

CONNECTED OPERATIONS IN THE IOT ERA: THE ASSET MANAGEMENT EDGE

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Report Highlights

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Operational efficiency pressures are driving Best-in-Class manufacturers toward connected operations. 43% of organizations cite the need to reduce costs, and 31% cite the need to drive revenues.

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Best-in-Class firms are twice as likely to integrate manufacturing systems with IoT data.

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The need to connect and monitor assets is driving IoT users to enterprise asset management. 40% of firms cite the need to control equipment reliability and to understand device failure to improve future efficiency.

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A connected operations strategy pays off. IoT users perform twice as well as non-IoT users, in both business operations metrics and in decision-making metrics.

This report looks at the use of IoT-enabled connected operations by top-performing manufacturers, who are driven by their need for asset reliability, availability, serviceability, and real-time visibility, into factors that influence asset performance. An enterprise asset management solution is not just the key software enabler to achieve this goal, it is arguably the best means to utilize IoT technologies to improve operational efficiency.

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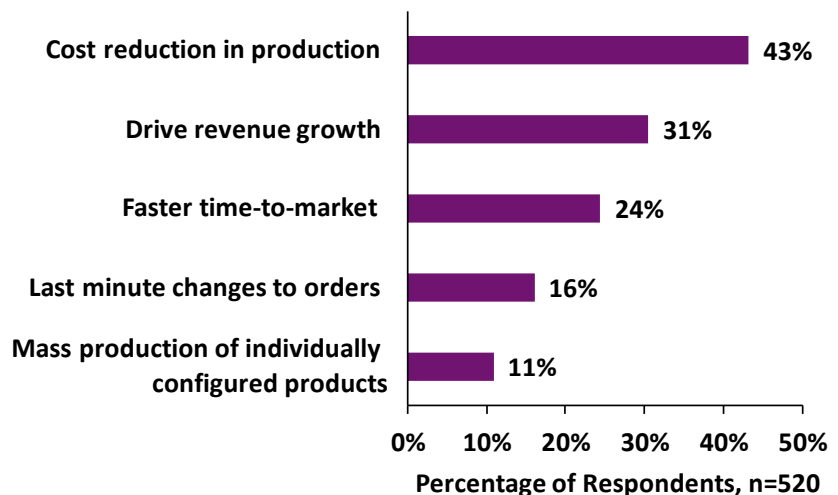
To achieve greater operational efficiency and uptime, the use of the IoT for connected operations is growing. Chief among its benefits is a new level of visibility into assets, and the ability to manage these assets in real-time.

Henry Ford introduced the first assembly line in 1913, and organizations have been looking for ways to improve their operational efficiency ever since. To this end, the use of the [IoT for connected operations](#), is growing. Chief among its benefits is a new level of real-time visibility into physical and technological assets. This visibility enables companies to monitor serviceable assets via the IoT, which is conducted with an eye toward predictive analytics and proactive maintenance. The overarching goal, is **improved uptime** (via asset reliability and availability), and **minimized unplanned downtime** (via servicing or repairing connected devices) before they fail and negatively impact operational efficiency or safety.

Pressures and Challenges for Connected Devices

Despite their aversion to risk, or perhaps *because* of it, manufacturers are driven by market pressures to connect their equipment and assets in pursuit of connected operations and greater operational efficiency (Figure 1).

Figure 1: Market Pressures for Connected Operations in Manufacturing



Source: Aberdeen Group, April 2017

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Definition: Operational Efficiency

Operational efficiency is the ratio between an output gained from the business, and an input to run a business operation. When improving operational efficiency, the output-to-input ratio improves.

Typical inputs are money (cost), people (headcount or the number of full-time equivalents) or time/effort. Typical outputs include money (revenue, margin, cash), operational speed and agility, operational equipment uptime, new customers, customer loyalty, market differentiation, production, innovation, quality, complexity or opportunities.

The most important pressure to connect devices in manufacturing is the need for cost reduction in production. Sensor-equipped machines automatically capture and log data on machine performance and health, which the firm may utilize to develop prognostics for a predictive maintenance system that reduces MRO (maintenance, repair, and operations) costs. Predictive maintenance, unlike time-based maintenance, lowers both operating and capital costs by facilitating proactive servicing and repair of assets, while allowing the more efficient use of repair resources. (This includes both human labor and replacement parts.)

