

# GETTING STARTED WITH ENTERPRISE MANUFACTURING INTELLIGENCE (EMI)

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# GETTING STARTED WITH ENTERPRISE MANUFACTURING INTELLIGENCE (EMI)

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## SECTION 1

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# Introduction

# Introduction

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GETTING STARTED  
WITH EMI

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Manufacturing and IT professionals are looking for faster and easier ways to support challenging business initiatives to improve products, services, processes, and the company bottom line. At the same time, it is important that their people be empowered with the best possible information and tools that enable them to consistently perform their jobs and achieve results. Through the use of this interactive eBook, readers will be able to quickly relate to manufacturing operational challenges seen in their own businesses and

understand how to get on the fast track with programs, processes, and technologies that truly help them address these challenges.

Readers will also find education on the terminology and technology issues associated with Enterprise Manufacturing Intelligence (EMI), and will be given five critical steps on how to get started and find success with their own EMI initiatives. A case study will be explored, along with the benefits that others are seeing from implementing EMI software solutions.



## SECTION 2

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### **5** EASY STEPS

# to Ensure a Successful EMI Deployment - How To Get Started

# 5 EASY STEPS

## to Ensure a Successful EMI Deployment - How To Get Started

Getting started with an Enterprise Manufacturing Intelligence (EMI) implementation does not have to be a daunting exercise. In fact, many companies put themselves on a fast track to achieving new information insights and reaping some fast and relatively easily achieved benefits, and then move onto additional areas or scope of improvements from

there. Success does breed more success, so the sooner an organization can get started with leveraging an EMI tool set, the sooner it will build momentum to uncover more application opportunities. LNS Research has seen these five easy steps provide an effective roadmap to getting started with successful EMI deployments.

**1 Don't go it alone.** It's important to start by building a small, easily manageable cross-functional team that includes members from the impacted areas of manufacturing/production operations and IT. The team leader can come from either camp; however, it's important that the team leader is very knowledgeable about the business issues/problems that can be solved.

Some companies have more flexibility and autonomy in their organizations for adding new applications than others. The key to rapidly getting started is to involve only those that truly need to be actively engaged in a first pilot effort that is utilized as a proof of concept.

Installing and setting up today's modern EMI software is not a difficult task, but the initial activity must be scoped, sanctioned, and supported by the proper level of management.

For example, if the initial performance management target is a set of machines or a single production line, then perhaps only the line level of management needs to provide approvals and support. Of course, every organization is different in its approval process.

**2 Have this cross-functional team clearly define the objectives of the pilot application.** The initial expectations should be set that the first proof of concept will collect, aggregate, and contextualize a certain set of data into new information that can "bring to life" some new or faster performance insights. These new insights need to be associated with one or more current challenges that exist within the manufacturing/production operations. Examples include inconsistencies in performance or quality, throughput issues, asset use or availability, energy consumption, etc.

The target role(s) of the new information insights should be identified in this early stage, such that their specific inputs can be solicited, as well as to ensure that the displays and information will be directly relevant to their job role(s) as part of the EMI software configuration and display building process.

**3** **Ensure that the first proof of concept project is scoped to be a short-term (1-3 months) slice for EMI.** It's important to not make this a time-consuming and expensive effort to get momentum started. Otherwise, the pilot project should be scaled back in complexity and scope to bring it into this type of timeframe. While being limited in scope, the project definition should include the ability to deliver some anticipated results that can be documented for the initial investment. Therefore, even though the project team will not be sure, it's important to get them to think in terms of some small potential outcomes.

The pilot project will need to address issues like where and how will the automated data collection occur. Will it connect to data from existing Data Historians, imported from spreadsheets, from inside of other application databases, or collect data from manual data capture screens?

The pilot will also need to address how to deliver the right information to the right role(s)/user(s). Oftentimes, a Web

browser-based interface may be used, displaying onto existing screens or terminals that are already in use by these same people. Today's EMI software solutions are also offering displays on mobile devices/tablets, so this may be a good option depending on the users and availability within your IT and manufacturing landscape.

By involving the end users in this proof of concept design phase, you can determine what metrics are most meaningful to provide, and what new actions can be potentially taken based on having the new information insights.

**4** **After completing a successful short-term slice as described above, your organization will likely produce many more ideas as to how these same EMI tools and approaches can be scaled to address additional areas of your manufacturing business.** These additional areas can become the next tactical EMI projects, or, better yet, form the basis for a longer term, grander vision.

Once the organization is convinced that EMI can act as a performance visualizer and accelerator, companies are ready to define a long-term vision (1-5 years). This vision should be transformative in the way in which your organization can work and collaborate in the future. The vision should also capitalize on major trends in technology like

using the “information anywhere” capabilities of mobile devices and cloud-based applications. As part of the long-term vision, you should also consider the use of “Big Data” analytics to mine massive amounts of data and to support a combination of corporate and manufacturing objectives. By aligning the achievement of manufacturing objectives that can be aided by EMI with overall corporate objectives, your EMI vision and roadmap can become an essential ingredient for future business success.

**5** **It’s important to select the right software and implementation partners that can work with you effectively along this fast track journey.** The software vendor should have a technology tool set that can address both the quick project cycles in the short term vision, as well as possess the capabilities to scale to the sophistication of your long-term vision.

LNS Research recommends that you work with software suppliers that have proven experience and a successful track record in your company’s industry. In addition, ensure that whatever software solution is selected fits well into your existing IT and application landscape to simplify the data integration efforts. And, it is always a best practice to speak with other users/customers of the solutions that you are considering to understand more about their experiences with both the software and the support provided.

Some companies have enough internal IT and application expertise to implement EMI software on their own. If you do need assistance from an integration/implementation partner, you can consider working with the professional services arm of the chosen software company. Or if you prefer to work with a separate implementation provider, choose one that is non-biased, but has an experienced practice working with the chosen software. The implementation partner should have the scale and resources to meet your company’s long-term vision, but be able to deliver on quick methodologies that meet your short-term vision and project slices as well.





