

LEAN PRODUCTION INSIGHTS: ADVANCE YOUR LEAN MANUFACTURING JOURNEY

IT'S TIME FOR A LEAN
MANUFACTURING MAKEOVER

THE BIGGEST OBSTACLES TO
MAKING MANUFACTURING
LEARNER

LEAN SUCCESS, PART 1:
IF IT'S NOT COMPLETE, IT'S
NOT LEAN ENOUGH

LEAN SUCCESS, PART 2:
IT'S NOT LEAN IF YOU CAN'T
MEASURE IT

LEAN SUCCESS, PART 3:
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This eBook was compiled from a series of articles written for the Manufacturing Transformation Blog on Lean Manufacturing.

Just as the world of Lean has a goal of continuous improvement – so too is the learning of how to continue on your Lean journey. We hope you find this collection of articles interesting, thought provoking and educational.

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Manufacturing has changed a lot since Toyota Motor Company of Japan introduced the concept of implementing an integrated process to more efficiently manage equipment, materials and its workforce throughout the production cycle. Over time, this technique allowed Toyota to deliver more reliable, higher-quality products faster — and at a lower cost — than other mass produced automakers. As time passed, the practice of eliminating waste to create customer value with fewer resources caught on in the U.S. and other countries.

While the concept and best practices of the Lean production system remain intact, the implementation on the plant floor faces a major facelift. That's simply because the entire manufacturing dynamic has transformed to include new technology, new global competition, new government regulations, and a hyper-connected world of intelligent devices and social networks that enable seamless communication between companies and their customers.

Times have changed. And, in order to remain an agile manufacturer, Lean methodologies must adapt and change too. Otherwise, organizations will remain stuck with outdated processes while the competition soars into modern manufacturing methodologies.

Before rushing into a new Lean manufacturing model, however, it's a worthwhile exercise to take a step back to identify what's different and the direct impact it has on Lean processes.



1

TECHNOLOGY IS A GOOD THING

Early pioneers of Lean systems pursued strategies of removing IT from production processes, viewing this technology as an additional step which could be “leaned” out of processes to remove waste. This philosophy was probably valid when technology was in its early, nascent stages; today, however, is a completely different situation with a level of complexity that necessitates reliance on IT systems to remove the waste of manual processes.

2

LEVERAGING THE RIGHT TECHNOLOGY

Manufacturing Execution Systems (MES), Manufacturing Operations Management (MOM) and Enterprise Manufacturing Intelligence (EMI) have become instrumental in the quest to add efficiency into scheduling production, tracking inventory, synchronizing material flows and increasing visibility across the supply chain. The Just-in-Time mentality to deliver product is now being transplanted by a need to be more predictive and insightful. Manufacturers need to know what customers want—and for that, they are turning to Big Data and predictive analytics. While Big Data deals with different data sets that don’t always seem relevant to the plant floor, everything in the supply chain, plant floor, enterprise, and beyond must be interconnected in today’s day and age. Therefore, it’s time to analyze the impact of every data stream on the production of goods.

3

GLOBAL COMPETITION

Cost pressure and the need to locate closer to end users has only accelerated the push to go global; as a result, the need to understand foreign cultures and designing new products and services for them has never been more acute. Lean must now be agile to support continuous innovation while comprehending the complexity associated with an ever-changing, fast-paced global world. All of these elements require a fresh look at Lean manufacturing practices..

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4 **GOVERNMENT REGULATIONS**

New regulations emerge in specific industries all of the time, forcing companies to reexamine processes. The new ANSI B11.0 - 2023: Safety of Machinery standard puts new safety requirements in place for both equipment users and equipment manufacturers. That means, back to the drawing board for many companies—especially those companies that are still paper-based. Time to digitize processes and reevaluate how quality practices are implemented, tracked, and audited.

