

ACCELERATING OPERATIONAL EXCELLENCE

FOR GLOBAL AND REGIONAL MANUFACTURERS



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SECTION 1

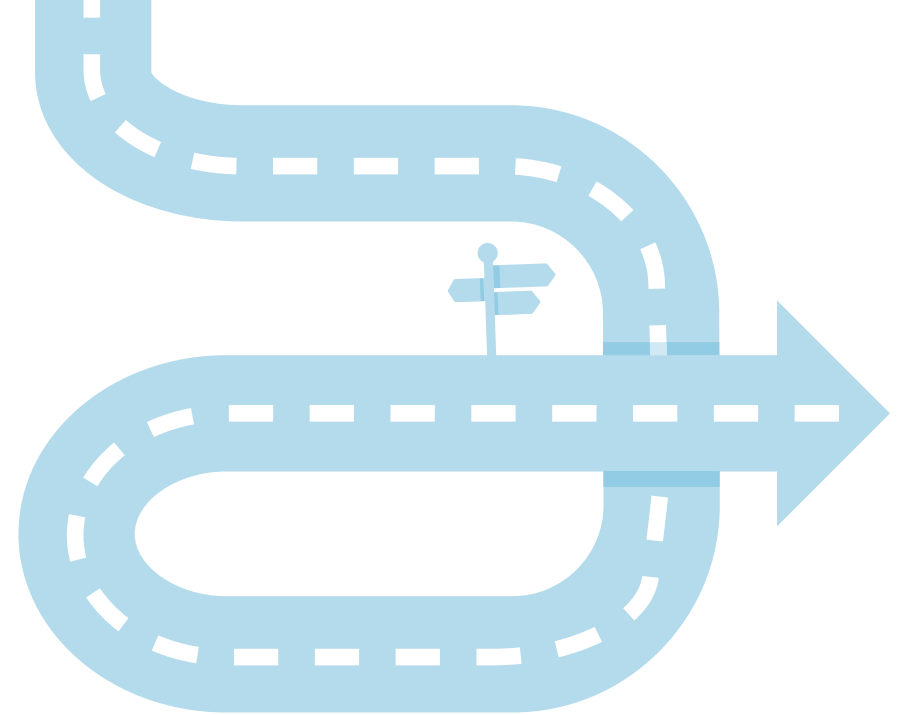
Introduction, Industry Drivers, and Challenges

Introduction, Industry Drivers, and Challenges




Business and manufacturing professionals are looking for new ways for operations to support improvements to their company's products, services, and bottom line. At the same time, it's important to optimize the leverage of their limited human resources and capital to ensure that their operations can consistently perform with good results.

Whether coming from a large, global manufacturer or from a smaller, more regional organization, readers of this eBook will be able to quickly relate to manufacturing operational challenges that they see in their own businesses, and understand how to get on the fast track with an Operational Excellence journey that includes programs, processes, and technologies that truly help them address these challenges.

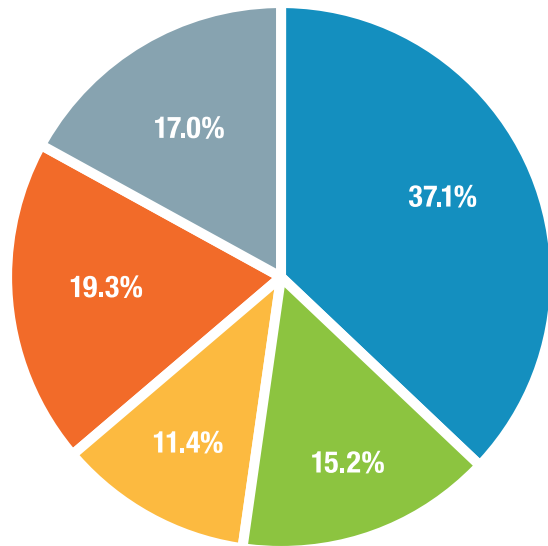
Driving Operational Excellence across industrial/manufacturing enterprises for global and regional competitiveness requires bold thinking, rapid reactions, decisions, and actions, along with fully informed and engaged teams. New software technologies and service providers are maturing and are ready to support end-to-end improvements across the Enterprise / Business Operations, Manufacturing Operations Management (MOM), and Industrial Automation levels of manufacturing businesses. The 2013-2014 LNS Research MOM Survey examines how innovative new approaches to this complex landscape of Operational Excellence challenges are being addressed in order to provide unprecedented new gains in productivity, quality, responsiveness, risk mitigation, and economic value generation.



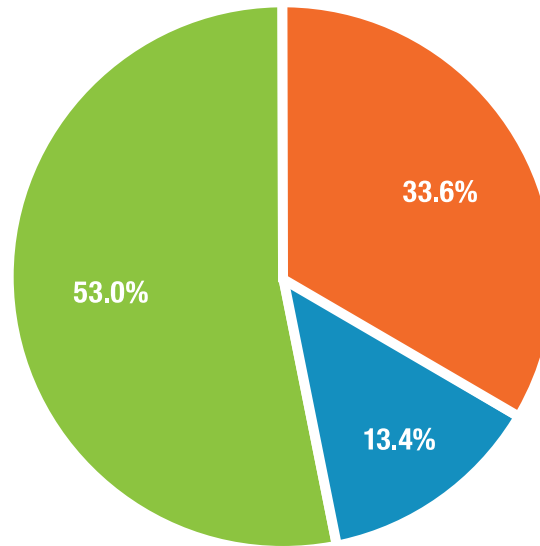
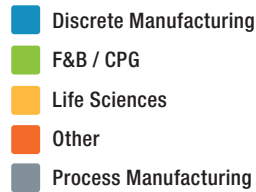
TRADITIONAL MANUFACTURING INFORMATION LEVELS

	LEVEL 4 Enterprise / Business Operations
	LEVEL 3 Manufacturing Operations Management
	LEVELS 2,1,0 Industrial Automation

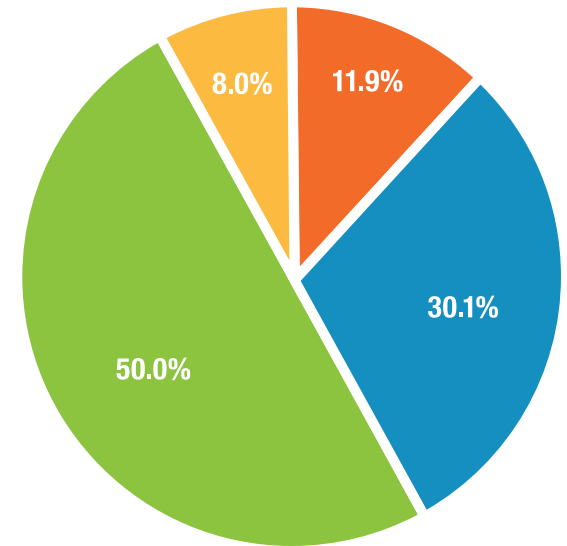
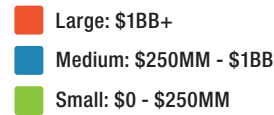
Research Demographics for 2013-2014 Manufacturing Operations Management Survey



