

WHAT DOES DIGITALIZATION IN MANUFACTURING MEAN NOW?

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Report Highlights

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Manufacturing challenges, from getting a product to market on time, to resolving customer issues are the impetus for digital transformation via the IoT, the Cloud, and advanced analytics.

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The Best-in-Class are five times more likely to have implemented superior discovery capabilities for operational intelligence.

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The crossover to Cloud-based applications has begun.

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Advanced Analytics is a key digitalization technology having a huge impact on Best-in-Class manufacturers.

This report will explore the digitalization of manufacturing, and its impact on the industry today. Specifically addressed are three technologies that use digitalization – the IoT, the Cloud and big data analytics – and how they positively impact operations and manufacturing intelligence.

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Many digitalization technologies are at a “tipping point,” that magical moment when an idea crosses the threshold from possibility to reality and spreads like wildfire. This presents an opportunity for manufacturers to take their business to the next level.

Manufacturing today faces a plethora of challenges. These include rising costs, operational inefficiencies, and shortened product release cycles. To meet these challenges, manufacturers are turning to digitalization. This method employs digital technologies to change a business model and provide new revenue and value-producing opportunities.

The digitalization of manufacturing is advancing on several fronts and is being driven by several motivations. These are, the need to improve productivity and performance; make better decisions; reduce operational risk; and comply with current and future regulations.

Impacting manufacturing these days are three digitization technologies: the Internet of Things (IoT), the Cloud, and Advanced Analytics. Together, technologies are part of a manufacturer’s larger digital transformation journey, known as “Industry 4.0.”

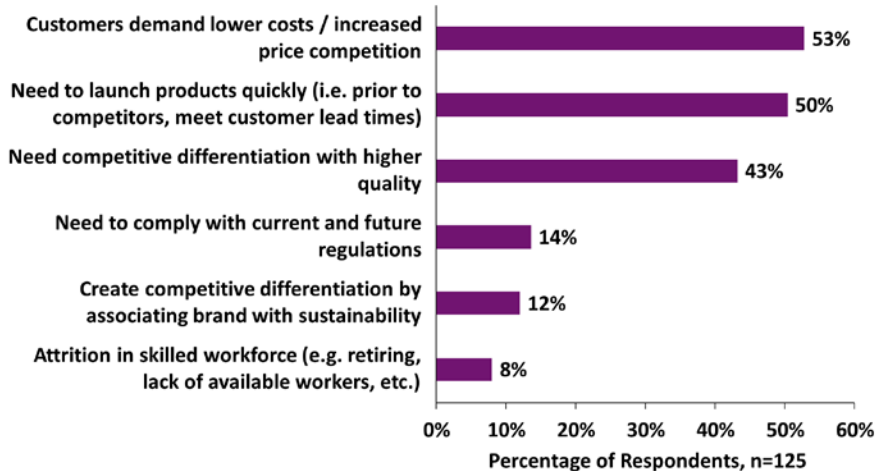
While the journey to Industry 4.0 is a long one, these three digitalization technologies are at a tipping point. As the age of experimentation draws to an end, the age of digital transformation has begun.

Obstacles = Opportunities for Manufacturers

While these challenges *are* pain points, they also create a real opportunity and sense of urgency for organizational improvement via digitalization. Manufacturer pressures and challenges raised by respondents to Aberdeen Group surveys, include better operational efficiencies, faster time-to-market, increased customer responsiveness, and the need for differentiation.

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Figure 1: Top Pressures on Manufacturing Operations



