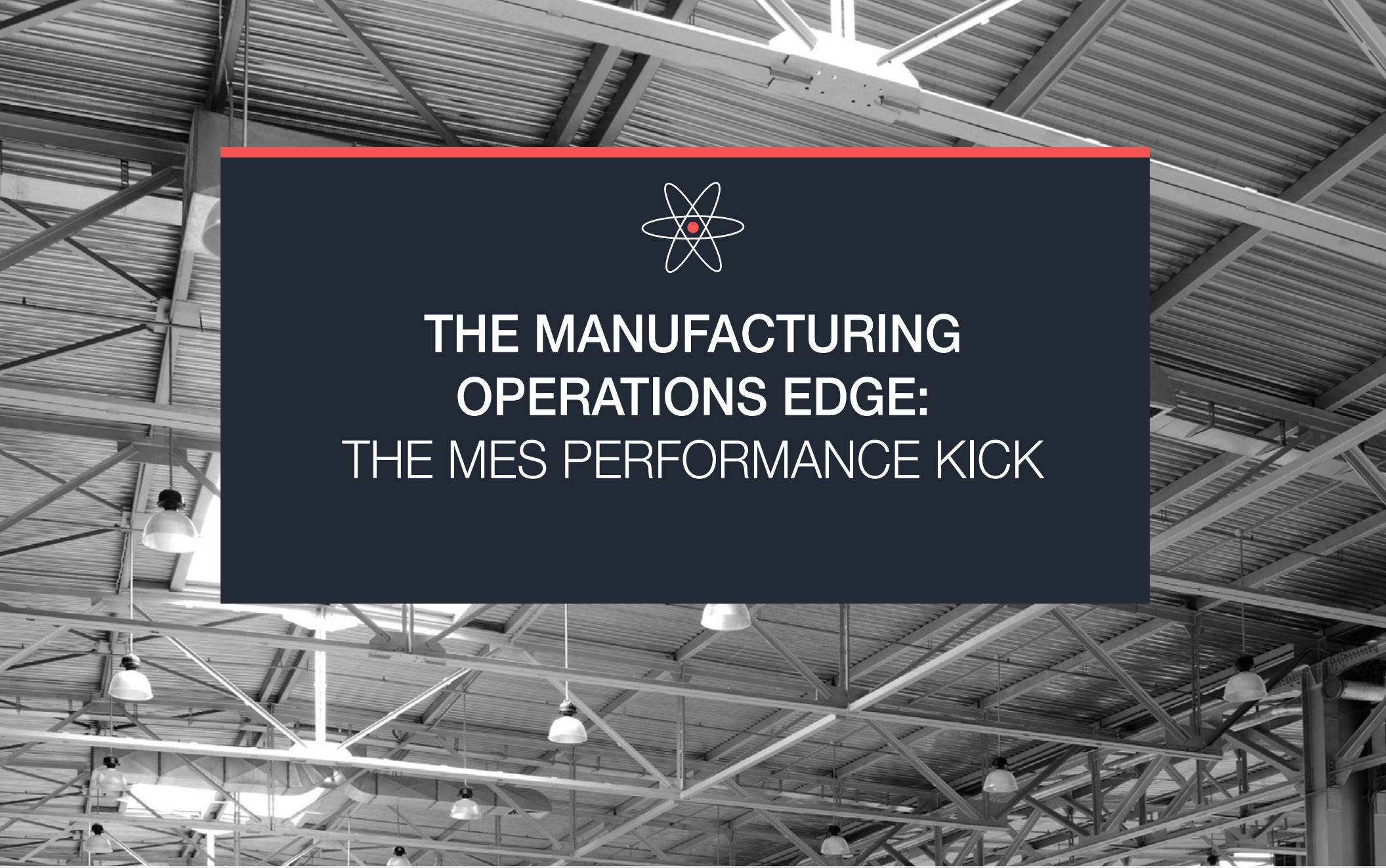


THE MANUFACTURING OPERATIONS EDGE:
THE MES PERFORMANCE KICK

ABERDEEN

INTRODUCTION

Manufacturing today faces a number of pressures and challenges.

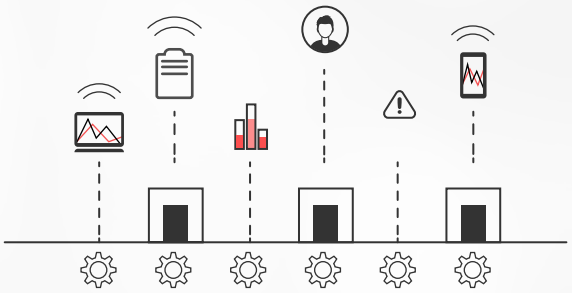
These include rising costs, operational inefficiencies, and shortened product release cycles. To meet these challenges and improve operations and profit margins, manufacturers are turning to manufacturing operations management (MOM) and manufacturing execution systems (MES).

As Industry 4.0 ushers in the Internet of Things (IoT), the Cloud, and big data analytics, MOM/MES leverages this new influx of data, makes sense of it, and drives value across production, quality, and compliance.