5 **HYPER-CONNECTED COMMUNICATION**

The new customer service interface is social media—especially from a mobile device. This means someone can post a comment or photo about your product anytime, anywhere. And, they expect an immediate response. Manufacturers must somehow capture the information—down to every last tweet—and sift through it to identify trends that can be pushed back into the research, development, and production cycles.

Lean manufacturing is still a very relevant business practice. But, like everything else in manufacturing, the process must progress to keep pace with the organizational shifts happening all around it. Perhaps that means new conversations will have to take place between CIOs and manufacturing executives. Or, that traditionally accepted best manufacturing practices have to get better. Either way, Lean is not going away, it's just in a new phase of innovation and transformation.

What will your Lean strategy look like in the future?

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By reducing waste from operations, implementing Lean manufacturing steps into your business can improve your profitability. Unfortunately, there are issues that present obstacles that must be addressed to achieve this goal.



Time

Tightening any manufacturing process takes time; it is not going to happen overnight. You must make a commitment to leaning your process and you must get everyone on board, working together. The actual amount of time required greatly depends on the number of problem areas a business is facing. The length of time can be reduced with the correct resources, the right systems, designated targets, adequate training and cooperation across all departments.



Resources

Without the right materials or resources, a manufacturer cannot make a product, and Lean manufacturing cannot be achieved. Resources include Six Sigma or Kaizen training, software and IT systems, and a budget to identify and embrace process improvement.

With regards to the software systems, there are many to choose from, each playing a different role. Enterprise Resource Planning (ERP) is management software ideally suited for keeping a record of production as it relates to financial tracking, with individual applications that can be integrated to meet an industry's needs. Manufacturing facilities can benefit greatly from Manufacturing Resource Planning (MRP) and Supply Chain Management (SCM) systems. The variety of solutions is vast and ERP is no longer just for larger enterprises.

Manufacturing Execution Systems (MES) and MOM (Manufacturing Operations Management) are designed to orchestrate activities on the shop floor and collect information from the factory to gain insights into operational performance and quality management. This program can also be integrated into an ERP solution.

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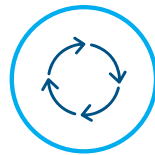


Correct Targets

Too often, time is lost by focusing on the wrong targets. Companies must be able to look at the entire manufacturing process – from initial order to product delivery – to identify each individual area that is impeding progress. If communication between departments presents an issue, the problem must be corrected. If communication is not an obstacle, the area can be marked as a function to watch.

Many manufacturers will find key areas in inventory, engineering and quality. Once a section of production has been identified, the cause of the failure needs to be analyzed. If duplicate or wrong materials are being purchased, the inventory control system must be updated. These issues require an in-depth evaluation. An inventory issue could be coming from outdated bills of materials or from old engineering designs being used for parts orders.

Rework or production that does not pass quality control is an expensive (and avoidable) cost of manufacturing. The company must determine where the quality is failing, which involves looking at each step of their production process. The problem may not be in the materials used or the skill of the production workers, the problem could be coming from machinery that is out of calibration.



Follow Through

Once your company begins to see the results of a Lean manufacturing program, you must continuously monitor the effectiveness. Backsliding into old habits will occur if no one is paying attention. Lean manufacturing is not a one-and-done function. Kaizen is directed toward waste elimination and continuous improvement – with the key it must be continuous.



Resistance

A lack of knowledge of what Lean manufacturing means and how the objective is achieved is a large barrier to progress. Lean manufacturing is the elimination of waste in all production areas including production, material flows, quality, delivery and costs. From Just-in-Time systems to reduce inventory to the efficient use of energy, all aspects of production can be improved. In fact, so too can the management as well.

Managers often present an obstacle in improving the production flow. This may be unconscious or conscious resistance. Many individuals in middle management positions do not want to release control over operations and may even fear losing their positions.

Production workers can present several obstacles. A large portion of Lean manufacturing is more production in less time at the same or better quality. Employees can be resistant to change and feel that Lean manufacturing will require them to work harder. This issue must be addressed by showing workers that the benefit is in streamlined production that is designed to make the work easier.