COLOR BY INDUSTRY



COLOR BY COMPANY REVENUE



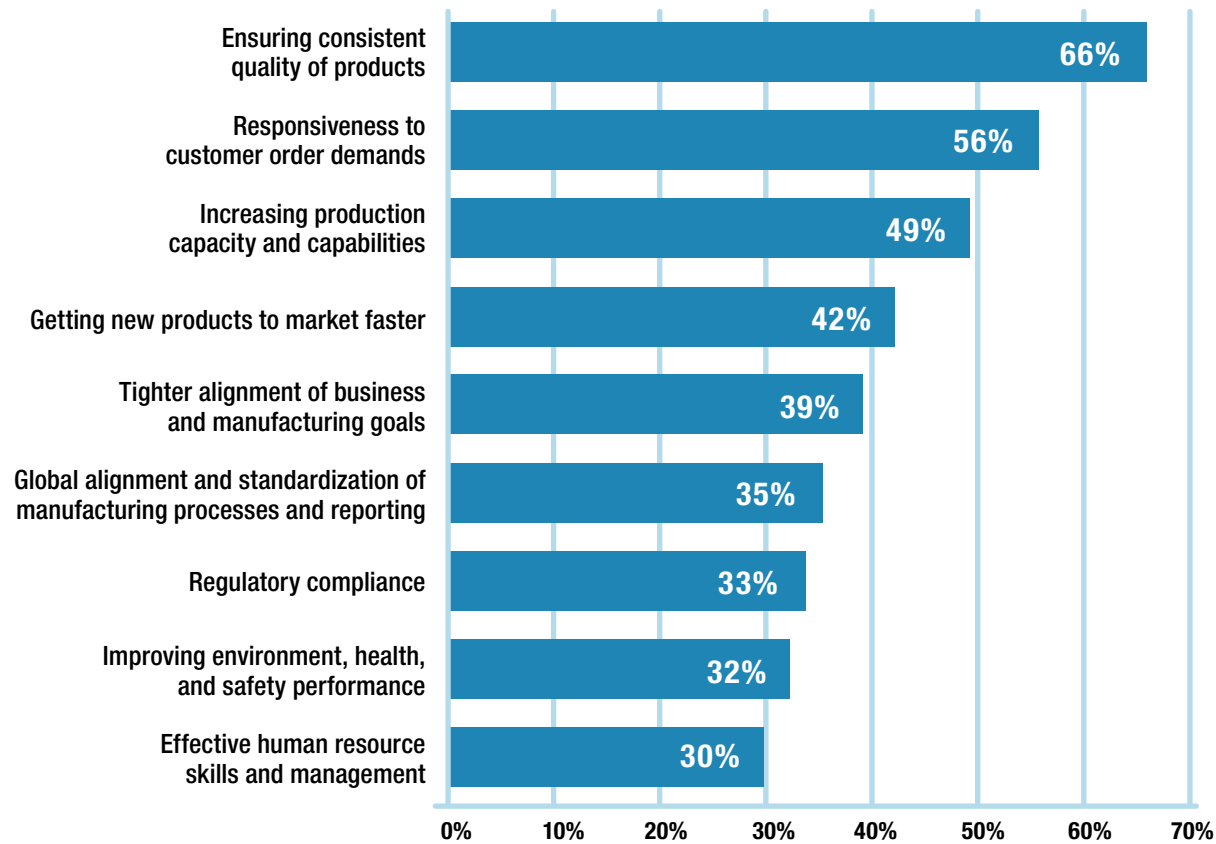
COLOR BY HQ LOCATION



The pie charts above provide background demographic information on the LNS Research MOM survey participants. As shown, the results depict a diverse set of respondents. There were 37.1% from the discrete manufacturing industries, 17.0% from process manufacturing, 15.2% from food & beverage/consumer packaged goods, 11.4% from life sciences and 19.3% for all other industries. Nearly

67% of the executives surveyed were from Small to Medium businesses, with 33.6% from companies with revenue greater than \$1 billion. Geographically, North American companies comprised half of respondents, 30.1% were from Europe, 11.9% from the Asia/Pacific region, and 8.0% were from the rest of world.

Top Strategic Objectives

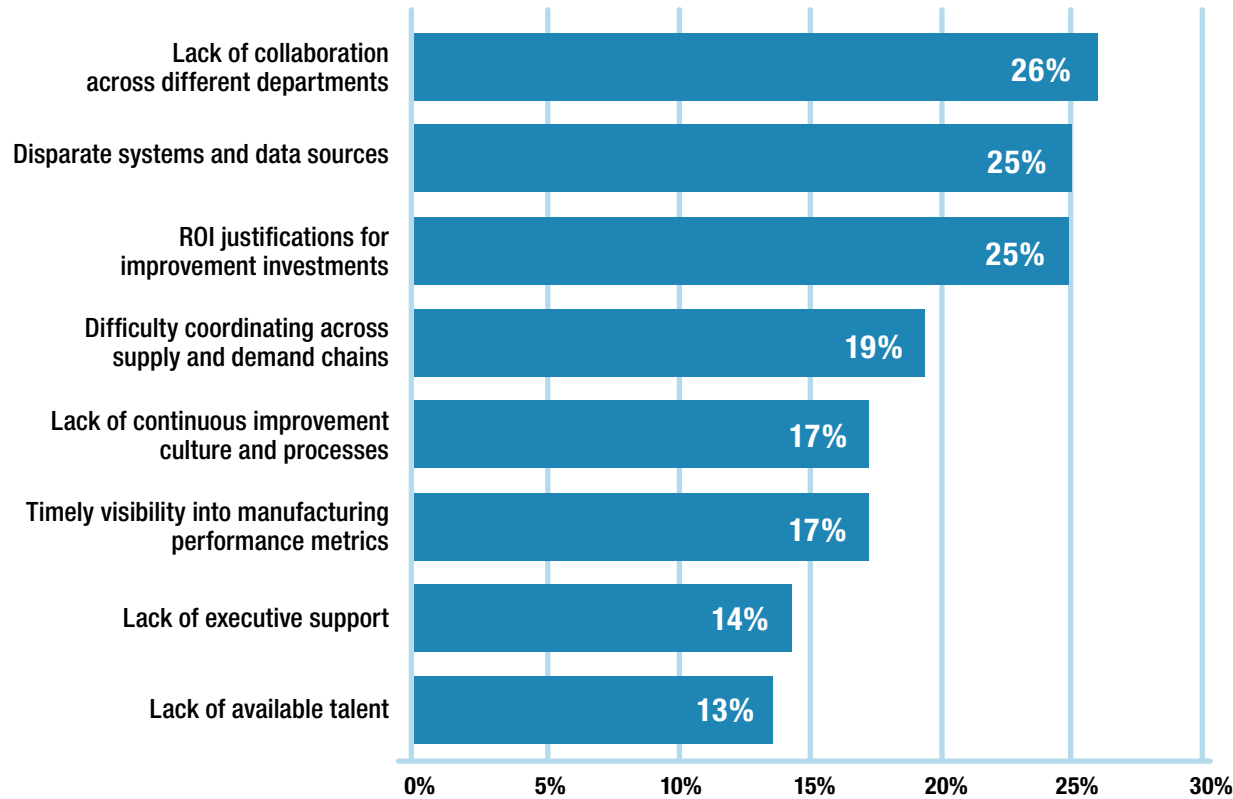


“These areas of customer focus bode well for the industry”

The MOM survey data clearly shows that top strategic objectives for manufacturing industries are all related to serving customers. First and foremost is ensuring consistency of quality for products produced at 66%, followed by timely order fulfillment at 56%, and then 49% focused on increasing production capacity and capabilities. These areas of customer focus bode well for the industry, given that if customers are not being properly served and satisfied, then nothing else will matter for a manufacturing business in a rapid fashion.

