

Dealing with Chaos; 4 steps to manufacturing success

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“In previous iterations of supply chain evolution, excellence came from lean-influenced or demand-driven planning. However, with chaos or “chronic uncertainty” emerging as the dominant operational environment factor, this approach is no longer likely to result in competitive differentiation. The next generation of supply chain excellence will depend on chaos-tolerant business processes.”

Building Agile Manufacturing that Enables Transformation, Gartner, Inc. Research Note G00151457, Dan Miklovic, 17 September 2007 Consulting Group

Executive summary

Change, Uncertainty, Variability, Chaos ... call it what you will, but it is certain that the dramatic shifts in demand, supply, costs, availability of materials, energy, market conditions, interest rates, geopolitical issues, green initiatives, etc. that have emerged in recent years will continue, and likely get more volatile. Therefore, it is essential that companies first understand the impact external changes have on their operations, plans and competitiveness, and then proactively prepare themselves to thrive and grow in this new reality.

Many manufacturing and distribution companies have rightly focused on Lean operations and Lean thinking as key to competitiveness in today's global markets. Cost reduction, waste elimination, shortened lead-times, improved quality and demand-driven production all contribute to the success of industry leaders across the spectrum and around the globe. One prime characteristic of Lean operations, however, is the elimination of traditional 'buffers' that protect a manufacturer from disruptions caused by late receipts of parts and materials, equipment breakdowns, quality rejects, insufficient lead-times (promises within lead-time, engineering changes after production has started) changing demand, and other everyday challenges. In today's increasingly unpredictable environment, this lack of buffers places additional stress on the plant and the supply chain in their struggle to satisfy customer demands.

Contrary to what some might believe, a Lean enterprise is not one that does not need traditional information system support. On the contrary, Lean companies still need systems to manage customer orders and billing/collections, purchasing and supplier management, accounting and finance, engineering, and, yes, even materials and planning. In fact, planning and the included simulation, collaboration, and communications functions are critical tools for detecting impending or developing change, determining the projected impact of the change (before it affects operations), identifying the best strategy for responding to the change, and implementing that strategy not only in the plant but through the entire supply chain.

The pursuit of excellence

Manufacturers continually strive to become better – improving quality, reducing costs, increasing flexibility and agility, looking for ways to improve customer service. This imperative has led to a stream of developments in information systems (MRP, MRP II, ERP, SCM, SRM, CRM and many more) as well as a continuing evolution in operational strategies from just-in-time to TQM, Six Sigma, Kanban, and other lean approaches.

In recent years, a great deal of that effort has been focused on Lean initiatives, and that has been a good thing. Lean companies now dominate many vertical industries with lower costs, superior quality, and great flexibility from efficient processes and a culture of continuous improvement. We've learned from the Japanese and the automotive industry in general that demand-driven operations and a focus on supply chain efficiencies can pay big dividends in almost any manufacturing environment.

Today, however, the manufacturing world is characterized by uncertainty. The dramatic swings in the cost of oil and all related petroleum-based materials are just one example of many. Critical raw materials are suddenly in short supply as weather patterns disrupt fragile supply chains. Wildly fluctuating exchange rates change the economics of imported materials and the demand for exported products. Stresses in the banking arena influence the availability of funds and credit as well as interest rates and stock values. Civil unrest changes the availability of materials and the nature of demand in certain areas of the world. Any disruption caused by, say, a labor dispute or a warehouse fire, ripples through the supply chain causing havoc across entire industries around the globe.

Lean operations, by their very nature, reduce or eliminate the usual “buffers” that manufacturers build into their operations to overcome expected volatility. Extra inventory (often called ‘safety stock’), padded lead-times, generous lot sizing, and ‘shrinkage’ allowances all contribute to an ability to continue operations when the inevitable but unwelcome disruption occurs. A late delivery from a vendor? Unexpectedly high reject rates? Short counts? Machine breakdowns? No problem if there is extra inventory to continue operations until the disruption is resolved. But each of these buffers increases inventory and inventory is an undesirable commodity in a tightly managed, efficient (Lean) environment. Lean companies strive to eliminate inventory and other wasteful practices but in so doing can become more vulnerable to disruptions.

It is not our intention here to disparage Lean in any way. To the contrary, Lean thinking and the use of Lean techniques are now essential to competitiveness in many industries. It is important, however, for companies to understand the impact changes have on operations, plans and competitiveness, and proactively prepare themselves to thrive and grow in this new reality. Be aware, too, that Lean companies must still plan. In fact, effective and dynamic planning is even more critical in a Lean environment where there is much less room for errors or surprises.