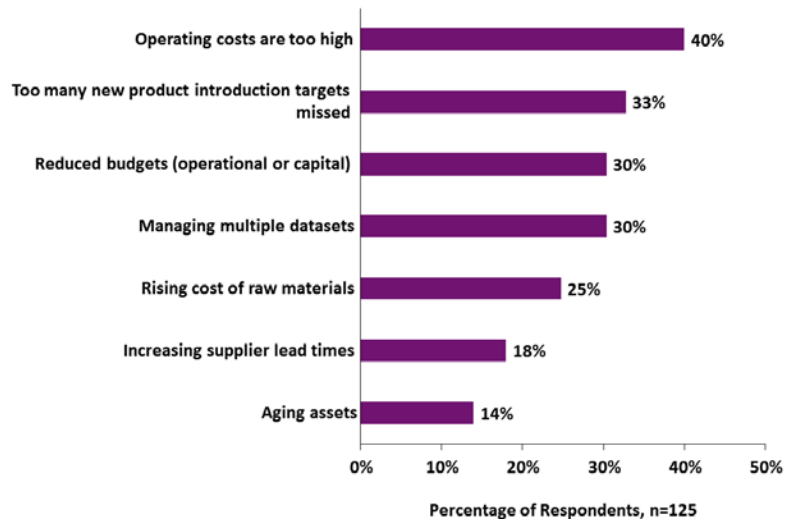
Source: Aberdeen Group, December 2016

The need for better operational efficiency stands out as a major pressure for all companies. Forty percent of respondents cited that operating costs are too high, 30% cite reduced budgets (operational or capital), 30% are challenged by managing multiple datasets, and 18% cite increasing supplier lead times.

Overall, 55% of survey respondents say that too many operational inefficiencies (e.g., waste, delays, false starts, rework) are a huge challenge for their organization. Additionally, operational intelligence survey respondents are pressed by expectations for real-time, critical decision-making across operations (a shorter decision window).

Time-to-market is also top of mind with 50% of citing the need to launch products quickly to meet customer lead times before competitors introduce competing products. Indeed, 33% of survey respondents say too many new product introduction targets are missed.

Figure 2: Top Challenges of Manufacturing Operations



Source: Aberdeen Group, December 2016

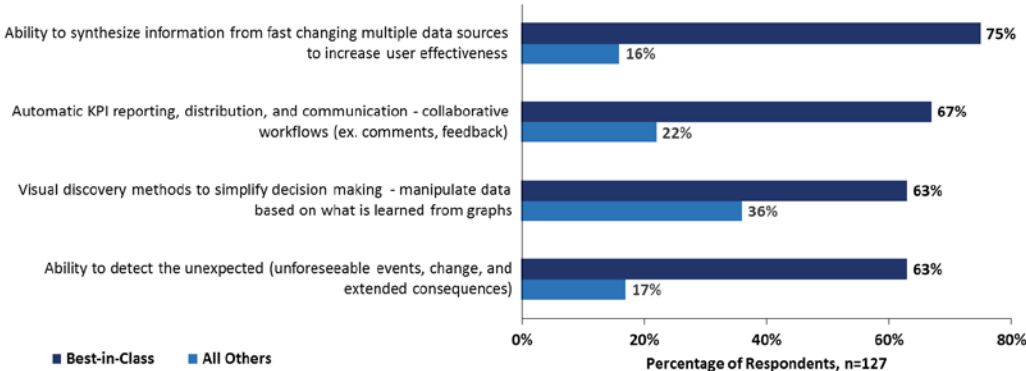
The need to improve customer satisfaction rates is important across the board, with 46% citing the need to fix defects to product performance, costs, and services. And 28% noted that they have a ways to go in understanding customer behavior based on preferences, needs and interest.

To better meet these challenges, manufacturers must improve their current capabilities to support better operational efficiencies, time-to-market, customer responsiveness, and differentiation.

IoT-based Discovery Capabilities for Improved Manufacturing Operations

Manufacturers are challenged by time-to-market, operational efficiency, customer responsiveness, and differentiation issues. Therefore, they are implementing Industry 4.0 capabilities through the digitalization of their operations (Figure 3). This enables them to respond to these pressures and meet these new challenges.

Figure 3: Manufacturers Connect All Parts of the Enterprise via IoT



Source: Aberdeen Group, December 2016

Currently, the IoT is the digitalization technology with the most potential for improving operational intelligence discovery. The term, IoT, refers to the networked connection of physical objects that contain embedded technology to communicate and sense – or interact – with their internal states, or the external environment. This embedded technology collects and transmits information about these objects, which is then used to optimize products, services, and operations.

By using IoT for the automated collection of operations data, manufacturers improve the accuracy of real-time decisions and reduce operational risk. While the digital transformation journey is just beginning for many, manufacturing leaders today are using IoT to move from asset optimization to system optimization. They are also going deep and broad on IoT. Deep, by deploying more sensors per asset. Broad, by deploying more assets with sensors. Over time, IoT’s role will not only permeate operations, but expand to demand-sensing, and extend to the supply chain as well.