The survey also indicated that there are many other strategic objectives that need to be simultaneously managed in order to have a successful business. These included the alignment of goals, getting new products to market more quickly, and meeting regulatory compliance. The research data show that there are multiple strategic objectives that are of some significant importance – all of which need to be simultaneously improved upon in order to come up with the optimal Operational Excellence approach for an organization.

Top Challenges



“Having multiple departments sharing some of the same goals and objectives is a best practice”

When we look at the top associated operational challenges that manufacturing businesses are facing in meeting top strategic objectives, there are multiple simultaneous challenges that are all of significance and need to be addressed.

At 26% of respondents, the top operational challenge is how to break down silos of organizations and departments and foster greater collaboration. Companies that effectively address this challenge are in a much better position to deliver superior

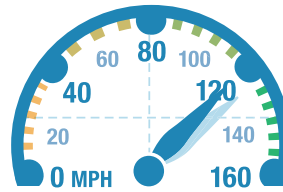
products and services, be responsive to customers, and be more efficient in doing so. Having multiple departments sharing some of the same team goals and objectives and being on the same page with the same data, information, and Key Performance Indicators (KPIs) is a best practice that LNS Research has observed to address this challenge.

At 25%, the next highest operational challenge is getting the required data and information out of the many disparate systems

and databases that exist across plants and the enterprise. The ability to connect, federate, aggregate, and contextualize data from multiple sources into useful and timely information is a key capability of today's MOM software solutions, which goes right to the heart of this significant operational challenge.

Also at 25%, the next challenge is one that we have a lot of discussion with manufacturers and software vendors alike. Creating a return on investment (ROI) business case to make operational improvements, and justifying capital project expenditures or expense budget expenditures can be a tedious and lengthy process. Good data and information can go a long way towards simplifying and improving this process. Oftentimes, it is a challenge to get good baseline performance information; therefore, it's important to start any Operational Excellence journey by first putting in the "as is" performance metrics.

“It’s important to start any Operational Excellence journey by first putting in the ‘as is’ performance metrics”





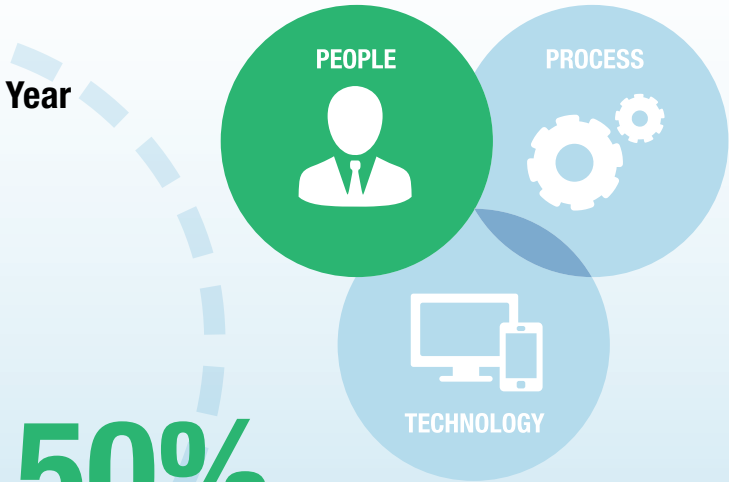
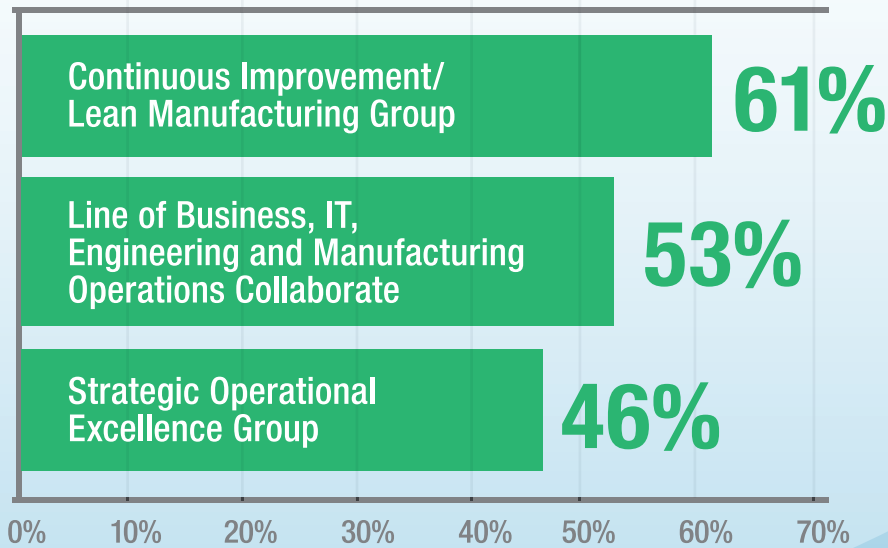
SECTION 2

Accelerating Success – People

Accelerating Success PEOPLE

Leading companies are putting organizational strength behind their Operational Excellence Initiatives

Organizational Capabilities Established or Planned Within a Year



50% have implemented or are implementing cross-functional groups to support their Operational Excellence journeys within a year

When we reflect on the top operational challenges from our survey, the top and most difficult example involves people, and how to break down silos of organizations and departments and foster greater collaboration. It stands to reason that companies that create an environment and culture of shared vision and collaboration can more easily excel in their performance. Company culture comes out of the examples set by management and the actions of ALL employees. Problems and issues always arise, but are always best resolved with a team effort, with all relevant stakeholders educated on the facts at hand.

Leading companies are also building organizational capabilities

that support Operational Excellence aspirations. Sixty-one percent of companies have in place or have planned within the next year to add a formal Continuous Improvement group with a dedicated executive leader and reporting structure. Fifty-three percent are breaking down organizational silos by having cross-functional teams work together that include Line of Business Managers, IT, Engineering, and Manufacturing. Forty-six percent have formal Operational Excellence groups in place. When we look across all companies, half have already implemented or are in process to implement some type of cross-functional group in support of their pursuit of Operational Excellence.



Knowledge Management Issues & Opportunities

Another key people-related issue and associated set of challenges is around talent and knowledge management. As manufacturing industries are becoming more sophisticated, the availability of qualified talent and the ability to effectively capture and share knowledge become critical success factors. In the U.S., Baby Boomers and their associated experience and knowledge

are retiring at rapid rates – with 10,000 workers exiting the workforce per day through the year 2020, according to the Pew Research Center. Not all of these workers are in manufacturing, but this exodus reflects a clear trend and concern that we hear from manufacturing companies all the time.

Accelerating Success PEOPLE

So what are some of the strategies and actions that can be taken to help address these people-related challenges?

- **Capture Knowledge** – From experienced workers and share their expertise through knowledge sharing applications like Document Management systems, and “institutionalize” the knowledge by making process improvements and enforcing these processes and procedures with Manufacturing Execution and Workflow systems.
- **Transfer Knowledge** – To others with formalized training and job certification programs, along with providing “just-in-time” information systems that provide procedural instructions, guidance and reference materials in-context as the activities are being performed.
- **Leverage Subject Matter Experts** – Using social, video, mobile, and workflow technologies to bring limited resources that have specialized expertise to the most critical situations – without the need for travel.
- **Support Team, Partner, and Customer Collaboration** – Using these same social, video, mobile and workflow technologies to foster rapid and efficient, virtual teamwork.