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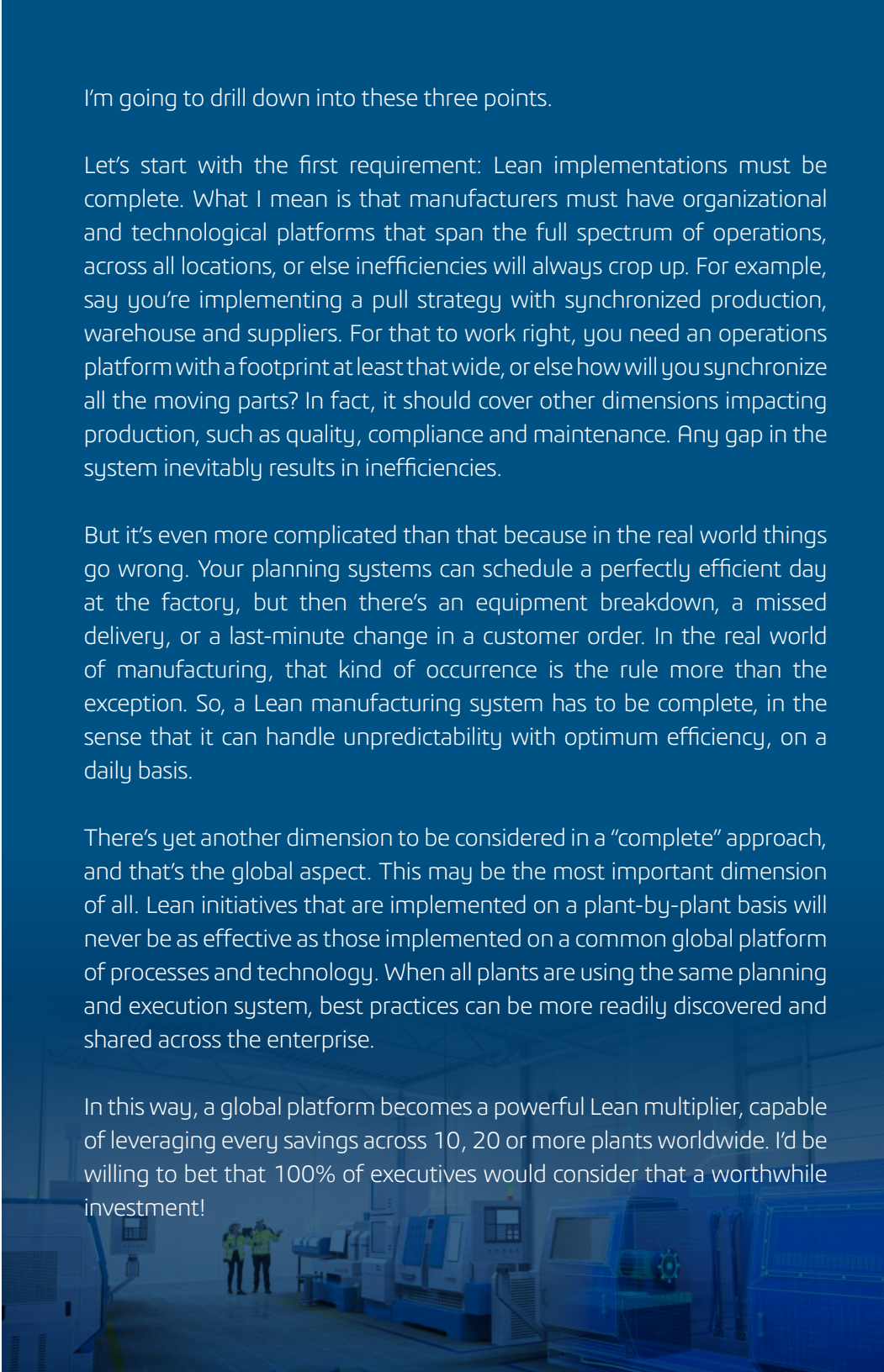
Is the journey to Lean manufacturing really worth the cost of admission? That's the provocative question asked by the business process consultants, AlixPartners, in a new survey of manufacturing executives.