## SECTION 3

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# Landscape of Organizations, Processes & Technology

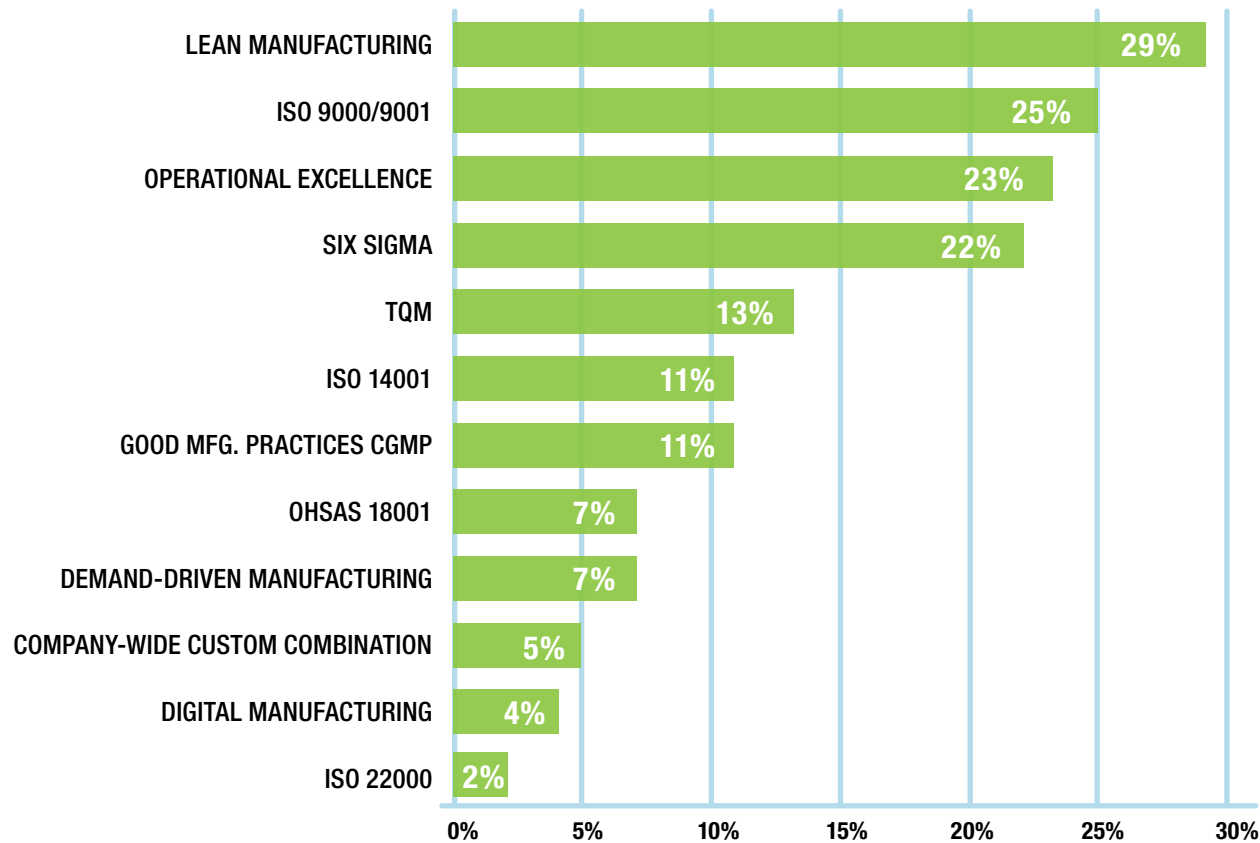
## Landscape of Organizations, Processes & Technology

Our research provided additional background and supporting materials to better understand the five steps to getting started with EMI. Step 1 involved the creation of a cross-functional team. In order to understand how manufacturing companies are organizing for success, LNS asked how long each company had a strategic manufacturing operations or Operational Excellence group in place. It may come as a surprise to learn that some companies have been on this journey for as many as 20 years, while others have still yet to put dedicated groups in place. The average response across all companies was 2.5 years. And 50% have implemented or are implementing cross-functional groups to support their Operational Excellence journeys within a year. It is clear that one of the critical success factors is to have an empowered cross-functional team that is focused on driving operational excellence on a continuous basis.

**Operational Excellence  
is a journey—  
some have been on for  
20 years, with the  
average being 2.5 years**

**“One of the critical success factors is to have an empowered cross-functional team that is focused on driving operational excellence on a continuous basis.”**