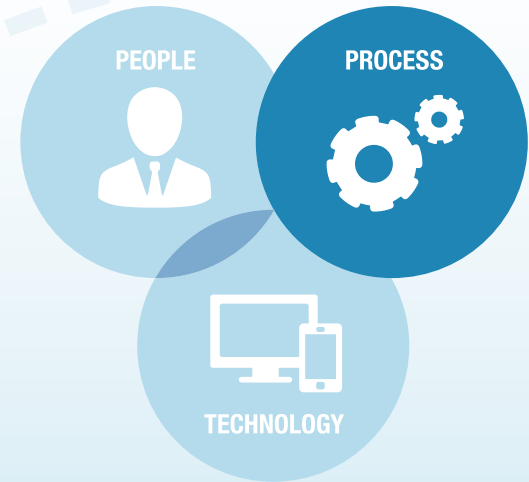
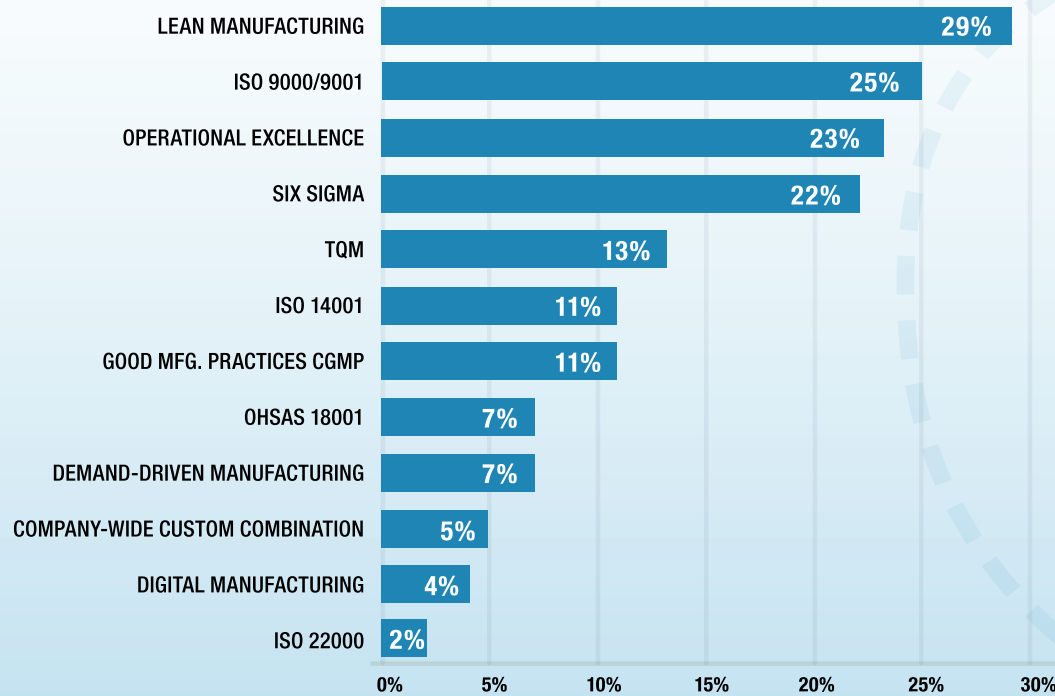




SECTION 3

Accelerating Success – Process

Manufacturing Programs Implemented or Planned



73% have formal programs in place or planned for next year

As continuous improvements are made along the road of your journey, it's important that these incremental improvements are sustainable by making them part of future processes and procedures. In order to accomplish this on a systematic basis, market leaders are accelerating their pace toward Operational Excellence through formal manufacturing programs and training.

The LNS Research MOM Survey shows that 73% of companies

have some type of formal manufacturing improvement program already in place.

The top programs planned or in place are Lean Manufacturing at 29%, ISO 9000/9001 at 25%, holistic Operational Excellence at 23%, and Six Sigma at 22%. All of these programs offer structured methodologies, training, certification, and they support company-wide engagement and collaboration.

Accelerating Success PROCESS

Most Continuous Improvement program activities start with better understanding and mapping existing processes and results and then looking for ways to make impactful, incremental improvements. We found that the majority of companies are using combinations of two to four different programs to achieve overall Operational Excellence objectives, and are choosing elements from the different programs based on industry and specific business challenges.

We strongly suggest that you take a similar approach of utilizing the right set of proven program methodologies to accelerate your journey. A great place to start in an Operational Excellence journey is to begin using these methodologies in conjunction with a small subset of processes that are most in need of improvement. It is impossible to tackle every major process improvement area simultaneously.



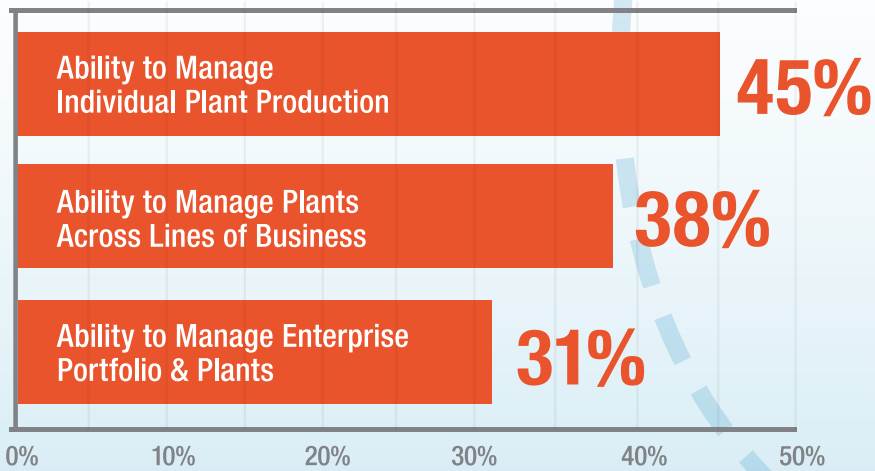
“A great place to start in an Operational Excellence journey is to begin using these methodologies in conjunction with a small subset of processes that are most in need of improvement.”



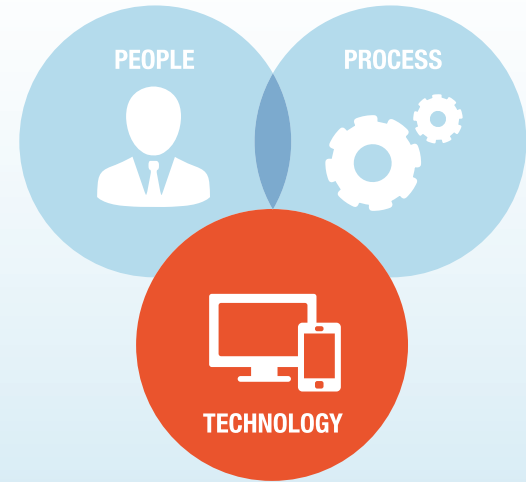
SECTION 4

Accelerating Success – Technology

Accelerating Success TECHNOLOGY



Over **60%** have implemented or are implementing software in combination with processes over the next year. If your company is not yet on this road, you need to be in order to compete.