Considering how much time, organizational effort and cost manufacturers have invested in Lean, the results of the survey surprised me. The issue is not whether Lean has failed – more than 90% of the executives surveyed said their efforts were somewhat or very effective. The question is whether Lean has delivered on expectations. Almost 60% of the executives said they were realizing “less than half of their expected savings.” What's more, among those enterprises that had projected 5% savings, less than a third had managed to reach that goal.

Why is there such a gap between expectations and reality?

One answer may be “inaccurate opportunity analysis,” in consultant jargon. But I think the survey points to something deeper. The fact is that some Lean projects are more successful than others. Why is this? What makes for a successful Lean initiative? Having worked with many manufacturing enterprises, I believe Lean delivers on value when three criteria are met:

-  **When the approach is complete**
-  **When results are measurable**
-  **When continuous process improvement is enforceable**



I'm going to drill down into these three points.

Let's start with the first requirement: Lean implementations must be complete. What I mean is that manufacturers must have organizational and technological platforms that span the full spectrum of operations, across all locations, or else inefficiencies will always crop up. For example, say you're implementing a pull strategy with synchronized production, warehouse and suppliers. For that to work right, you need an operations platform with a footprint at least that wide, or else how will you synchronize all the moving parts? In fact, it should cover other dimensions impacting production, such as quality, compliance and maintenance. Any gap in the system inevitably results in inefficiencies.

But it's even more complicated than that because in the real world things go wrong. Your planning systems can schedule a perfectly efficient day at the factory, but then there's an equipment breakdown, a missed delivery, or a last-minute change in a customer order. In the real world of manufacturing, that kind of occurrence is the rule more than the exception. So, a Lean manufacturing system has to be complete, in the sense that it can handle unpredictability with optimum efficiency, on a daily basis.

There's yet another dimension to be considered in a “complete” approach, and that's the global aspect. This may be the most important dimension of all. Lean initiatives that are implemented on a plant-by-plant basis will never be as effective as those implemented on a common global platform of processes and technology. When all plants are using the same planning and execution system, best practices can be more readily discovered and shared across the enterprise.

In this way, a global platform becomes a powerful Lean multiplier, capable of leveraging every savings across 10, 20 or more plants worldwide. I'd be willing to bet that 100% of executives would consider that a worthwhile investment!

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LEAN SUCCESS, PART 2: IT'S NOT LEAN IF YOU CAN'T MEASURE IT

I came across a startling statistic recently, from a survey of manufacturing executives. Fully 14% said they did not know how much their Lean initiatives had saved. Think about that for a moment. Manufacturers have invested significant amounts of time, resources and cash in Lean initiatives, yet one in seven can't say how much they've saved – or even if they've saved.

Lean success depends on three factors:

-  **When the approach is complete**
-  **When results are measurable**
-  **When continuous process improvement is enforceable**

In this post, I will discuss the second factor: Lean must be measurable.

So how is it possible that so many executives are in the dark about the performance of their Lean projects? After all, you can't improve what you can't measure. Measuring the right things, the Key Performance Indicators that drive behavior is essential to successful continuous improvement initiatives. As important, and too often overlooked, these metrics need to be defined, measured and reported the same way so they mean the same thing, at each plant in the enterprise. This concept is paramount to achieving long-lasting Lean success.

Let's assume you have clearly defined what will be measured. A big question still remains ... how will you measure it? Even within a single plant, producing metrics correctly and in a timely fashion can be a challenge, especially if some processes are paper-based. For example, a production line might have automated execution, but downstream assembly is still using paper. Or, you might have several automated data collection systems making data integration difficult and costly.

