The electronics supply chain is, in many ways, peerless within manufacturing. The global reach, lightning pace, and dynamic interaction of this network is staggering; leading companies have hundreds of thousands of employees, several thousand suppliers, hundreds of manufacturing sites, and customers in virtually every industry.

Given this complexity, it is not surprising that electronics manufacturers today are laser focused on responding to customer demands, ensuring product quality, and successfully delivering new product to market. Unfortunately many electronics manufacturers are underperforming other industries in these critical areas and often struggle to justify the ROI to make the needed investments to improve.

In this Research Spotlight, LNS Research will discuss how leading companies are facing these manufacturing challenges and achieving success through next-generation Manufacturing Operations Management (MOM) software application abilities, and overcoming business hurdles to pursue these improvements. Specifically LNS Research covers:

- Top goals and objectives for electronics companies
- The top challenges specific to the electronics industry today
- How a platform approach to MOM is driving business value for manufacturers
- Trends in adoption and use of MOM software
- The importance of due diligence in software vendor evaluation, building a business case for implementation, and generating positive ROI
- Actionable Recommendations

**Putting Electronics Manufacturers’ Operational Objectives and Challenges into Perspective**

Drawing upon data from LNS Research’s recent MOM survey can offer insight into the specific objectives and challenges faced by companies in electronics.
To date, the survey has been completed by over 500 respondents and comprises a variety of company sizes, geographies, and industries, including:

- 55% headquartered in North America
- 22% headquartered in Europe
- 54% in discrete manufacturing
- 38% with revenue exceeding $1 Billion

By looking at this data, clear objectives and focus areas are identifiable by industry. Within electronics, there are a number of objectives that bubble to the top of priority as compared to respondents as a whole.

**Top Operational Objectives**

Responsiveness to customer demands and getting new products to market faster are two operational objectives of significantly more focus than all industries.

As anyone in the industry can attest, electronics is unique in many ways. Perhaps the most critical of these differences is around the priority of quickly getting new products to market. In fact it is over 50% more likely to be a top objective than other industries. This is of course not surprising, the electronics industry is extremely consumer focused and these industries have some of the shortest product life cycles, often six months or less with a tremendous amount of product variation. To deliver products to market successfully, companies are making many organization, process, and technology changes that will be examined in this Research Spotlight, including:
• End-to-end product traceability and PLM-to-manufacturing integration
• Robust and flexible product development methodologies
• Cross functional teams to support new product launches
• Machine programming for New Product Introduction
• Deploying Global MOM Software supporting production execution, quality execution, and analytics

The above graph also shows that electronics manufacturers are also more likely to focus on the supply chain and being responsive to customer demands as well as quality, with quality being a top three objective just as it is in every other industry. Although supply chain and quality issues are tightly related to new product introductions, they go beyond and apply to all of manufacturing operations. For these quality and supply chain issues electronic manufacturers are undertaking a number of similar and related initiatives, including:

• Operational Excellence, Lean, and Six Sigma
• Process harmonization across the global manufacturing network
• Collaboration between manufacturing and IT groups
• Deploying Global MOM Software supporting production execution, quality execution, and analytics

**Top Operational Objectives**
Of course pursuing these objectives does not come without challenge. In a separate question, respondents were asked about top operational challenges faced. As can be seen, while all industries’ top challenge involved a lack of collaboration across different departments, within the electronics industry, there is a 50% increased likelihood of having ROI justification as being a top challenge.

These challenges have many root causes, including a lack of alignment between financial and performance metrics, no cohesive metrics program in place to measure improvement in manufacturing, and a lack in confidence that software improvement projects will be implemented on time, and according to budget.