Companies have more process and software capabilities to manage operations at the Plant level versus the Business Unit or Enterprise level

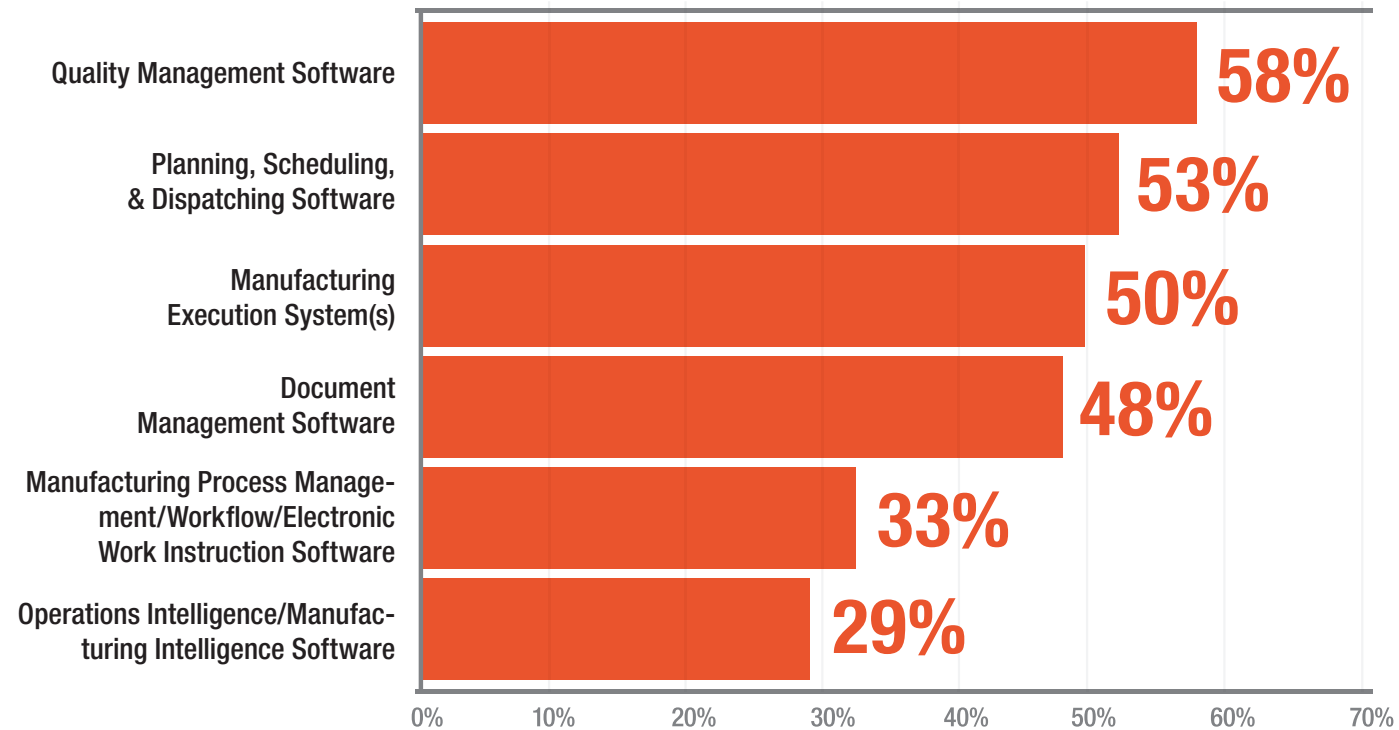
Most companies are accelerating their Operational Excellence initiatives by institutionalizing best practice processes into software. Over 60% have already implemented or are planning to implement processes supported by a combination of Enterprise, MOM, and Automation software.

When we look at the process and software capabilities that are either in place or planned across a broad set of industries, we can see a clear journey that companies are on. However, we can also see that there are more companies that have the ability to manage single plants with both processes and software (45%) than at the line of business (38%) or enterprise level (31%).

At the enterprise level, existing process capabilities appear to make up for the lack of having more comprehensive software in place. It is also much more challenging to automate processes using software across an entire enterprise than it is within a single production plant; however, LNS Research believes that this represents a real opportunity for businesses.

We continue to see that leading companies are harmonizing business and manufacturing processes to ensure consistency and efficiency, while also ensuring that every plant can be agile and responsive to customer demands.

Top MOM Applications Used by Companies That Effectively Manage their Manufacturing Operations



So what are the most popular MOM software applications that companies are using today to be most effective with operations? In our survey, we looked at companies that stated that they had the capabilities to effectively manage their manufacturing operations at either the plant, line of business, or enterprise levels. Next, we explored which MOM software applications those companies had deployed.

The results line up well to other data we saw earlier on top strategic objectives and challenges. We can see that Quality Management applications (58%) are most deployed in support of the top strategic

objective of ensuring consistent quality. Planning, Scheduling & Dispatching (53%) and MES (50%) software were the next most popular, and these have been proven to assist companies with being more responsive to customer demands and helping companies increase production capacity and capabilities – which are the next highest top strategic objectives in our survey.

The next highest software applications, Document Management (48%), Workflow (33%), and OI/EMI (29%) align well towards supporting the top two challenges in the survey – lack of collaboration across

Accelerating Success **TECHNOLOGY**

different departments, and disparate systems and data sources.

Workflow software assists companies in ensuring that teams of people are following proper procedures and are collaborating properly within their delegated authorities. Document Management software ensures that everyone is operating from the most up to date documentation and that people are collaborating properly on documentation updates. Operational Intelligence/Enterprise Manufacturing Intelligence (OI/EMI) software reaches across disparate shop floor and enterprise systems and data sources, and puts this information into context—providing timely decision support and actionable intelligence.

“Companies are supporting people and processes with integrated systems and real-time information visibility”

Delivering KPIs to All Personnel in Real-Time

0018%

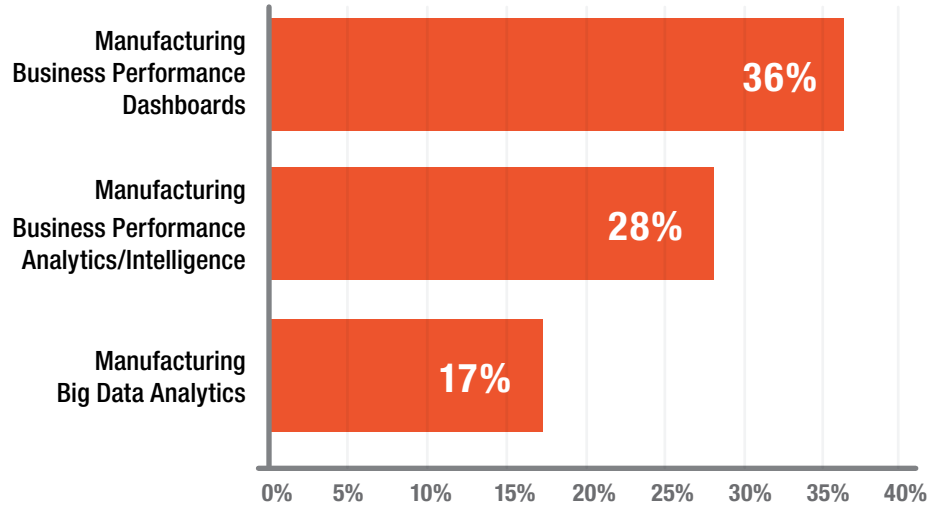
of companies currently have both processes and software to achieve this goal