Having identified what and how to measure, the next step is to actually perform the measurement, which can sometimes take too long, reducing their "actionable" value. The challenges grow exponentially when you want to measure the flow of materials and production processes across multiple plants.

While these challenges are great, they are far from insurmountable. World class companies that have been most successful have built common processes and metrics on a common global platform, which has greatly simplified data aggregation, visibility and accuracy. I have seen a medical device company reduce inventories by 25-35% across 16 plants. A consumer goods manufacturer cut WIP inventory by 50% and reduced cycle time by 50%.

The bottom line is that manufacturers can certainly meet – or even exceed – their Lean goals. A critical step is that you must know what should be measured and you must have a system in place to accurately, consistently measure these activities in order to ascertain if performance improvement has really occurred. Consistent visibility and measurement of key activities can drive performance or anticipate issues, across all facilities and operations.



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LEAN SUCCESS, PART 3: YOU WON'T STAY LEAN IF YOU CAN'T ENFORCE IT

I don't know how many times I've heard this story. A manufacturer invests hundreds of thousands of dollars in Lean initiatives, hires consultants, works for 6 months to make vital and profitable process improvements, and then ... the project winds down, the consultants leave, and people slip back into their old habits. Most if not all of the benefits are lost, despite the hard work and investment, because the process improvements couldn't be embedded and sustained with how the work actually gets done.

This brings me to my third key to Lean success: Enforcement. (My previous blogs covered the first two keys, Completeness and Measurability.)

How can you ensure that your Lean procedures and continuous process improvement initiatives will be followed? While training programs and corporate manuals may provide a sense of accomplishment, they can't actually enforce the consistent practice of Lean behaviors necessary for success. Instead, Lean succeeds when the enforcement is embedded directly into the processes, through such mechanisms as automated directed manufacturing, reviews and signoffs. Workers can then be guided through new procedures, reinforcing new behaviors until they become habits.



Here is the challenge: embedding enforcement is not easy if you're manufacturing IT systems can't support frequent process changes. This is what we typically see with older manufacturing execution systems, which typically require a software change and / or a new release of the software to incorporate change. Often changes must be made in multiple "point" or departmental systems for processes that cross functional boundaries – for example, a quality inspection embedded in a manufacturing process, resulting in further challenges and delays. To make matters worse, if you have multiple plants running different manufacturing or paper-based systems, as most enterprises do, then your initial Lean process improvements may need to be done manually, as a way to test for improved results. Even if the results are stunning, rolling these improvements out across your enterprise is nearly impossible. If you cannot quickly share the fruits of your Kaizen events across all sites, you're losing a huge part of the value of your Lean initiatives.

On the other hand, if you have a global manufacturing platform that enables you to model, execute and share your business processes, then you can easily standardize best practices spanning departments and locations. This puts you in a whole different ballpark.

I would propose that this is the real key to Lean success. In the end, a great idea doesn't count for much if the improvements can't actually be executed and sustained. Microsoft made this point in their white paper, The Importance of Manufacturing Visibility: "Remember, though, that manufacturing visibility is merely a tool to achieve business objectives. Although visibility can gauge the progress of operations ...the real work still occurs on the plant floor – and in the minds of employees dedicated to improving that work."

There's no better way to be sure that employees follow procedures – and ensure the success of your Lean investment – than by embedding automated enforcement into your operations throughout the enterprise.

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Lean manufacturing principles yield proven results in operations management with direct benefits for customers. The implementation of Lean processes on the manufacturing floor is hardly new, yet it is still expanding at manufacturing companies to drive improved performance in quality, cost, and product delivery to customers. As an example of what can be accomplished at a major manufacturing company, Lean improvements made on our large format printing operations have reduced production cycle times by 15% and significantly decreased costs across the product set.