The next most important pressure to connect devices in manufacturing is the need to drive revenue growth. By monitoring and analyzing assets and processes, via IoT-driven connected operations, organizations gain powerful, revenue-generating insights into their business. Business decisions, based on applying these insights, can have a huge effect on operational excellence and hence are a revenue generating event.

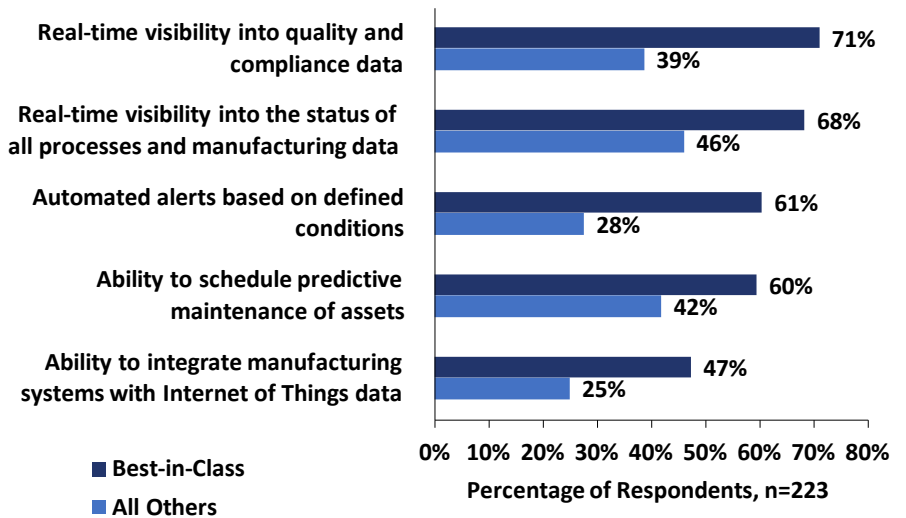
The third biggest pressure to connect devices in manufacturing is faster time to market. Manufacturers are pressured to break down connectivity barriers created by information silos. By opening up information flows between the plant floor and business applications, silos disappear, plant floor/enterprise disconnects diminish, and new product introductions are streamlined.

Capabilities for Connected Operations

Responding to these tremendous manufacturing pressures, Best-in-Class firms are rapidly implementing the process and business management capabilities necessary for connected operations (Figure 2, next page).

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Figure 2: Best-in-Class Capabilities for Connected Operations



Source: Aberdeen Group, April 2017

The overarching foundational capability necessary for connected operations is the ability to integrate manufacturing systems with IoT data. In this regard, Aberdeen’s innovative class of first movers, “Best-in-Class” firms, are twice as likely than All Others to possess this capability today.

First among ranked capabilities for connected operation is real-time visibility into quality data, compliance data, all processes, and all manufacturing data. This capability enables automated data collection, which can now be assimilated in real time and converted into automated insights. Best-in-Class organizations are 1.5 times (or more) likely to possess this capability today than All Others.

Second among ranked capabilities is condition-based monitoring of assets. Best-in-Class organizations are more than twice as likely than All Others to implement automated alerts, based on defined conditions. Online condition monitoring devices offer real-time condition assessment, as well as alert mechanisms for critical

Best-in-Class firms are twice as likely to integrate manufacturing systems with IoT data.

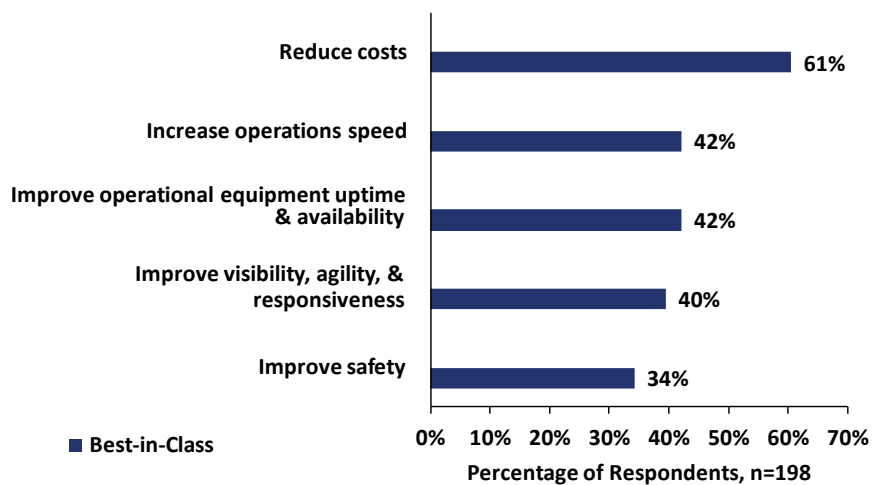
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assets. This is invaluable to minimize unplanned downtime and avoid major repair costs or collateral damages.