### Manufacturing Programs Implemented or Planned



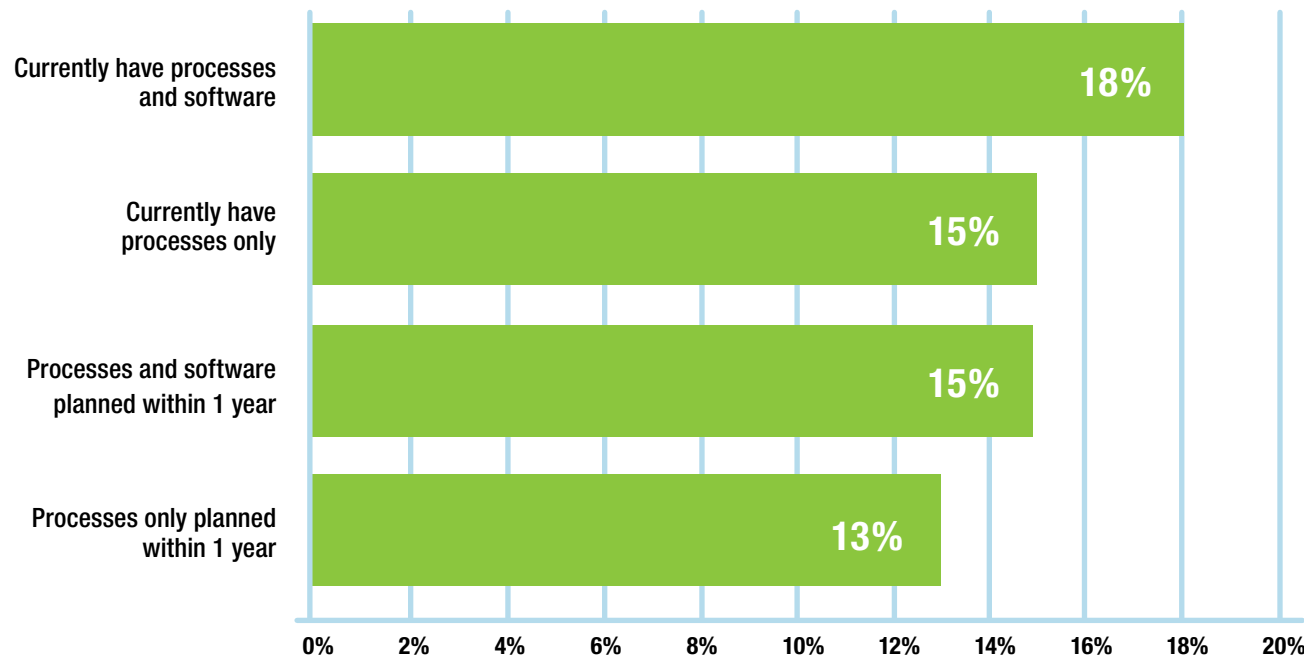
**73%**  
have formal  
programs  
in place or  
planned for  
next year

Most continuous improvement activities start by better understanding and mapping existing processes and results and then looking for ways to make impactful, incremental improvements. These teams need reliable data and information that can be the basis for baseline measurements and ongoing improvements. This is a key area where EMI software can provide support.

When looking at the popular manufacturing programs and initiatives

that are either in place or planned across a broad set of industries, 73% of manufacturing / production companies have formal programs in place or else planned for the following year. LNS found that most companies are implementing combinations of the programs in this graph in order to meet their strategic objectives, as opposed to just one. And in some cases, companies have customized combinations of these well-established programs to tailor them to their businesses.

## Ability to Deliver Relevant KPIs to All Personnel in Real-Time



The trend towards enabling real-time performance information continues to accelerate

All of these manufacturing programs require accurate data collection and analysis in order to measure and guide their respective success. Most companies start out by manually collecting the data and performing analyses, and as their programs progress, by automating the data collection with more integrated systems and providing their teams with better analysis tools that facilitate quicker access and responses to information.

Therefore, looking at the current state of established processes and software in support of these Continuous Improvement programs, 61% of manufacturing / production companies have processes and / or software implemented or planned to help deliver

relevant Key Performance Indicators (KPIs) to all personnel in real time. There appears a clear trend towards proactive performance management engagement with employees by providing transparency on how operations are performing on a real-time basis, such that corrective actions can be taken as early as possible.

Eighteen percent of companies surveyed already have a combination of processes and software in place to provide this real-time visibility, and another 15% are planning to have both processes and software in place in the next year to accomplish this. The trend towards enabling real-time performance information continues to accelerate.

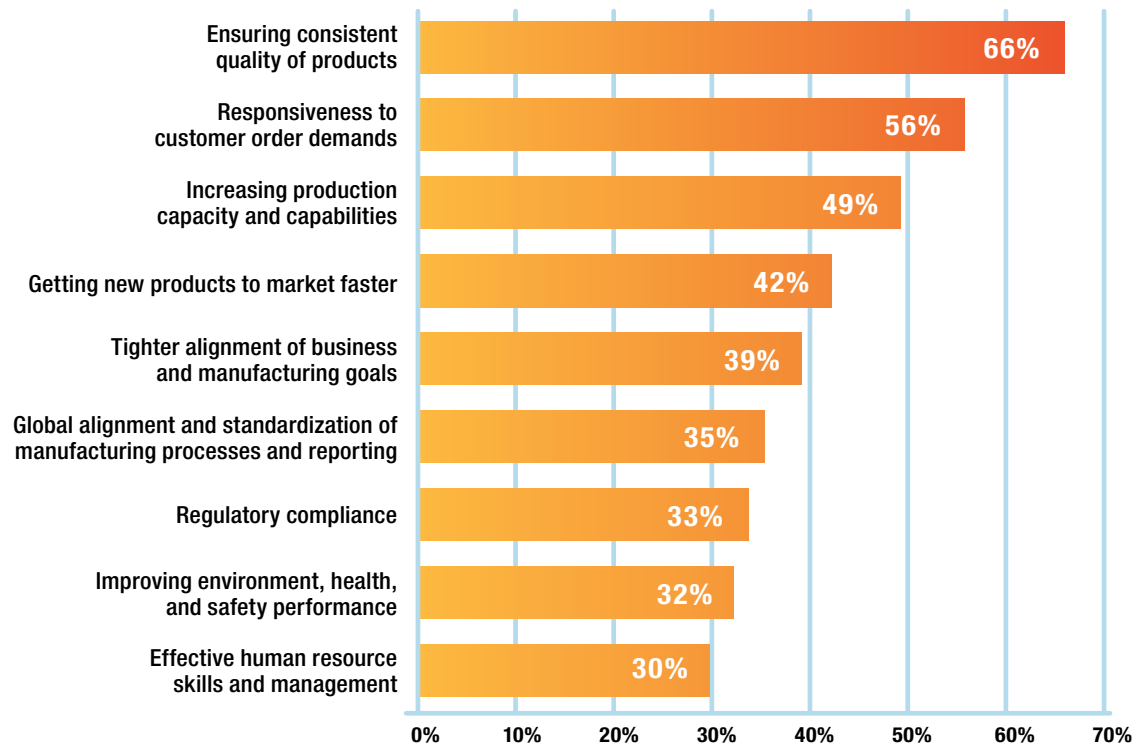


## SECTION 4

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# Top Manufacturing Objectives & Challenges