Across the industry, Supply Chain teams are shaping change by driving Lean principles through our data management and purchasing systems. Similar to the impact of reducing physical steps in the manufacturing process, removal of unnecessary data transfers, entry, and validation yields important benefits both internally and externally. Fewer data management points significantly decreases the opportunities for errors (and their associated costs) as well as reducing the processing steps that need monitoring. The greater the complexity of the businesses supported, the greater the need for Lean business processes.

Many contract manufacturing companies, such as The Coghlin Companies, support the complex manufacturing requirements of a diverse and global customer base. The profile of work on any given week might include manufacturing large capital equipment, or precise requirements to produce a high mix of printed circuit board assemblies. The management of the materials in support of these profiles include planning, purchasing and handling of approximately 60,000 unique part numbers. This type of volume might require about 500 different suppliers, shipping product into facilities via 7,000 purchase orders (PO) requiring approximately 50,000 systematic transactions (PO placement, confirmation, receipt, stocking, kitting, etc.) before a finished good is shipped. Mistakes or delays in any of these transactions for any of these parts could delay shipments and increase costs.


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Fewer steps in the manufacturing process can also make it easier to identify areas for improvement, or quickly pinpoint the culprit if a step should go wrong. A Lean data management system can also streamline your business analytics. For example, the points become more meaningful when examining Return on Investment or evaluating the effectiveness of specific steps in the manufacturing process.


The implementation of Lean theory to optimize the processing requirements is a critical part of continuous improvement. An organization's Supply Chain team, working closely with its supply base, should be on a mission to focus requirements on reducing steps and thus margin of error.

Some of the ways I have observed this type of continuous process improvement include:


- 1




Automating demand signal transfers from our firm into the supply base
- 2




Removing manual data entry at both the firm and the supplier
- 3



Automating routine transactions
- 4



Implementing monitoring metrics to flag exceptions and track performance
- 5



Matching the processing steps to the physical flow and practice (e.g., Kanban parts don't flow as Manufacturing Requirements Planning [MRP] planned parts)

Lean manufacturing is hardly a management improvement “fad.” It is a never-ending journey that holds the keys to achieving current and future performance improvement on a go-forward basis. On-going initiatives to develop Lean data practices continue to contribute to the achievement of manufacturing goals for improved quality, delivery and cost performance. The focus on Lean data practices in our supply chain is just one example of how Lean initiatives still benefit companies and clients in profound ways – now and in the future.

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The necessary technology now exists, and is increasingly being used by manufacturers and their suppliers, to apply greater automation through the use of real-time information as part of a Lean manufacturing strategy. Interestingly, the full potential of the “The Toyota-Style Information System,” as Taiichi Ohno envisioned it, is finally being realized today.

Here are five specific ways this new-found real-time capability can be used to take Lean manufacturing to a new level:

1 Leverage second order information

Dynamic data, such as the up-to-the-minute or up-to-the-second standard deviation, micro-trends and variability can now be used to trigger better actions and control processes (such as dynamic buffers, dynamic Kanban flow, real-time TOC). These data can of course be used to support Six-sigma improvement efforts and reduce DMIAC cycle time for projects, as well as to improve the accuracy of master data in planning systems (standard lead time, standard cost, etc.).

2 Extend in-process visibility/intelligence for enterprise operations decision support

This is different from typical batch-based business intelligence or after-the-fact analysis. Real-time in-process visibility enables prompt human decision-making, in effect putting executives in direct control of the manufacturing “steering wheel”. While executives do not need to know all the real-time details in operation, this capability is especially important when dealing with a critical event in the supply chain, such as during a natural disaster or an unplanned failure of a bottleneck machine.

3 Enable pull process to supply chain partners and customers

Synchronization of suppliers and sales is key to Lean initiatives, even when most Lean improvement efforts are focused within the four walls of a production facility. Only by coordinating in real-time with outside upstream and downstream partners can manufacturers approach the full potential of Lean practices.