0015%

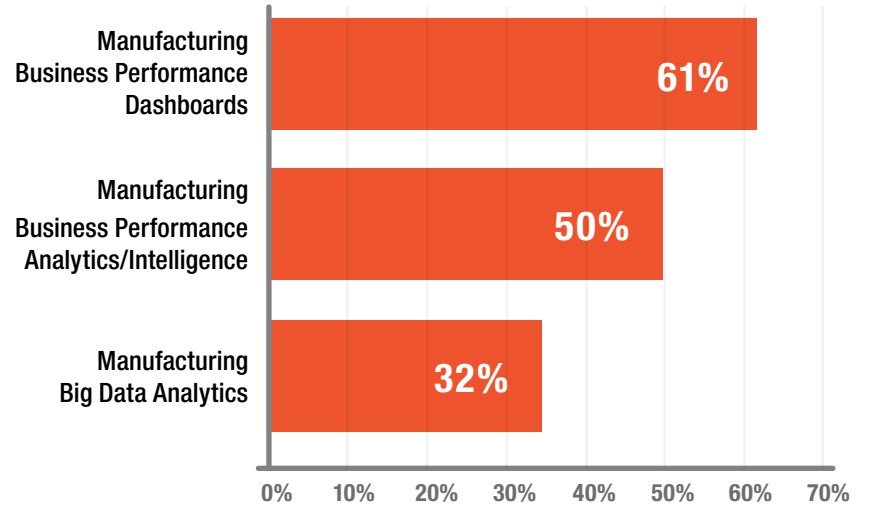
have software and processes planned within the next year

We can see that 18% of companies are already integrating metrics processes and software (typically OI/EMI software) to deliver KPIs to all of team members in real-time. Another 15% of companies are looking to add this capability within a year in support of Operational Excellence journeys. LNS Research sees this as a best practice.

Currently Implemented Functionality



Currently Implemented Functionality or Planned for Next Year



When we look at the currently implemented functionality of software to provide real-time performance information, 36% of companies currently have manufacturing dashboards in place, and 61% have them or are planning on having them within the next year. From these same charts, you can also see that companies will be deploying more capable analytics to mine their data to uncover new insights as they move forward. In order to accomplish this, some companies are also looking at using Business Intelligence (BI) software in conjunction

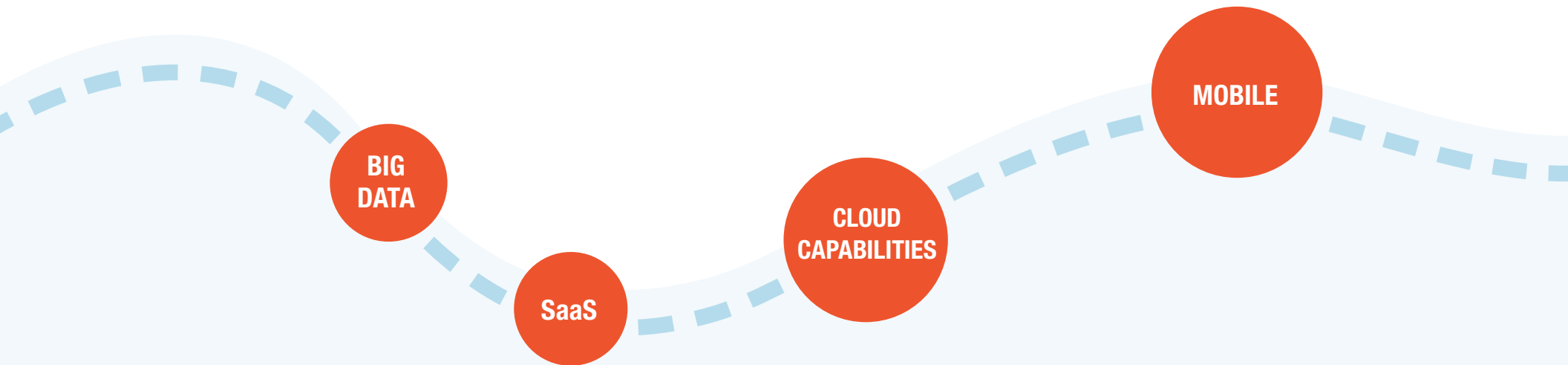
with OI/EMI software. BI software typically looks at transactional business data to generate new business insights, and BI software can be a good companion to the detailed real-time information that is generated with OI/EMI software.

These are clearly trends worth noticing. If your company isn't on the path towards using manufacturing performance dashboards, 61% of your competitors will be using them to drive continuous improvements in performance more accurately and rapidly.

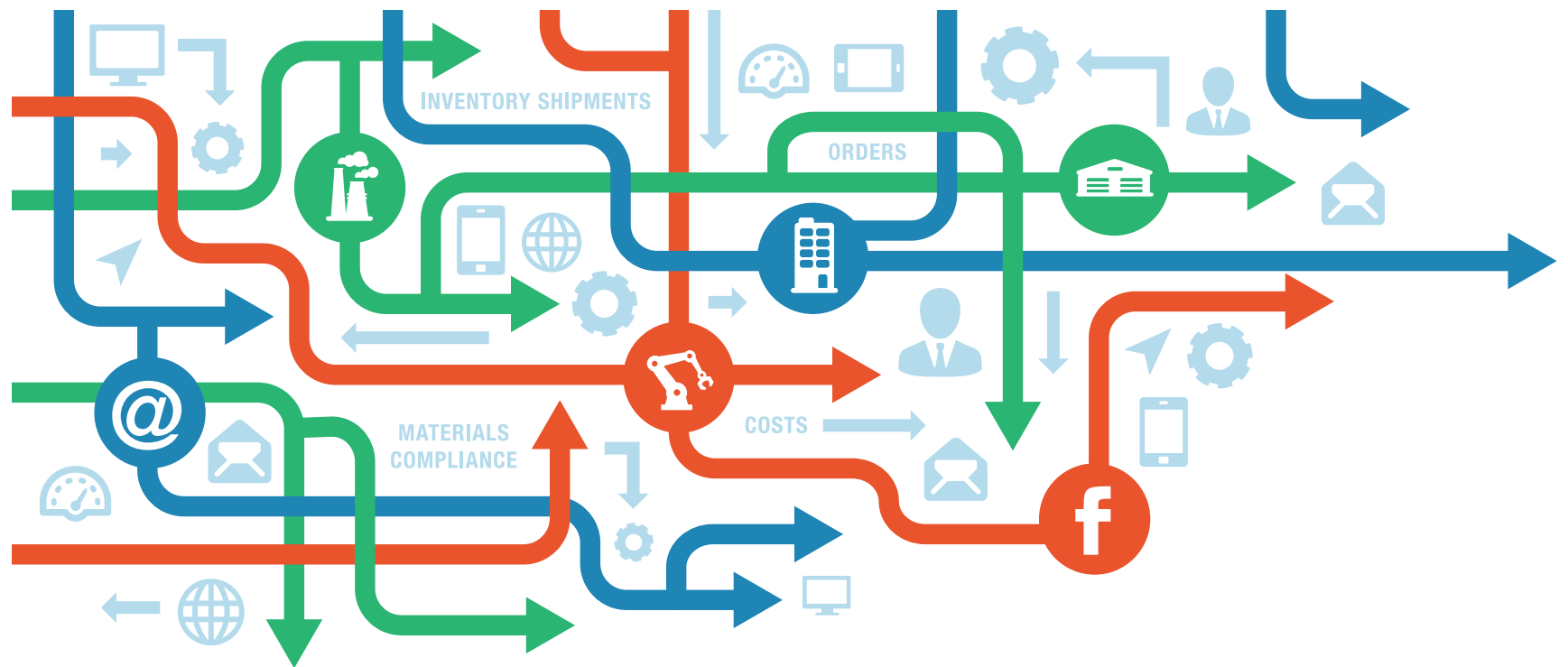
Accelerating Success **TECHNOLOGY**

As the MOM space evolves, there a number of technological macro-trends already present in other enterprise software categories like BI and ERP that LNS Research sees as integral to the next generation of MOM solution offerings. Big Data, Software as a Service (SaaS)/Cloud, and Mobile are three rapidly advancing capabilities that are poised to advance the MOM market by allowing greater operational agility, universal data access, and previously unknown data correlations and

actionable information to drive business value. MOM applications leveraging these trends are already present in the marketplace to some degree, but are poised to become a standard in vendor offerings in the future. Below, we'll explore each technology in further detail and how they are positioned to further companies' Operational Excellence journeys.