## Top Strategic Manufacturing Objectives - #1, #2, & #3



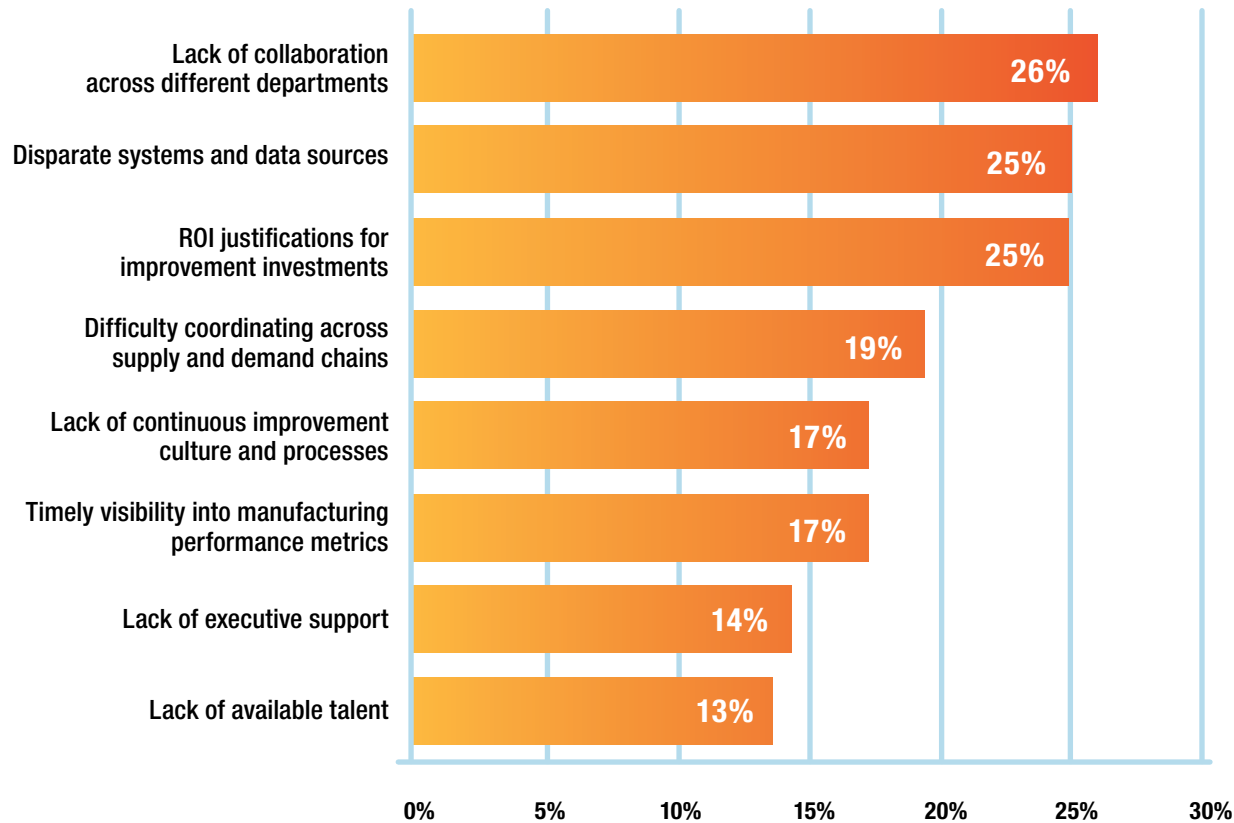
**Serving customers takes top priority**

In support of Step 2 of how to get started with EMI, it's important to align your proof of concept project to a specific subset of objectives and challenges. Therefore, we wanted to share related research in these areas. The LNS Research Manufacturing Operations Management (MOM) survey data collected to date show that the combination of the top 1, 2, and 3 strategic objectives for manufacturing industries are related to serving customers. First and foremost is ensuring consistency of quality for products produced, followed by being responsive to customer order demands. 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 / production business in a rapid fashion.

We can also see that there are many other strategic objectives that need to be simultaneously managed in order to have a successful business. These include meeting regulatory compliance, improving on production capabilities, getting new products to market more quickly, and others. These research data show that there are multiple strategic objectives that are of some significant importance – all of which need to be simultaneously improved upon. This makes for a challenging environment, whereby better tools and information can be of assistance.