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4 Sustain Kaizen

Kaizen drives many small steps of change in the Lean journey. The effect of the small changes in shop floor layout, work sequence, equipment, methods, people and material can all now be captured and made available in real-time. This makes possible rapid measurement of Kaizen results and the bench-marking of operational KPIs across multiple facilities to reinforce common goals.

5 Increase process and supply network flexibility

Real-time data, if coupled with the ability to act, opens up the possibility for new levels in process and supply network flexibility. Companies now have the information they need to make decisions about ramping up suppliers, switching processes and reconfiguring supply networks to meet changing conditions.

Harnessing real-time information in these ways is not just possible, it's becoming more and more practical and cost-effective. In some industries, it's becoming a financial and competitive imperative. More than a quarter of a century has passed since Taiichi Ohno's seminal book was published, and we finally have the technologies to unleash the full potential of Lean methodology. This accomplishment was beyond the reach of its inventor, but it's now within ours.

Are you using real-time access to manufacturing intelligence to support your Lean manufacturing across the enterprise? If so, I would be very interested to hear your stories. If not, I would be equally interested in have a discussion to explain what is now truly possible!



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When Taiichi Ohno first formulated his concept behind the Toyota Production System – now evolved into Lean manufacturing – he was several decades ahead of his time.

As described in his book, “Toyota Production System: Beyond Large-Scale Production,” his concept was based on a Pull approach to manufacturing, where processes and actions are triggered by actual events in the real world – such as a machine failure or the need for a part on the production line. This was opposed to the old way of production, called Push, where processes are guided more rigidly by plans and schedules.

In theory, Mr. Ohno proposed 2 pillars that formed the foundation of TPS. These are JIT (Just-In-Time) and autonomation (Jidoka). Both pillars are based on the concept of a Pull signal triggering a business process based on actual, real-time information.

JIT requires production activities to be carried out at just the right time in order to minimize any queuing of jobs or materials, which are considered waste. For example, the completion of a product downstream automatically triggers the start of an upstream assembly operation, so there is no unnecessary queuing of work-in-process materials.

Autonomation is about automating the business process of stopping machines and correcting problems based on a real-time response to the unplanned event of machine malfunction. This can prevent production of defective parts, eliminate overproduction and avoid delays. Autonomation relieves the workers from the need to continuously judge whether the operation of the machine is normal. The workers are then only engaged when there is an alert for a problem and hence can simultaneously supervise several machines to achieve better cost-effectiveness.

So why was Mr. Ohno ahead of his time?

Because the technology to fully enable his vision didn’t exist. Pull approach requires the real-time flow of data among all the steps of manufacturing, so that processes and timing can be tightly synchronized. Back then, with only mainframe batch-processing and rudimentary event sensing available, Taiichi Ohno sought to implement his system without the use of computers. And while he couldn’t fully realize his vision, he was able to succeed sufficiently to revolutionize production at Toyota and at manufacturing facilities around the world.

But that was then. Today, the necessary computer technology not only exists, but it is increasingly being used by manufacturers and their suppliers to explore the usage of real-time information in a complex production and supply chain. That means the full potential of the “The Toyota-Style Information System,” as Ohno envisioned it, is finally beginning to be realized today. And, it is making a very large impact on manufacturing enterprises

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When compared to the experience of my colleagues, my knowledge of continuous improvement programs such as Lean and Six Sigma is nascent. But, over the past six years that I have been working in the manufacturing industry, I have quickly learned about the importance of reducing waste by operating Lean. Lean thinking is almost a religion, given the focus, passion and intense conversations and philosophies that surround the topic. One of the hot conversation items in the past had been the role that an IT system plays in Lean. Some Lean proponents believe that there is no place for an IT system as it is adding work / complexity / etc. to the process, thereby creating waste.

IDC Manufacturing Insights recently published a report on Manufacturing Operations Technology that suggests otherwise. In the report there were some observations and conclusions about Lean that I found very interesting. First, it really does pay to be Lean. IDC Manufacturing Insights conducted research on 800 manufacturers that are part of an index that they regularly cover. Lean companies really do achieve greater profitability than “non-Lean” companies – on average they earn higher net profit margins that are nearly two percentage points higher. So, if you are considering a Lean program of your own, here is a good benchmark to include as part of your Return on Investment calculation.