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IoT-based automated data collection contributes to all areas of operational intelligence. The Best-in-Class, are particularly adept at this process, as they are:

- Almost five times as likely to be able to synthesize information from multiple, quickly changing, data sources, in order to increase user effectiveness.
- Almost four times as likely to be able to detect the unexpected (unforeseeable events, change, and extended consequences).
- Over three times more likely to have used automatic Key Performance Indicator (KPI) reporting, distribution, and communication – collaborative workflows.
- Almost twice as likely to have implemented visual discovery methods, to simplify decision making.

There is no doubt that IoT is nearing an inflection point. Analysts estimate the 2020 market for IoT at 20 billion to 30 billion devices (all types). In addition, a recent Morgan Stanley survey¹ of more than 100 decision makers (in automotive, consumer electronics, and industrial manufacturing) found more than 90% of these respondents are baking connectivity technologies into their designs.

To summarize, IoT-based smart devices are opening new windows of visibility into manufacturing processes. While the road to pervasive industrial IoT is a long process, this technology is already making a difference.

¹Morgan Stanley, "[Mighty Micro Engines of the Internet of Things](#)," 9/9/2016.



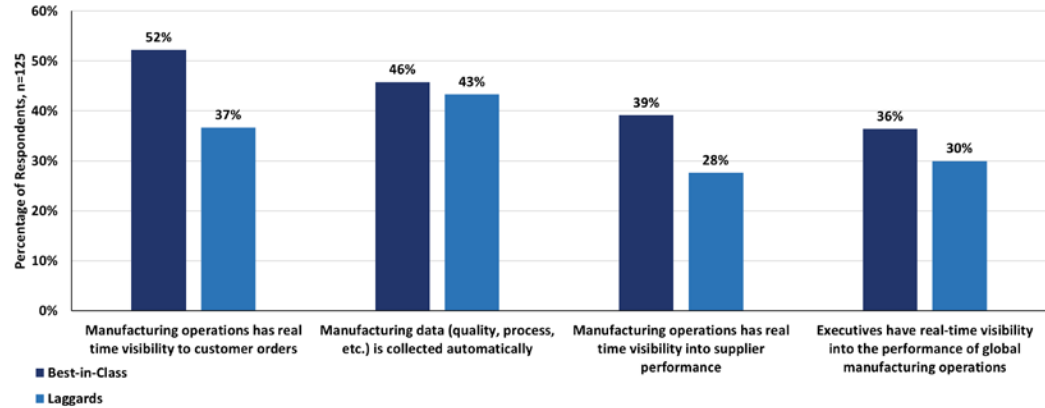
Cloud-based Business Management Capabilities for Improved Manufacturing Operations

Manufacturers, confronted with globalization and its attendant challenges, must find a new way to leverage resources and capabilities to remain competitive and profitable. To achieve this goal, manufacturers are investing in management capabilities for cloud computing.

Cloud computing, a type of internet computing, relies on *sharing computing resources*, rather than having local servers or personal devices to handle applications. In cloud computing, different services — such as servers, storage and software applications — are delivered to an organization's computers and devices through the internet.

Through the Cloud, Best-in-Class manufacturers can achieve real-time visibility and enhance internal and external collaboration (Figure 4).

Figure 4: Manufacturers Manage Better via the Cloud



Source: Aberdeen Group, December 2016

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Results show that the Best-in-Class are using management operations data to obtain real-time visibility into customer orders, supplier performance, and global manufacturing operations performance.

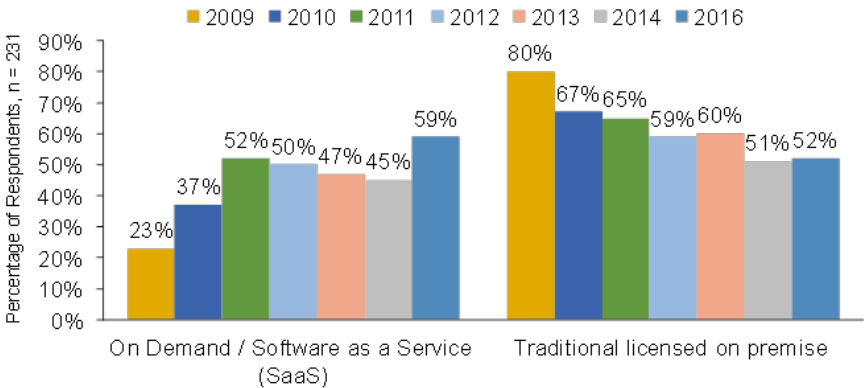
The data clearly supports the thesis that manufacturers manage operations better through their use of the Cloud. And the fact that Laggards are close to catching up to the leaders is a testament to how far and how fast cloud proliferation has advanced in the last five years.