## Top Operational Challenges for Meeting Strategic Manufacturing Objectives - #1, #2, & #3

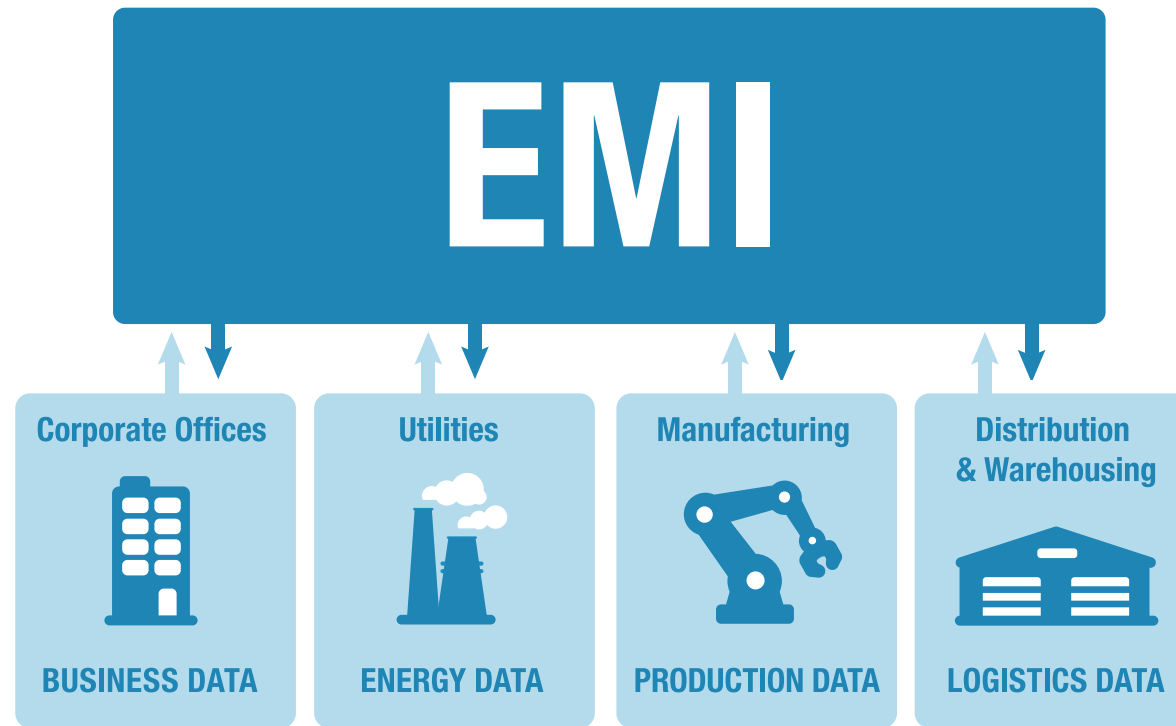


**Sharing the same goals, objectives, data, information and KPIs is a best practice**

When we look at the top 1, 2, and 3 associated challenges that manufacturing / production businesses are facing in meeting top strategic objectives, there are multiple simultaneous challenges that are all of significance and need to be addressed.

The top operational challenge is how to break down silos of organizations and departments and to foster greater collaboration. Companies that effectively address this challenge are in a

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



The next highest operational challenge that manufacturers / producers have in order to meet their strategic objectives is getting the required data and information out of the many disparate systems and databases that exist across their plants and enterprise. The ability to connect, federate, aggregate, and contextualize data from multiple sources into useful and timely information are key capabilities of today's Enterprise Manufacturing Intelligence software solutions. And these EMI technology capabilities go right to the heart of this significant operational challenge.

**“The ability to connect, federate, aggregate, and contextualize data...are key capabilities of today's EMI software solutions.”**





## BASELINE PERFORMANCE MEASURES

The next challenge is one that we have a lot of discussion with manufacturers / producers 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.

It is often challenging to get good baseline performance information. Therefore, one popular approach to defining the short-term slice of EMI in Step 3, is to start with putting in the 'as is' performance metrics. Sometimes the required data to observe or calculate performance metrics is not even being measured or collected. This is where automated data collection systems like Historians can be a first fundamental step towards justifying and tracking the results of operational improvement programs.



Company culture comes out of the examples set by management and the actions of all employees. Therefore, the next top operational challenge of building a continuous improvement culture and supporting processes is a longer and never-ending journey for any organization. Industry experience has shown that without also making continuous improvements to the associated measurement, data, and information systems, building a competitive performance culture is not going to be possible.

Another key way of getting this type of culture ingrained into the DNA

of an organization is to provide universal and timely visibility into manufacturing performance metrics. This links directly with where many organizations go with Step 4 of getting started with EMI. After getting some experience on a smaller scale, they see that the longer term vision can support a cultural shift. When everyone across an organization is aligned in their individual, group, and company goals and armed with the information they need at their fingertips, truly great things can happen. We can see from the survey that timely visibility into manufacturing performance metrics was among the top operational challenges.



## SECTION 5

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# EMI - Further Explained

## EMI - Further Explained

This section is intended to assist with Step 5 of getting started with EMI - by providing additional technology and requirements information to consider as you select a solution partner for your journey. EMI software is a crucial tool that organizations have been using to gain immediate and actionable intelligence from both shop floor automation and enterprise business systems.

### Enterprise Manufacturing Intelligence (EMI)



- Brings together business, energy, production, and logistics data by connecting to disparate sources – equipment, systems, applications, and databases
- Often used as an intermediary step to connect to multiple different Data Historians and other available databases serving as real-time data collection applications that may contain manually input data from energy, production, and logistics data
- Contextualizes data into relevant and useful information using calculations and data models to make it immediate and actionable to decision makers

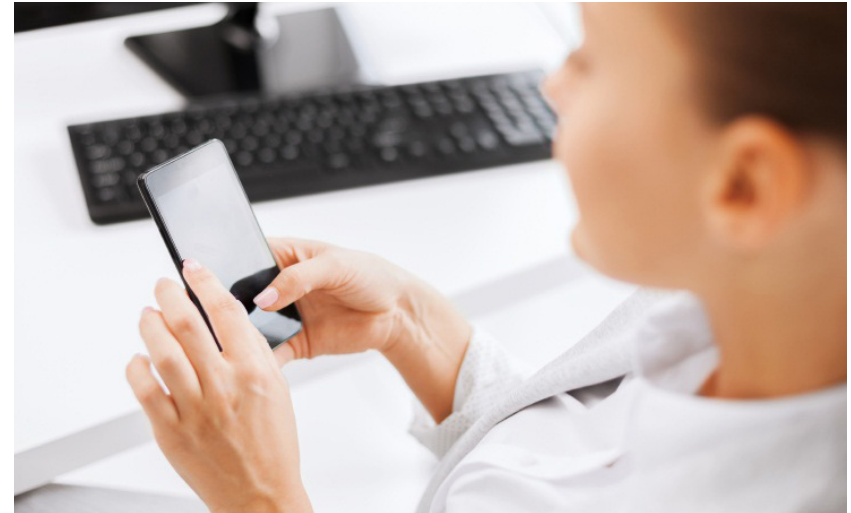
- Provides the appropriate alerts, dashboards and displays to support a wide range of roles and responsibilities across a manufacturing / production organization. The dashboards usually support drill-down navigation to uncover additional levels of detail and to perform root-cause analysis.
- Provides additional analytical tools to enable “power users” to uncover interrelationships across data sets that provide new insights for making improvements or taking corrective actions
- Pulls business systems information in order to correlate specific customer, product line, or cost information along with production, energy, and logistics information

## Enterprise Manufacturing Intelligence (EMI)



## Impact of Mobile Technology

- Mobile displays now allow EMI functionality on smart phones and tablets
- Full visual capability supported from operator up through managers and executives
- Operators, supervisors, maintenance, quality, and engineering personnel no longer need to be tethered to the factory for information
- Reduced time to react to potential operational issues, with alerts sent directly to each involved person's device of choice
- Allows executives who previously never viewed manufacturing level reporting to see and compare real-time information from across multiple plants, and to get new business unit and product line views of performance





## SECTION 6

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# Case Study



## CASE STUDY

### Hillshire Farms Sausage

#### BACKGROUND

Jimmy Dean, part of the Hillshire Brands portfolio, is the largest retailer of refrigerated breakfast sausages in the U.S., outselling the next top four producers combined. The company attributes this leading position in part to delivering consistently high-quality and uniform products while keeping costs low and throughput high.