Big Data Analytics



Big Data Analytics software tools provide the ability to examine large amounts of data of a variety of types and structures (Big Data), to uncover hidden patterns, unknown correlations, and other useful information. There is an exponential explosion of manufacturing data coming from connected devices. This is being referred to as the Internet of Things (IoT), and Cisco has estimated that 13.5 Billion manufacturing devices will be connected using Internet networking technology by the year 2022.

Big Data Analytics techniques require specialized expertise in predictive analytics and data mining; however, manufacturers are

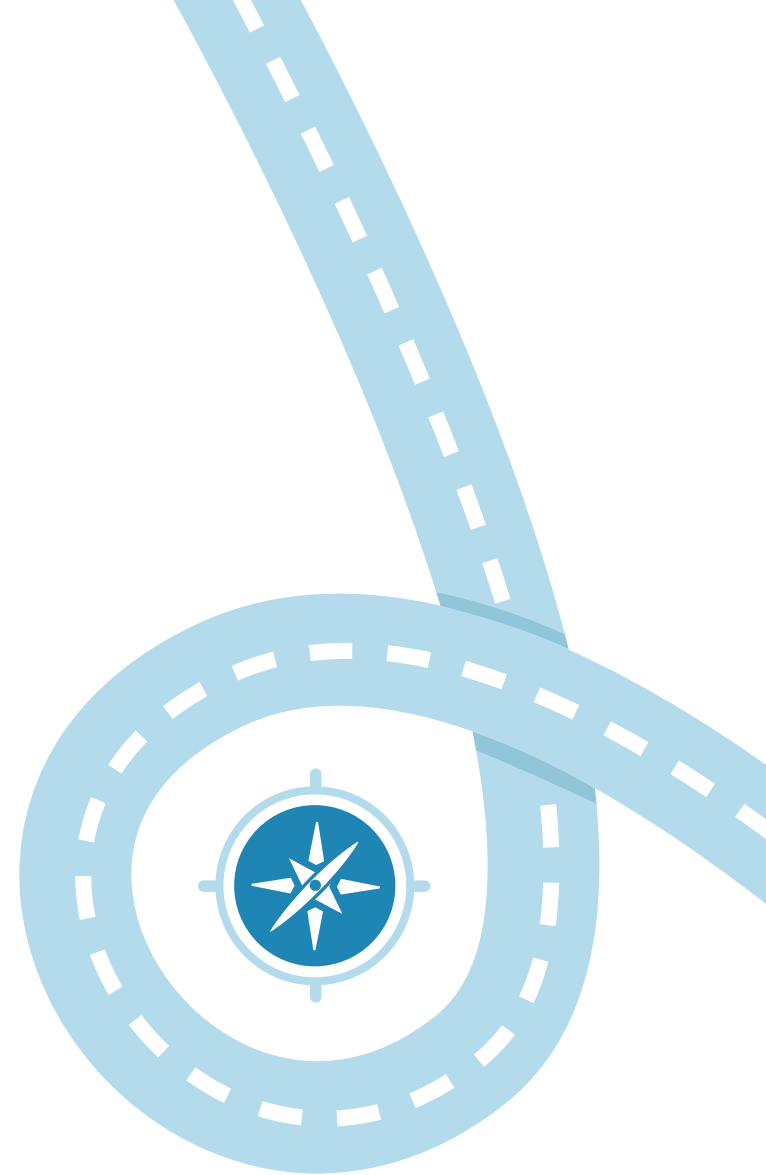
starting to deploy these types of solutions to predict consumer demand patterns. LNS Research sees these same techniques and tools being used to uncover previously undiscovered correlations of plant operating conditions and events, in order to drive new performance improvement opportunities.

Seventeen percent of companies surveyed are already using some forms of Manufacturing Big Data Analytics in their businesses, and 32% intend to do so in the next year. We also see many MOM software vendors who are currently developing Big Data Analytics tools as part of their future offerings.

Big Data - Manufacturing Application Examples

Here are some current and future applications that we see for Big Data in Manufacturing:

- 1** Enabling better product/production forecasts that tie to consumer trends
- 2** Improving interactions with suppliers based on dynamic sourcing needs
- 3** Providing faster customer service and support—harnessing knowledge
- 4** Better understanding customer requirements for new products
- 5** Better correlations of performance across multiple plants
- 6** Better understanding plant performance across multiple metrics
- 7** Performing predictive modeling of manufacturing data
- 8** Enabling real-time alerts based on analyzing manufacturing data
- 9** Correlating manufacturing and business performance information together
- 10** Mining combinations of manufacturing and other enterprise data to uncover new improvement and business opportunities



Mobile Technologies

Mobile devices and applications are being rapidly adopted across manufacturing enterprises in support of increased worker productivity and collaboration. This technology is now proven to securely eliminate the need for on-site access in order to perform designated operations, and it is enabling workers to access the performance and decision support information applicable to their respective roles, including:



Executives



Plant Managers/Supervisors



Plant Operators



Technical/Quality Personnel



Maintenance Personnel

Some companies have achieved or are well on the way towards creating an entirely paperless manufacturing environment, whereby all operations are supported by a combination of smart procedural software, scanners, RFID tags, and wireless mobile devices.

Larger manufacturing enterprises are also using mobile technologies to allow information to be shared with suppliers, or separately with customers.

The use of mobile devices is pervasive for day-to-day communications and some companies have gone beyond this type of application to enable a completely mobile workforce in production operations. In fact, 18% of companies surveyed currently have Mobile Operations Visualization & Management capabilities already in place, and 14% are planning for these capabilities within one year.