The third ranked capability of the Best-in-Class is the ability to schedule predictive maintenance. Again, Best-in-Class firms are ahead of the pack, and almost 1.5 times (or more) likely to possess this capability today, than All Others.

A simple, yet far-reaching asset management example illustrates the power of these of these three ranked capabilities: IoT-enabled motors. In real-time, motors outfitted with smart sensors wirelessly provide a continual stream of operational data to condition-based asset monitoring software, alerting plant operators of the need for maintenance – long before a motor fails. The net result is increased asset performance, measured by enhanced reliability, higher uptime, no unscheduled maintenance, energy savings, and an extremely high return on investment (often less than one year). Implementing these capabilities, via the IoT, yields results, as shown in Figure 3:

Figure 3: IoT-Connected Operations Yields Operational Efficiency



Source: Aberdeen Group, April 2017

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Best-in-Class organizations attest that a primary IoT benefit is **operational efficiency**, as evidenced by reduced costs (61% of respondents), increased operational speed, operational equipment uptime, and asset availability (42% of respondents).

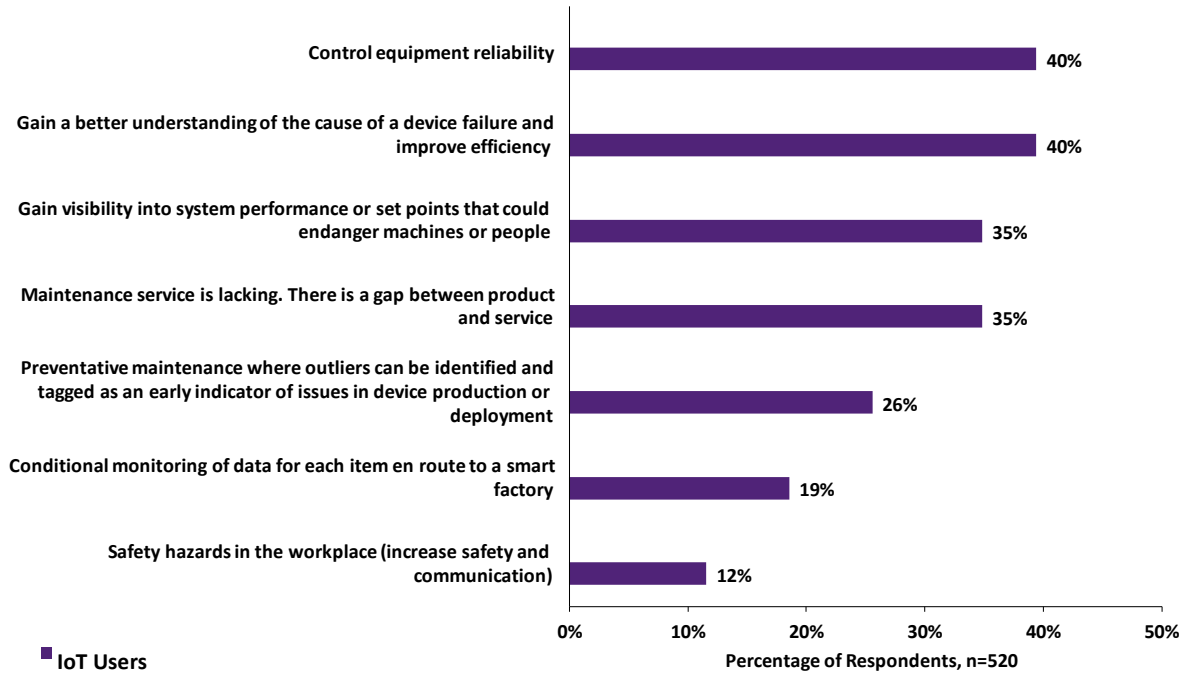
The IoT also improves visibility, agility, and responsiveness. By adopting the IoT, Best-in-Class manufacturers are essentially building agility into their business model. The ability to adapt to change, can mean the difference between thriving, or just surviving.