The company's Newbern, TN plant produces more than 150 million pounds of sausage annually, with two-thirds of this production total dedicated to one-pound sausage rolls ("chubs"). Chubs that are off-weight are manually sliced open and checked for contaminants, at which point, they are placed back into the system or discarded, both costly options. Since the product is priced per package, any amount of weight over the requirement is lost revenue, and any under risks customer satisfaction. In addition, the company must comply with the Federal Meat Inspection Act, which requires that packages of meat products are accurate to weight labels.



#### BUSINESS PROBLEM

Newbern plant operators were experiencing unacceptable variances in chub weight, resulting in lost revenue and compliance issues, but lacked the control-system data to understand the amounts or the cause of throwaway.

Meeting federal compliance was a concern, and plant engineers saw an opportunity to reduce weight variances if the source of the problem could be pinpointed.





## CASE STUDY

### Hillshire Farms Sausage



## SOLUTION

Senior Engineer Jon Riechert brought in third-party expertise to implement an EMI solution suite, which integrated directly to the control platform that provides access to the plant's real-time production data.

In addition, the 11 chub-line machines at Newbern were connected to a Data Historian, allowing the team to collect data over longer-term periods for trend viewing and more accurate performance comparisons. Newbern engineers were able to pinpoint when chub variances began and better examine the causes through a customized dashboard accessible from any browser.

"The Newbern team had full control over what that they wanted to see on the dashboards," said Riechert. "I've worked with this software enough to understand that there are almost infinite possibilities of what it can show visually."

## RESULTS

The data access enabled by this EMI implementation translated to a yield improvement of nearly 0.10% within the first six weeks of system roll-out, the equivalent of saving 105,000 chubs a year and hundreds of thousands of dollars in cost of goods sold.

"Before we implemented this system, operators could only see how many bad apples were produced," Reichert said. "Now operators can see weight fluctuations along the line, the exact giveaways on finished chubs, machine downtime, OEE, and even meat temperature."

While the 0.10% yield improvement satisfied the company's ROI justification, the company expects chub giveaway to be reduced another several tenths of a percent, increasing yield by up to 0.50%, or more than half a million pounds of sausage. The tremendous success of the implementation has even spurred the potential for further system development.

"We are currently considering adding energy-use metrics to the system at several plants," said Reichert. "The information is empowering and the operators want more."

**Within the first six weeks of system roll-out...  
saving hundreds of thousands of dollars in cost of goods sold**



## SECTION 7

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# EMI Adoption Trends

## EMI Adoption Trends



**EMI adoption is accelerating... as companies look to utilize real-time information as a strategic tool to improve business**

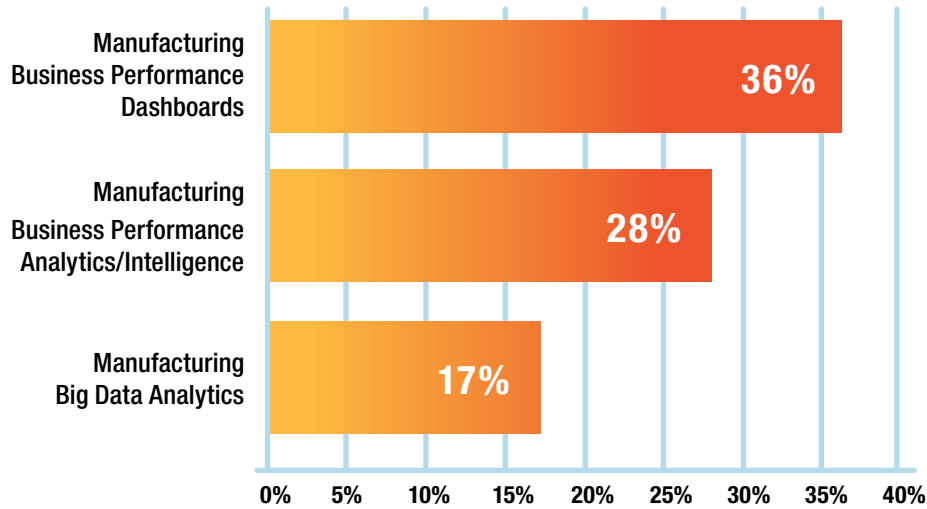
The strategic business drivers, organizations, programs and technology issues that are accelerating EMI software solution adoption have been covered, but what do the specific adoption trends look like?