After the financial crisis of 2008 and the natural disasters that hit Japan in 2011, companies have taken a less aggressive stance on inventory levels. Supply chain disruptions can be quite painful when operating with razor thin inventory levels, offsetting any possible efficiency gains from Lean manufacturing if customer orders can’t be filled. Despite operating with higher inventories today, Lean companies are still more profitable than “non-Lean” companies. This is attributed to the lower overall operating costs that have been achieved by taking a highly detailed, methodological examination of how all business processes are executed. It turns out that having lower inventory levels is just one component of Lean – the bigger picture is that performance improvement can come from many areas of operations, such as productivity gains, a lower cost of quality and less warranty and recall costs.

What was really interesting is the link that IDC was able to connect between how IT was used to drive Lean practices. IDC gave some examples of how this was a reality:



IT integration (e.g. implementing a Manufacturing Execution System) that supports process automation to avoid manual entries, overlapping requirements and achieving a more paperless environment



Centralizing master data management to reduce redundant and inconsistent data that leads to inaccurate reporting and inefficient business processes



IT enabled business process re-engineering projects for process analysis and optimization to improve performance

Throughout this eBook, we have delved into the transformative realm of lean manufacturing, offering a comprehensive understanding of its principles, methodologies, and real-world applications. As the complexities of the modern manufacturing industry become more apparent, the value of lean methodology becomes increasingly appealing. From waste reduction to continuous improvement, the principles of lean manufacturing open a path towards operational excellence and sustainable growth.

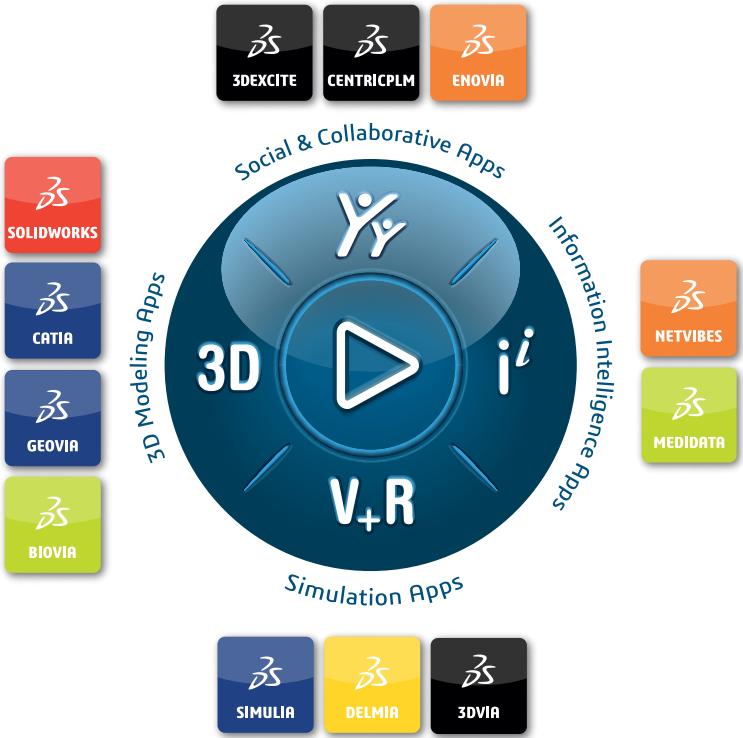
Evidently, however, the switch to lean manufacturing is a process and not a one-and-done deal. Only by embracing a culture of continuous improvement, fostering collaboration, and relentlessly pursuing efficiency can organizations not only survive but thrive with lean methodologies in the dynamic landscape of today's global market. Drive effective lean transformation in your organization with DELMIA support.

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