Best-in-Class organizations are better positioned to reap the benefits of MOM/MES systems, including improved operational efficiency, faster decision making, improved tracking and traceability, improved visibility into the factory, and better quality.

MANUFACTURING OPERATIONS MANAGEMENT

Manufacturing operations management (MOM) is a methodology for viewing an ***end-to-end manufacturing process*** in order to optimize efficiency. There are many types of MOM software, including production management, performance analysis, quality and compliance, and human machine interface (HMI).



MANUFACTURING EXECUTION SYSTEMS MANAGEMENT

Manufacturing execution systems (MES) manage, monitor and synchronize the execution of ***real-time, physical processes*** involved in transforming raw materials into intermediate and / or finished goods. They coordinate this execution of work orders with production scheduling and enterprise-level systems.

MES applications also provide feedback on process performance, and support component and material-level traceability, genealogy, and integration with process history, where required.

BEST-IN-CLASS MATURITY MATRIX

To identify best practices in MOM/MES for manufacturers, Aberdeen used three key performance indicators (KPIs) to distinguish the Best-in-Class from Industry Average and Laggard organizations. These are:

COMPLETE AND ON-TIME DELIVERY

Percentage of complete products delivered on-time as compared to total commitment.

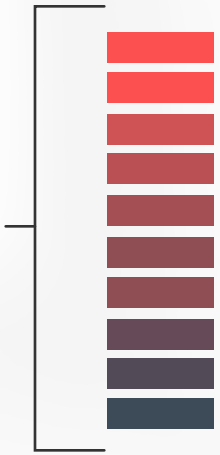
OVERALL EQUIPMENT EFFECTIVENESS (OEE)

Measured in percent as: Availability x Performance x Quality.

MANUFACTURING CYCLE TIME

Measured in percent improvement over the past two years.

Respondents were divided among three categories based on their aggregate performances in the above three metrics:



BEST IN CLASS:
the top 20% of performers

INDUSTRY AVERAGE:
the middle 50%

LAGGARDS:
the bottom 30% of performers

PRESSURES AND CHALLENGES DRIVING MOM/MES USAGE

AGGREGATE PERFORMANCE OF ALL SURVEYED ORGANIZATIONS

64% Need to **reduce costs**

24% **Attrition** in skilled workforce (e.g. retiring, lack of available workers, etc.)

39% Customers demand **competetive differentiation** with higher quality

20% Need to support **customization** / individualized mass production

36% Improve ability / flexibility to respond to **business demands**

16% Market demands **reduced energy** and resource consumption

30% Increasing pace of **innovation / changing** business demands

9% **Visibility** into future production needs

27% Need to comply with current and future **regulations**

7% Lack of insights into **operational data**

COST REDUCTION

The need to reduce costs and increase operational efficiency is a major pressure for manufacturers today.

45% of manufacturers say **operating costs** are too high.

64% are pressured to **reduce costs overall**.

OPERATIONAL INEFFICIENCIES

Manufacturers are pressed by expectations for real-time, critical decision-making across operations —aka a shorter decision window.

55% say that too many **operational inefficiencies** (e.g., waste, delays, false starts, rework) are a burden on their organization.

BEST-IN-CLASS MANUFACTURERS PURSUE A BETTER PATH TO OPERATIONAL EXCELLENCE

The demands on manufacturers are significant. Research reveals, however, that Best-in-Class organizations are responding to these pressures and meeting these challenges by pursuing operational excellence through MOM and MES systems, focusing on tracking and traceability, visibility, and quality.

TRACKING AND TRACEABILITY

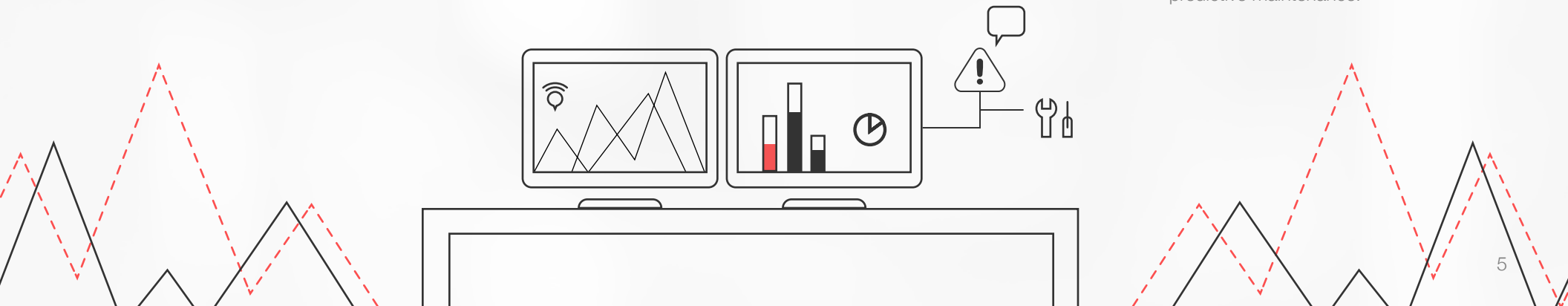
The Best-in-Class are 50% more likely than All Others to build compliance and traceability into production processes. Being able to track every relevant part, process, and final product means manufacturers quickly isolate defects, stop adding value to defective works in process, and limit the need for costly rework through product recalls.