According to the survey, 28% of companies already have Data Historians in place to automatically and reliably collect manufacturing / production data, and another 24% are planning to implement Historians next year. Clearly, companies are seeing the benefits of auto-

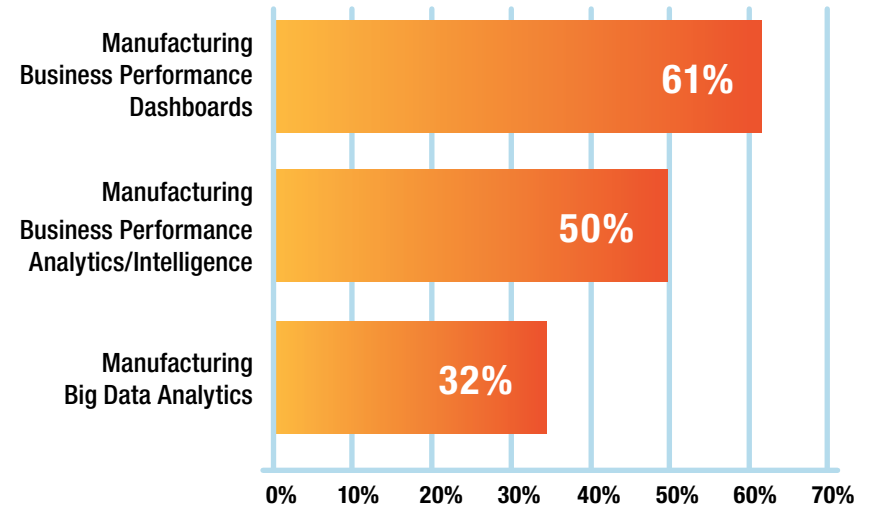
minating data collection processes and getting away from time consuming and error prone manual data collection wherever possible.

Twenty-one percent of companies surveyed are currently using EMI software solutions and an additional 26% are planning to do so in the next year. Therefore, EMI adoption is accelerating beyond current adoption rates as companies look to utilize real-time information as a strategic tool to improve business.

### Currently Implemented Functionality



### Currently Implemented Functionality or Planned for Next Year



Some companies are also looking at using Business Intelligence (BI) software in conjunction with EMI software. BI typically looks at transactional business data to generate new business insights, and can serve as a good companion to the detailed real-time information that is generated from EMI software.

When LNS looked at the currently implemented functionality of both BI and EMI software, 36% of companies were found to currently have manufacturing dashboards in place, and 61% either currently

have them or are planning to install them in the next year. The same chart shows that companies will be deploying more capable analytics to mine data and uncover new insights moving forward.

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.



## SECTION 8

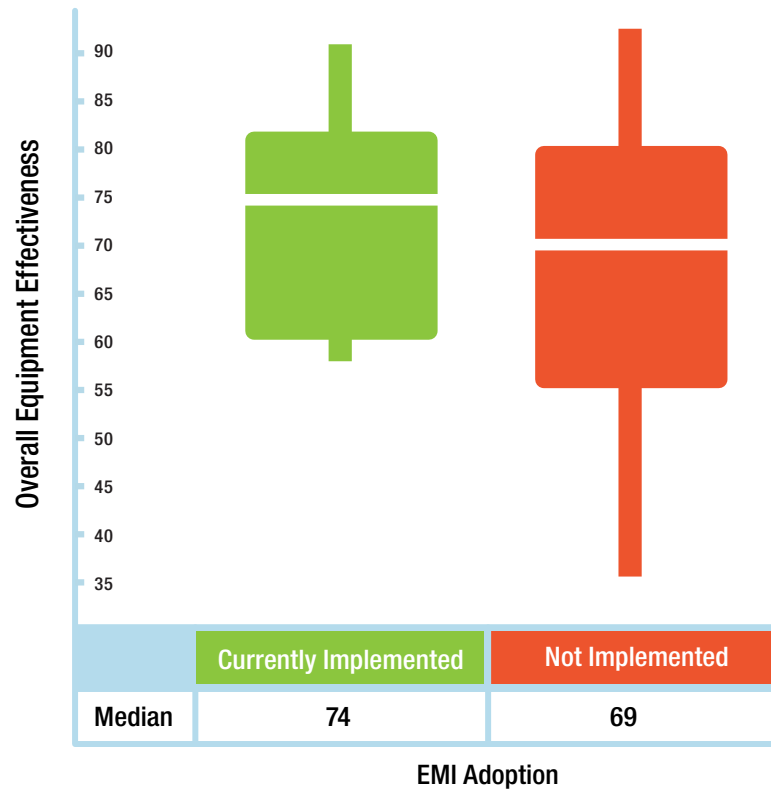
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# Summary/Recommendations

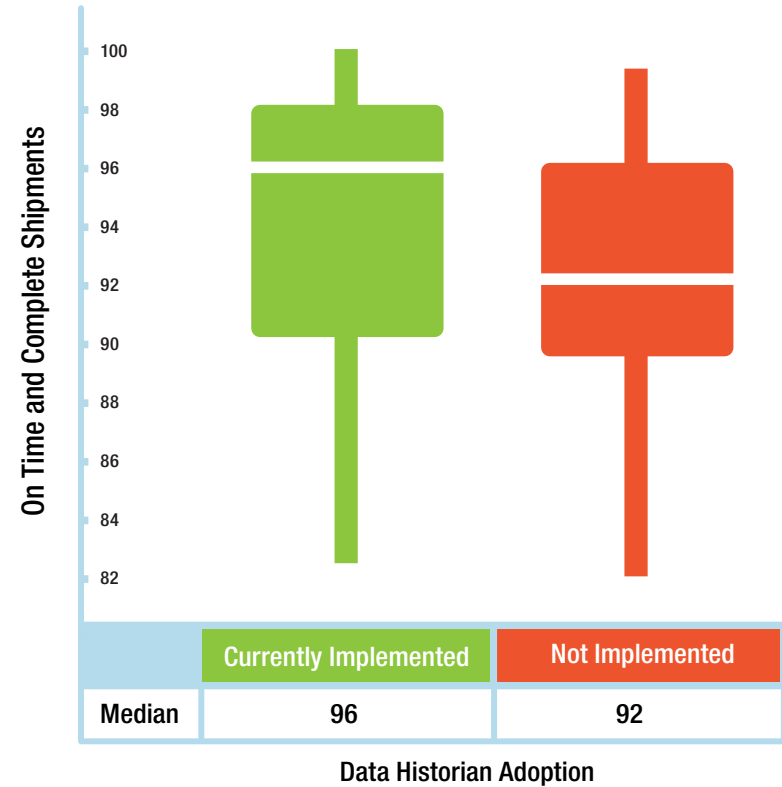
# Summary/Recommendations

## Benefits of a Successful EMI Implementation

Analysis of the LNS Research MOM survey has uncovered the following facts in relation to benefits of a successful EMI implementation.