**Building a Platform for Growth**

In the traditional approach, 80%+ of companies have adopted Enterprise Resource Planning (ERP), but only 23% have moved to rationalize the multiple applications needed on the plant floor with a comprehensive suite of MOM software.
Companies with this approach face a number of technical challenges, including:

- Multiple homegrown and commercial data bases and configuration tools needed to manage full set of MOM functionality
- Purpose built solutions that lack configurability and make it difficult to expand functionality to new or improved modules
- Inconsistent user interface and visualization approaches due to multiple different application database approaches
- The complexity of integration with enterprise and industrial automation solutions can be tremendously onerous with homegrown solutions, as these systems vary widely in interoperability and are difficult and costly to maintain

**MANUFACTURING OPERATIONS MANAGEMENT**

**Future: Integration & Collaboration Platforms**

It is important for companies to evaluate and understand not only the up-front costs of software, but the total cost of ownership. Implementation costs may be cut, but it is critical to know what costs will be associated with customization, support, maintenance, and upgrades as well.
This more modern vision of Manufacturing Operations Management Software involves deploying a broad set of MOM capabilities as part of a common application that involves configurable processes, a common manufacturing data model, built-in analytics, along with the ability to leverage emerging technologies.

Unfortunately, this diagram represents LNS Research’s future vision for a MOM platform architecture and even though there are solution providers that have developed a comprehensive MOM platform, no vendor to date has a solution encompassing all of these platform capabilities. On the bright side, this does not mean companies should not be starting to invest, in fact quite the contrary.

Investments in these areas are critical to addressing the market challenges faced in the electronics industry but, as described above, many electronics manufacturers are hesitant to invest because of an inability to calculate credible ROI justification. The key is choosing the right MOM platform that has the right roadmap for the future and can deliver today on the capabilities that will deliver the most value, especially those highlighted in red above and depicted in the graph below.

**MOM capabilities delivering the most business value**

As the graph above shows, manufacturers are primarily concerned with managing production execution and quality while gaining real-time visibility into performance—all critical for deliver business value and ROI.
Measuring MOM Software ROI

While accurately and effectively building a business case for a software implementation is a challenge that many manufacturers face, there are a few steps that electronics companies can take to precisely quantify the scope of investment and take into account costs as well as benefits.

- Electronics companies would be well served to evaluate MOM solution providers that offer a configurable approach to speed implementation that are built on best practices but can handle the uniqueness of every manufacturing process, 80% of needed functionality out of the box is a good rule of thumb.

- It is important for companies to evaluate and understand not only the up-front costs of software, but the total cost of ownership (TCO) in which they are involving themselves. Software license costs may be clear cut, but it is critical to know what costs that will be associated with professional services. Companies often under estimate these costs, which can extend well beyond initial estimates if there isn’t a clear understanding of current and future state before the project begins. Even worse, if the wrong partner is chosen customization that seems smart at the time can drive up the cost of future support, maintenance, and upgrades.

- Companies should start with the MOM applications that deliver the most business value today, and a focus should be put on the processes that drive the most KPI improvement, great starting points include: production execution, track and trace, quality execution, NPI, OEE, and analytics.

- With such short product lifecycles and focus on improving NPI, electronics manufacturers should consider MOM applications that streamline NPI processes and smooth the release of new products to manufacturing.

- Establish current performance in KPIs and measure improvements over time as MOM rollout succeeds; focus on small wins at pilot plants or pilot processes.

When building such a business case and planning for investment by setting ROI expectations, it is also always beneficial to understand what other peer companies are setting as targets, specifically for:

- Time to Implementation
- Time to ROI

In this regard, there is good news for electronics manufacturers considering MOM implementations. Those that are able to invest the time and resources typically find

The good news?
Electronics manufacturers that are able to invest the time and resources into MOM implementation typically find a quicker roll-out time when compared to industry at large.
a quicker roll-out time and subsequently are anticipating a much quicker ROI when compared to industry at large.

**Time to First MOM Implementation**

As the chart above shows, electronics manufacturers are almost twice as likely as the industry to successfully implement MOM software in less than six months or within the year and are much less likely to take longer. This is not surprising giving the demands of the industry but this speed to implementation is a major factor in achieving ROI.