Finally, the IoT improves safety. Given its prominent role in corporations today, integrating [health, safety, and environment](#) with asset management is a smart strategy, as it creates a safe and efficient workplace.

Asset Management Solutions for Connected Operations

A key enabler of these capabilities (in Figure 2, page 4) is enterprise asset management software. In fact, the reasons IoT users cite for connecting and monitoring manufacturing assets, map directly to features offered in asset management solutions, both on premise solutions and SaaS-based (Figure 4, next page).

Figure 4: What’s Driving IoT Users to Asset Management?



Source: Aberdeen Group, April 2017

Aberdeen Group asked manufacturing users of the IoT what drives their organizations to connect and monitor assets. The first set of drivers cited (by 40% of the respondents), is the need to control equipment reliability and the need to understand device failure.

Improving operations through asset reliability and availability is, of course, a central design goal of asset management software. The “reliability-centered maintenance” journey is all about asset management’s ability to guide you from preventative maintenance, to predictive maintenance. Predictive maintenance is best, because it focuses on monitoring and correcting the causes of failure, long before asset breakdown occurs. It helps reduce asset downtime, by ensuring maintenance is performed exactly (and only) when needed.

Understanding device failure entails analyzing the root cause of device failure to improve efficiency in the future. Automating this

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function is not only ideal, it's well within reach through cognitive computing technologies, such as asset management solutions.

Cognitive computing systems are well-suited to this domain, because they are probabilistic, can make sense of large amounts of IoT information, and can make suggestions on how an asset may fail and the most effective means to remedy the problem. Asset management solutions are just beginning to employ this AI-based technology with the goal of solving asset problems by enhancing human expertise. Aberdeen research has also found one other bonus benefit of using of cognitive technology: its positive effect on customer satisfaction and the [customer experience](#).

Another set of drivers that come into play is the need for safety. General safety hazards in the workplace drive the need to connect devices to gain visibility into system performance, or set points, that could endanger machines or people. Asset management solutions achieve this goal by reducing overall risk to comply with appropriate regulations, and to create a safe and efficient operating environment in which assets are used.

Achieving a smart factory environment, via condition-based monitoring and preventative maintenance, is a third set of drivers. Condition-based monitoring, via asset management, is a great way to achieve preventative asset maintenance, where outliers are tagged and identified as an early indicator of possible issues. This makes asset management solutions a very good investment. Since most assets fail randomly, tagging outliers earlier allows a preventative replacement without any negative effect on asset uptime.

A Note on the Cloud

In addition to enabling connected operations via the IoT, organizations should also consider a cloud-based platform for additional benefits. Respondents identified lower cost, faster

Definition: Cognitive Computing

Cognitive computing, broadly speaking, describes technology platforms that are based on the scientific disciplines of artificial intelligence and signal processing. These platforms encompass machine learning, reasoning, natural language processing, speech and vision, human-computer interaction, dialog and narrative generation, among other technologies.

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Connected Operations Yield Better Decisions

Performance metrics that separate IoT Users from Non-IoT Users:

Speed of decision making has substantially improved:

IoT Users: 22%
Non- IoT Users: 6%

Cycle time of critical business processes has substantially improved:

IoT Users: 14%
Non- IoT Users: 6%

Trust/confidence in the available data has substantially improved:

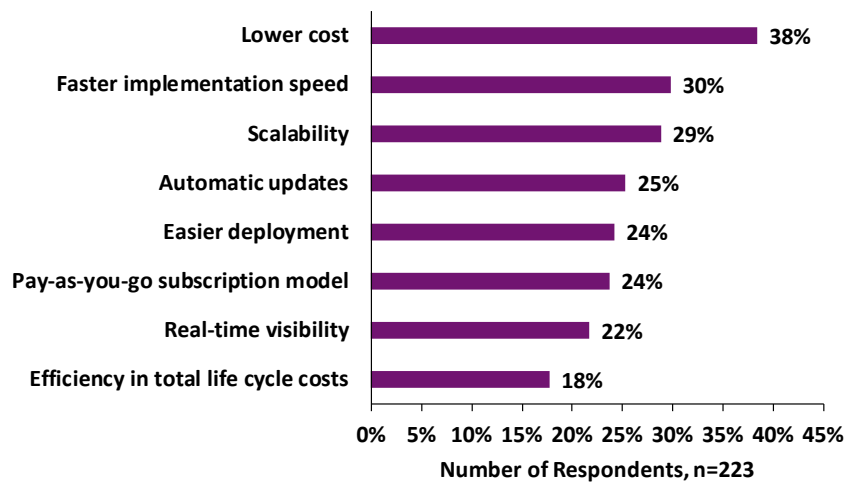
IoT Users: 25%
Non- IoT Users: 13%

Breadth/volume of information available has substantially improved:

IoT Users: 25%
Non- IoT Users: 11%

implementation speed, and scalability, as top benefits of cloud-based solutions shown here:

Figure 5: Why the Cloud? Cost, Speed, Scalability!



Source: Aberdeen Group, April 2017

Choosing an asset management solution provider – offering both premises-based and software-as-a-service (SaaS) solutions – provides additional flexibility, as business needs and preferred software delivery models change.

Connected Operations: IoT Users Achieve Results

Is the move to IoT-based connected operations in manufacturing paying off? To find out, Aberdeen Group identified and evaluated results for two maturity classes: IoT Users and Non-IoT Users. (See Table 1, next page).

Table 1: IoT Success Metrics for Connected Operations

n = 472 Source: Aberdeen Group, December 2016	Uses IoT	Does Not Use IoT
Average Revenue Growth Percentage	18%	8%
Average % Increase in Operating Profit	14%	7%
Average % Increase in Operating Cash Flow	13%	6%
Average % Improvement in Operating Costs	7%	4%

Source: Aberdeen Group, April 2017

IoT users achieve outstanding results, performing twice as well as non-IoT users, in four key operational business metrics:

- YoY Revenue Growth;
- Change in Operating Profit;
- Change in Operating Cash Flow; and
- Change in Operating Cost.

Organizations implementing connected operations also make better decisions (see sidebar on page 9). IoT users' speed of decision-making is twice that of non-IoT users. IoT users also enjoy improved cycle time, greater trust/confidence in available data, and an improved breadth/volume of available information.

Summary: Connected Operations and the Asset Management Edge

The Internet of Things is not just the latest buzzword in manufacturing. The IoT is a proven strategy, a developing trend, and an innovative technology.

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The market pressures for connecting devices in manufacturing are great, driven by the need for increased operational efficiency. Best-in-Class organizations are responding to these pressures by integrating manufacturing systems with IoT data. In doing so, they are creating agile excellence, through capabilities for real-time visibility into operations, condition-based monitoring with automated alerts, and the ability to schedule predictive and proactive maintenance of assets.

The key solution that enables Best-in-Class capabilities, for connected operations, is enterprise asset management. This technology's foundational capabilities include tracking, monitoring, and managing information around asset reliability, availability, usage, and performance. Forty percent of respondents call out the need for equipment reliability and the need to understand device failure, which is exactly what asset management solutions do.

Considering the analytical capabilities of an asset management solution is also essential. Condition-based asset monitoring brings real-time condition assessment, as well as predictive and alert mechanisms. Looking ahead, AI-based cognitive computing even offers the very real promise of solving asset problems, by enhancing human expertise.

Where the IoT offers connectivity, the Cloud offers lower cost, faster implementation speed, and scalability. Thus, a prime consideration, in selecting an asset management solution, is whether the solution provider offers both premises-based, and SaaS-based options.

Aberdeen Group research finds that a connected operations strategy pays off in manufacturing. IoT users perform twice as well as non-IoT users, in operations business metrics and in decision-making metrics. Especially relevant to the goal of operational excellence, is the fact that speed of decision-making is substantially improved for IoT users. Cycle time of critical business processes is also substantially improved.

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The Internet of Things is fundamentally changing the way that manufacturing organizations create value. The IoT is all about asset visibility, and asset management is the single, biggest controllable expenditure in a plant. Given this reality, an asset management solution is not just a good idea, it is arguably the best means to utilize IoT technologies to improve operational efficiency.

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

Related Research

[*What Does the Digitalization in Manufacturing Mean Now?*](#); January 2017

[*Product Development in the Era of IoT: Tying the Digital Thread*](#); April 2017

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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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