**Fact:** As the above box plot shows, companies that have adopted EMI software solutions are experiencing a 5% higher OEE performance.



**Fact:** As the above box plot shows, companies that have adopted Historian software for automated data collection also have 4% higher On-Time and Complete Product Shipments.

**Fact:** Companies that have more maturity in their organizations and manufacturing excellence programs are also using Historians for automated data collection and EMI software solutions. As evidence of this, the users of these technologies have had their Continuous Improvement organizations in place for an average of 5.4 years versus an average of 2.5 years for all companies.

## Summary/Recommendations - Continued

Manufacturers are using a combination of proven program methodologies and process improvements to drive bottom-line results. Key to achieving these results is the ability to harness the capabilities and collaboration of the different people that contribute to success, and to empower them with the best possible information and tools that enable them to consistently perform their jobs and get results.

Many organizations tell us that they are drowning in data, but starving for good information. In order to harness all of the different data sources into useful information and analysis, EMI software solutions are now well proven and easier than ever to deploy. Companies can start with a narrowly defined problem area and then quickly scale the scope of their EMI solution over time – often funding the expansion of their initiatives from savings that were achieved in the previous deployments.

In order to be most successful, five easy steps should be followed to ensure a successful EMI deployment:

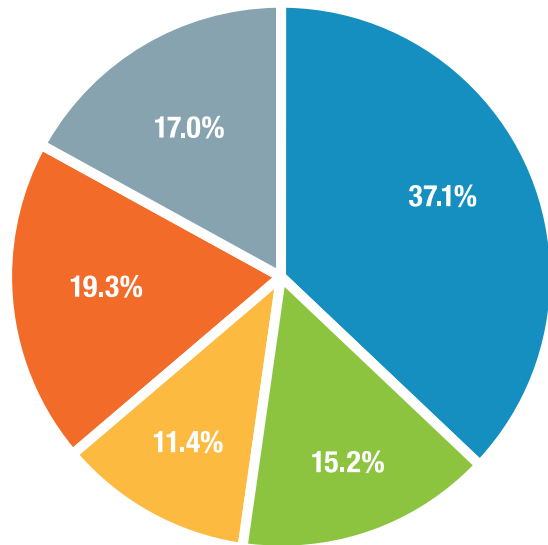
- 1** Build a cross-functional team to define an initial proof of concept
- 2** Clearly define the objectives and users/roles of the new information insights
- 3** Implement a short-term (1-3 months) slice for an EMI pilot
- 4** Use initial results to define a long term-vision (1-5 years)
- 5** Select the right software and implementation partners that match the short and long-term requirements of your EMI journey

From our analysis of survey data, we can conclude that companies that are using Historians for automated data collection and EMI software solutions are about three years ahead of competition on the maturity of their Continuous Improvement programs. They are also enjoying the benefits of 5% greater OEE performance and 4% better On-Time and Complete Delivery to customers.

When we reflect on the case study, we can also conclude that EMI software solutions are directly contributing to reductions in waste and bottom line cost savings.

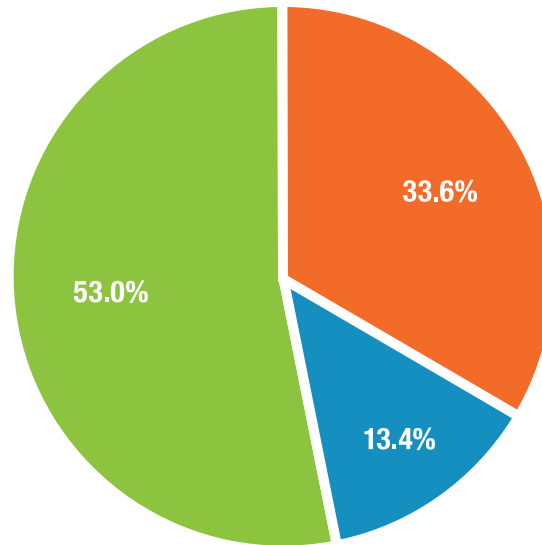
**LNS Research recommends  
EMI software solutions  
as a solid place to start  
for enabling continuous  
improvements**

## Research Demographics for Manufacturing Operations Management Survey



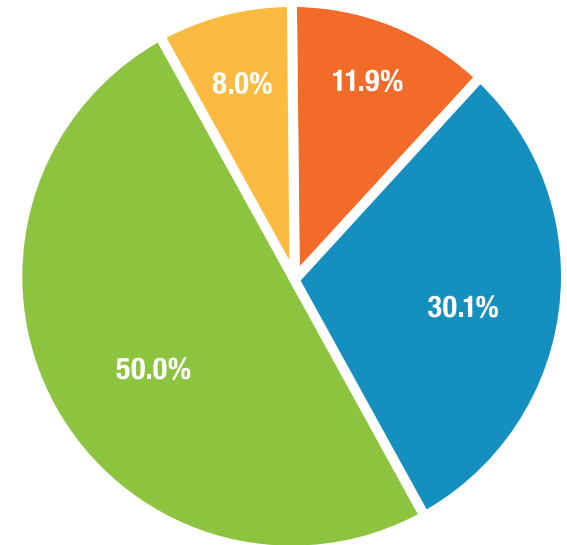
**COLOR BY INDUSTRY**

- Discrete Manufacturing
- F&B / CPG
- Life Sciences
- Other
- Process Manufacturing



**COLOR BY COMPANY REVENUE**

- Large: \$1BB+
- Medium: \$250MM - \$1BB
- Small: \$0 - \$250MM



**COLOR BY HQ LOCATION**

- Asia / Pacific
- Europe
- North America
- Rest of the World

The pie charts above provide background information on the LNS Research MOM survey participants. Each was asked to fill in basic demographic data. 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 others. 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.



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