Driven by the need for real-time access to critical data, as well as collaboration anywhere across their supply chain, the migration of key manufacturing software applications to the Cloud is happening now (ERP, MES, MOM, Asset Management, etc.). Consider, as a case study, the rising interest in cloud-based Enterprise Resource Planning (ERP) applications (Figure 5).

- From 2009 to 2016, interest in cloud-based ERP soared, growing from 23% to 59% of respondents.
- On the flip side, interest in traditional (licensed, premises-based) ERP sank, from an 80% interest rate in 2009, to a 52% interest rate in 2016.

For ERP, 2016 was clearly the year when the crossover to cloud occurred in terms of user interest.

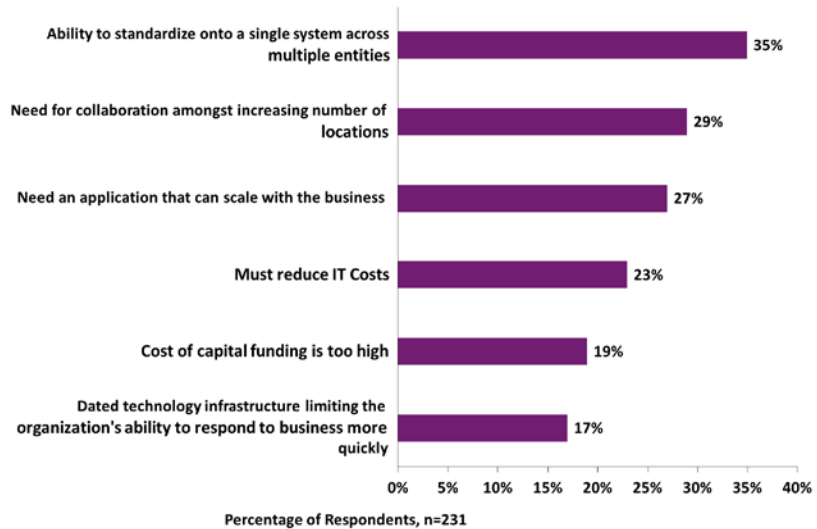
Figure 5: ERP Migration to the Cloud: 2016 As Crossover Year



Source: Aberdeen Group, July 2016

But why do organizations today select a cloud solution? Aberdeen research clearly shows that the main benefits of the cloud are its scalability, its status as a single end-to-end system, and its ability to enhance collaborative pursuits amongst many enterprise locations (Figure 6). Notably, 35% of respondents say the Cloud’s ability to standardize onto a single system, across multiple entities, is a major draw. In the case of manufacturing, these connected entities may extend upstream to suppliers, or downstream to customers, enhancing operational intelligence’s end-to-end view of the world.

Figure 6: Why the Cloud?



Source:

Aberdeen Group, 2016

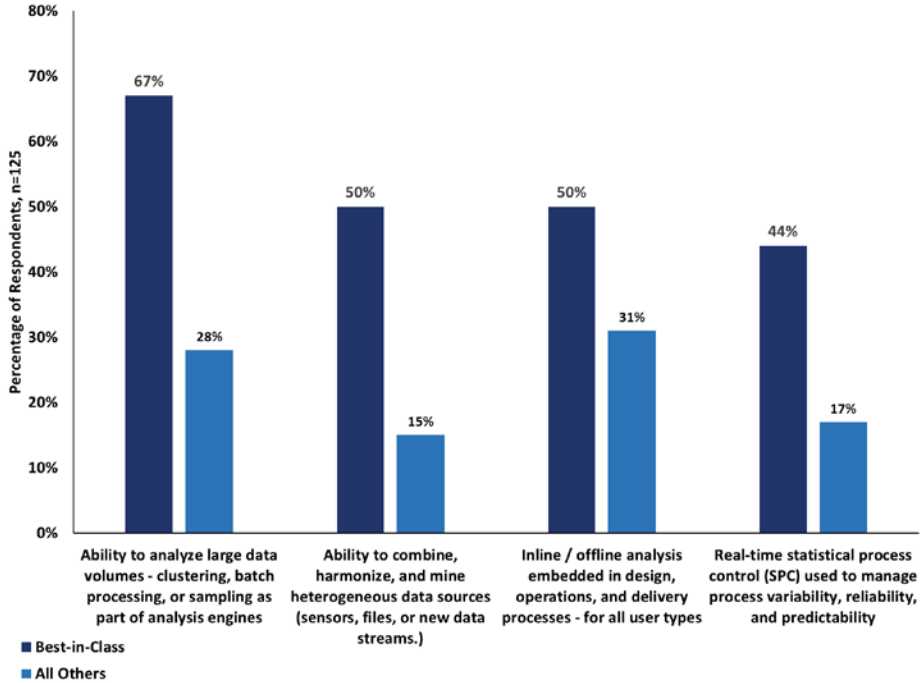
With manufacturers under constant pressure to streamline their operations and processes, turning to the Cloud has been an effective way to transform resources and capabilities into manufacturing services. In turn, these cloud-based manufacturing services enable end-to-end visibility across the whole manufacturing life cycle.

Advanced Analytics for Better Decision Making

Perhaps the highest synergistic value in a digitalization strategy comes from the analysis capabilities of Best-in-Class manufacturer. Today, manufacturers are making better analytics-based decisions via the ability to process big data; the ability to combine, harmonize, and mine heterogeneous data sources; analysis embedded everywhere; and real-time statistical process control (Figure 7).

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Figure 7: Manufacturers Make Better Decisions via Analytics



Source: Aberdeen Group, 2013

The Best-in-Class are:

- ➔ over three times more likely to have implemented analytical capabilities to combine, harmonize, and mine heterogeneous data sources (sensors, files, new data streams)
- ➔ over two times more likely to have implemented analytical capabilities to analyze large data volumes (e.g., clustering, batch processing, or sampling), as part of analysis engines
- ➔ two-and-a-half times more likely to have implemented real-time statistical process control (SPC) used to manage process variability, reliability, and predictability

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- almost twice as likely to have mastered inline / offline analysis embedded in design, operations, and delivery processes – for all user types

As strongly implied by these survey results, advanced analytics is a key digitalization technology now having a tremendous impact on Best-in-Class manufacturers. In manufacturing, this technology has emerged as a method to optimize production quality, save energy, and improve equipment service through predictive analytics and pattern recognition / root-cause analysis.

Key Takeaways and Recommendations

Digital disruption is all around us, and it has massive implications for business. Manufacturing is in the midst of a fourth wave of technological advancement and change via digitalization technologies. Today's manufacturers should follow the lead of the Best-in-Class by aggressively starting their digital transformation today. Here's how:

- Connect all parts of the enterprise, from the shop floor to the front floor; IoT-based connectivity enables a new level of operational intelligence focused on enabling better manufacturing operations today.
- Pursue cloud-based business management capabilities. Not only does this impart real-time visibility and scalability, but also the migration of key collaborative software applications to the cloud. And doing so enables scalability, incremental feature upgrades (vs. forklift upgrades of premises-based solutions), and longer system life.
- Leverage advanced analytics to usher in a new era of proactive management and predictive analytics based on big data.

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As mounting organizational pressures and challenges cause manufacturers to think and act differently, Best-in-Class organizations are leading the way in manufacturing transformation via digitalization technologies.

Right now, intelligent deployment of IoT, the Cloud, and Big Data Analytics are effective tools for improving manufacturing operations. Combined, these technologies can have a significant impact by providing a multitude of benefits: better discovery capabilities; new visibility into resources and processes; and the ability to transform data into predictive, actionable operational insights.

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research

[*A Consolidated Approach to Manufacturing Operation Management*](#); September 2016
[*Operational Risk Management in High Tech*](#); August 2016

[*Driving Manufacturing Visibility*](#); October 2016
[*Cloud-based ERP's Time Has Come!*](#); August 2016

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About Aberdeen Group

Since 1988, Aberdeen Group has published research that helps businesses worldwide improve their performance. Our analysts derive fact-based, vendor-agnostic 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 strategy. Aberdeen Group is headquartered in Waltham, MA.

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