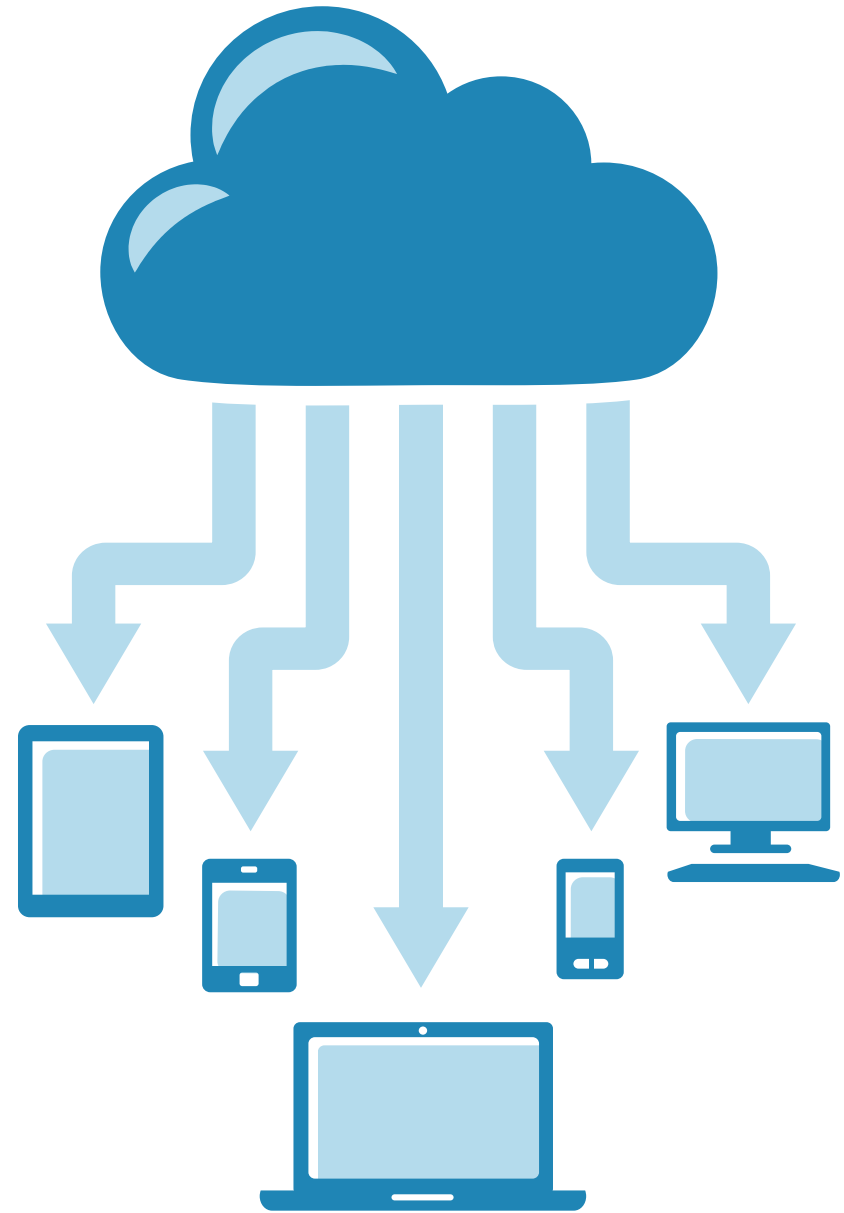
Cloud Adoption for MOM Applications

Cloud-based and Software as a Service (SaaS) software offerings for Manufacturing Operations Management applications are rapidly emerging, with the promise of automatic updates, unlimited capacity upgrades, built-in disaster recovery, and universal remote access capabilities. Cloud platforms are bringing this level of functionality to manufacturing businesses, and without the capital expenditures and lifecycle maintenance costs that come with implementing on-premise solutions.

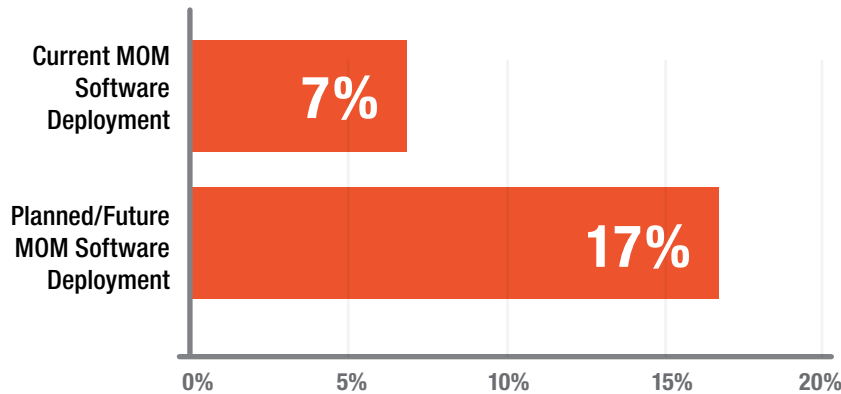
However, there are several concerns with cloud deployments, including:

- With full cloud capabilities dependent on Internet connectivity and cloud service providers, continuity of service has been a legitimate concern
- Decision makers are also still highly concerned about the safety of their intellectual property on a public cloud which, given the stakes of a security breach, is understandable

Both of these concerns are being addressed as cloud technology and combinations of private and public clouds are being made available.



LNS Research MOM Survey - Cloud/SaaS Adoption



We find that just 7% of companies surveyed currently leverage vendor hosted and cloud in manufacturing operations. However, 17% of respondents replied that they are planning to use cloud and vendor hosted solutions for manufacturing operations applications in their future plans. This shows that manufacturing executives are beginning to overcome some of their bigger confidence hurdles and see the significant benefits that come with cloud technology adoptions.

“As the industry gains more experience, we expect that cloud manufacturing software deployments will accelerate in the future”

Additionally, our vendor research indicates that 90% of manufacturing operations software vendors either have cloud offerings or are turning their attention to the cloud in their future developments. As the industry gains more experience, we expect that cloud manufacturing software deployments will accelerate in the future.



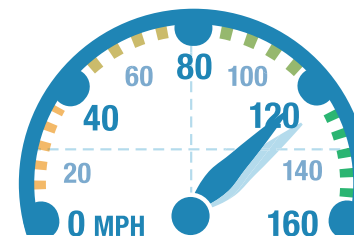
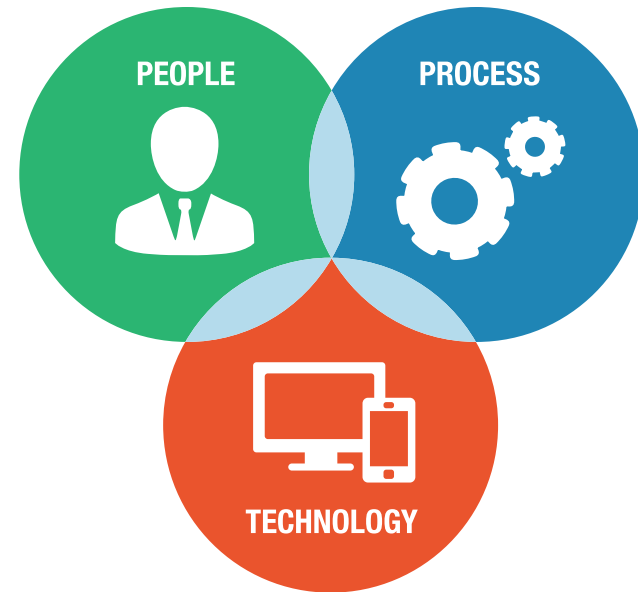
SECTION 5

Summary/Recommendations

Summary/Recommendations

The following is a summary of LNS Research’s recommendations and steps for accelerating your Operational Excellence journey:

- 1** Start or refine your Operational Excellence journey as you learn
- 2** Ensure alignment with strategy, goals, actions, and metrics
- 3** Empower people with both team-based and role-based real-time performance information
- 4** Build organizational capabilities for sustainable success
- 5** Implement the most important processes/programs to accelerate progress
- 6** Over time, build a Continuous Improvement culture
- 7** Support process improvements and knowledge management with technology – in particular, MOM software integrated with critical business and operating information coming from your Enterprise and Automation Systems
- 8** Investigate and experiment with new technologies – Big Data Analytics, Cloud, Mobile
- 9** The appropriate scope of your journey may be at the plant, line of business, or enterprise level; however, it’s most important that you get on with your journey in order to sustain your competitiveness



Leading companies are aligning people, optimizing processes, and supporting both with MOM software applications in order to accelerate their Operational Excellence journeys

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