VISIBILITY

The Best-in-Class ensure real-time visibility into the status of all processes and manufacturing data, and that manufacturing data is located in a centralized repository. Further, visibility also means real-time operational dashboards increasingly based on IoT technology. Plant data is handled in real-time / event-driven dashboards with role-based data accessibility, navigation, aggregation, or drill-down.

QUALITY

The Best-in-Class invest in IoT to greatly enhance manufacturing quality. If a quality issue arises on the shop floor, business systems receive real-time notifications via IoT sensor networks. This can trigger necessary corrective actions for real-time events and scheduled tasks, including dynamic adjustment of product runs. Best-in-Class manufacturers are extending asset quality even further by eliminating machine downtime using predictive maintenance.



THE MES PERFORMANCE EDGE

		Best-in-Class		Best-in-Class		All Others	Comparison
PRODUCTION	Complete and **on-time** shipments	92%	>	87%	6%
	Overall equipment **effectiveness**	90%	>	85%	6%
	Capacity utilization	90%	>	84%	7%
	Raw material utililzation	89%	>	85%	5%
PRODUCT	Product **launch dates** met	73%	>	68%	6%
	Product **cost targets** met	70%	>	67%	4%
	Quality targets at **design release** met	75%	>	67%	12%
	Product **revenue targets** met	70%	>	65%	8%
BUSINESS	Time to **decision** imprvement	14%	>	6%	2.3x
	Operating margin improvement	13%	>	6%	2.2x
	Total **cost per unit** improvement	12%	>	6%	2x
	Manufacturing cycle time improvement	14%	>	7%	2x

MES plays a foundational role in the success of manufacturing leaders in achieving tracking and traceability, visibility, and quality. Best-in-Class firms are 50% more likely to implement MES than All Others, and 76% more likely to implement MOM. Moreover, organizations deploying manufacturing execution systems receive a pronounced performance boost from such deployment.

The table shown quantifies the MES Edge across production, product, and business metrics, including the following highlights:

ON-TIME SHIPMENTS 6% higher

PRODUCT LAUNCH DATES 6% higher

PRODUCT REVENUE 8% higher

COST PER UNIT IMPROVEMENT 2x better

WHAT DO BEST-IN-CLASS ORGANIZATIONS SEEK FROM THEIR MES?

AGGREGATE PERFORMANCE OF ALL SURVEYED ORGANIZATIONS

50%

Quality and production flow management capabilities

32%

Ability to **migrate to Cloud**

37%

Ability to **integrate into other systems**, such as ERP

26%

ISA-95 standard support (for integrating enterprise and control systems)

34%

Real-time **production analytics**

18%

Ability to **aggregate, process,** and **analyze information** from batch records, raw-material details, and results of in-process and product-testing results

32%

Ability to **collect, aggregate,** and **feed** real-time sensor data

13%

Browser-based **KPI content** available on any mobile device (smartfphone, tablet, notebook, Chromebooks)

32%

Ability to visualize data on **mobile devices** without the need for custom development

13%

ISA-83 standard support (for batch process control)

MOST PRIZED QUALITIES IN MES

1. **Quality and production flow** management
2. **Integration into other systems**, such as ERP
3. Real-time **production analytics**
4. Out-of-the box **data visualization** on mobile
5. Ability to **migrate to the cloud**

As plant managers reach a greater level of comfort with Cloud, they are open to considering moving MES or certain MES components to the Cloud (depending on the industry and type of manufacturing). And as Best-in-Class managers move towards IoT-connected equipment in the plant, MES turns out to be more important than ever as the unifying force to bring together all production information in real time.

MOM/MES PLAYS A FOUNDATIONAL ROLE IN THE SUCCESS OF MANUFACTURING

THE IMPORTANCE OF MOM/MES

As we enter the era of Cloud and industrial IoT, the Best-in-Class are better positioned to reap the benefits of MOM / MES — including improved operational efficiency, faster decision making, improved tracking and traceability, improved visibility into the factory, and better quality.

PRESSURES / CHALLENGEES

The pressures and challenges driving manufacturers to use manufacturing execution systems include cost reduction in manufacturing, the need to driving revenue growth, and faster time-to market. To meet these challenges, the Best-in-Class are deploying MOM / MES systems to ensure better quality, production flow management, enterprise application integration, real-time production analytics, and data visualization on mobile devices.

BENEFITS

Implementing these capabilities yields increased operations speed; higher asset uptime and efficiency; improved visibility, agility and responsiveness; and improved safety.

MOM / MES plays a foundational role in the success of manufacturing. Aberdeen's research findings and analysis substantiates the need for organizations to invest in MOM / MES capabilities in order to remain competitive in the dynamic new manufacturing landscape of Industry 4.0.

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