**Time to ROI**

These laggard KPI figures speak back to industry-specific challenges in electronics manufacturing, particularly in getting new products to market faster.
As seen above, the speed in implementation is paying dividends for the industry, with electronics manufacturers being over twice as likely as other industries to deliver a positive ROI in less than three months or within six months and much less likely than other industries to take longer. Unfortunately, this finding is also a double-edged sword, the bar has been set much higher for electronics manufacturers, and companies that do not have the right plan up front, choose the right vendor, and successfully deploy in a timely manner will be at a competitive disadvantage.

**Key Performance Indicators for Building a MOM Software Business Case**

Three metrics that are well aligned to the top objectives of the electronics industry of speeding new products to market, responding to customer demands, and ensuring product quality include:

- **Successful New Product Introductions (NPI)**, defined as the percentage of new products delivered on time, on volume, and on quality.
- **On Time and Complete Shipments (OTCS)**, defined as the percentage of products delivered on time and complete with no re-promise dates.
- **Overall Equipment Effectiveness (OEE)**, defined as availability (uptime when a customer order exists) x efficiency (based on theoretical maximum speed) x quality (first pass yield).

Interestingly, electronics manufacturers are underperforming other industries in these metrics, which may in part explain the accelerated ROI achievement for the industry as well as explain some of the top challenges reported by the industry, especially around NPI and customer responsiveness.

### Median KPI Performance

<table>
<thead>
<tr>
<th></th>
<th>All Industries</th>
<th>Electronics Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Time and Complete Shipments</td>
<td>88%</td>
<td>86%</td>
</tr>
<tr>
<td>Overall Equipment Effectiveness</td>
<td>74%</td>
<td>66%</td>
</tr>
<tr>
<td>Successful New Product Introductions</td>
<td>80%</td>
<td>54%</td>
</tr>
</tbody>
</table>

### Proven Benefits

To spur on improvements in some of these metrics, there are specific steps companies can take. Specifically, companies deploying MOM Software in line with the best practices described above can automate and harmonize the business processes highlighted in the table below to driving significant performance benefits.
As the table above shows, companies with formal processes in place experience significant benefits in these KPIs. For a large electronics manufacturer, even a few percentage points difference in these metrics can spell millions of dollars in savings; therefore, this level of improvement could potentially deliver ROI on MOM application improvements in a relatively short period of time.

**Actionable Recommendations**

LNS Research recommends that electronics manufacturers build a MOM implementation plan and evaluate potential solutions providers based on criteria that make a clear and compelling business case, including:

- Focus ROI on improving metrics that align to top operational objectives, including improving new product introduction, customer responsiveness, and product quality. These improvements require a clear and concise measurement of these metrics in the current state and over time.

- Reducing MOM software implementation time drives quicker ROI, typically electronics manufacturers can deploy in under a year and see a positive ROI in less than six months.

- Speeding implementation and ROI requires a solution that is configurable but also has built-in in best practices, leading vendors should have 80% of needed functionality out of the box.

- Successful software implementations are supported by the right
organizational capabilities and enable the right process, including operational excellence along with improved end-to-end processes across engineering, manufacturing, and the supply chain.

- Don’t underestimate costs. Clearly document the current state of applications and processes as well as the desired future state. Be mindful of the roll of professional services cost in the total project cost, these can often go over budget and extend well beyond license costs if the proper planning is not done upfront and truly configurable software is not chosen.

Aegis Software is a provider of innovative software solutions to improve speed, control, and visibility throughout manufacturing operations.

The company’s FactoryLogix software supports all types of discrete manufacturing, from PCB assembly, to complex box-builds and large system integrations. Aegis is headquartered in Philadelphia PA, with regional headquarters in Germany, UK, China and Japan, supporting over 1700 factories worldwide.

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LNS Research provides advisory and benchmarking services to help Line-of-Business, IT, and Industrial Automation executives make critical business and operational decisions. LNS research focuses on providing insights into the key business processes, metrics, and technologies adopted in industrial operations. Current coverage areas include

- Enterprise Quality Management Software (EQMS)
- Industrial Energy Management (IEM)
- Environment, Health and Safety (EH&S)
- Manufacturing Operations Management (MOM)
- Asset Performance Management (APM)