The Lean enterprise and the Lean supply chain are a veritable ballet of coordinated activities designed to minimize “waste” – defined as anything that does not add value. Prime examples of waste are inventory, handling, and delays that are not essential to producing the product and delivering on-time to the customer. Extending the ballet analogy a bit, if one dancer trips, it can ruin the whole performance.

Lean enterprises do not operate solely on mechanical methods like kanban. Even in the Leanest of plants, there is still a need for computer systems to manage customer orders and billing/ collections, purchasing and supplier management, accounting and finance, engineering, and, yes, even materials and planning. Parts of traditional ERP systems, customer software, and ERPs specifically adapted to serving these needs in a Lean environment provide the needed functionality to manage the operations that support the demand-driven production line and closely coordinated supply chain. The good news is that these systems are also the key to keeping the Lean plant operating in a chaotic world.

Lean or not, manufacturing companies are faced with the challenge of recognizing change as early as possible, assessing the potential impact of the change, formulating an appropriate response, and implementing that response in the most expeditious manner possible. The intelligent application of information management technology is a key part of that process.

Demand disturbances

Lean enterprises are “demand driven” meaning that, at least in theory, nothing happens until there is a customer order (demand). As soon as there is demand, all activities are tied to that demand in a ‘pull’ execution strategy – materials are pulled into and through the plant to make the product and ship it out. In reality, everything must be prepared in advance to be able to respond to the demand signal. And that takes planning. Inherent in that planning process is some kind of forecast. Based on the forecast and plan, production facilities are set up, materials and components are staged, and everything is ready to respond quickly. When the demand hits and the products are produced, replenishment activities pull replacements into line ready for the next demand.

When demand changes, or does not fit the forecast, the otherwise smooth execution no longer meets demand exactly and the intricate arrangement of production and material flow is now out of synch. The most effective preventive strategy is early detection and quick adjustment to minimize waste and assure product availability.

First off, the forecast must be as accurate as possible and carefully monitored. This is best done through working closely with key customers using collaboration technologies built into modern planning suites. Then monitor the forecast and use business intelligence applications to help detect trends and changes. Next, advanced demand planning applications offer simulation capabilities to let you try various ‘what-if’ scenarios to identify the impact of changes and formulate the best response strategy. Finally, lock in the revised plan and let the system communicate the necessary changes through the plant and down through the entire supply chain.

Before Pawtucket, Rhode Island-based Colonial Mills installed Infor ERP SyteLine (now Infor ERP SL), the maker of braided rugs struggled to maintain an 81% on-time shipment and 7.5 days from order to shipment for the 150,000 items that they manufacture and distribute. After implementation, company CIO Bill Turgeon says “Now we can view all details within the manufacturing process ... alerting us to potential problems so we can react in time.” Colonial Mills quickly raised its on-time record to 92% while cutting order-to-shipment time in half. “Most of our competition quotes delivery of 20 days or longer.”

Even though the rug designs Colonial now manufactures are the most complicated in the company's history, production rates and other key measurements translate into higher profitability. “We credit SyteLine and a dedication to Lean principles. The application made all the difference in helping us maintain our position as industry leader in on-time shipment and low turnaround time.” Colonial is much better able to respond to varying demand and has reduced costs at the same time.

Supply snafus

It happens to all of us. A key supplier fails to meet a delivery date. A transportation foul-up delays a shipment. A key material suddenly becomes in short supply. A lot fails inspection and is not usable. If there isn't enough extra inventory to cover the problem, production will be interrupted. Again, early detection and quick response, and fixing the problem once and for all, are the keys to resolving this kind of problem. But preparation can help minimize the damage.

Most Lean enterprises have established close working relationships with suppliers – pretty much a necessity for getting the kind of service necessary to be successful with Lean. Working closely within those relationships to avoid the kind of disruptions listed above is the first step. Despite your (joint) best efforts, sometimes problems cannot be avoided. In those cases, your planning system can help you quickly identify the impact of the shortage and how you might be able to redeploy production resources in the interim. Also, you may have contingencies built into your plan (alternate suppliers, substitute parts) that could be activated on short notice. It's good to have thought these things through in advance so you are prepared to move quickly to resolve the problem.

Changes in the global supply chain hit hard when lead times for critical materials went from a few days to at least 30 days – and sometimes as much as 120 days – for cleaning product and industrial chemical supplier CPAC, Inc. This wake-up call motivated CPAC to get better control of inventory information and integrate business information from forecasting to manufacturing and distribution with Infor ERP Syteline. “The flexibility that the system gave us was critical in allowing us to react to constantly changing customer needs and the market while maintaining reasonable inventory levels,” according to Jim Mullin, CPAC division IT manager. “Rush shipments have decreased by more than 40%.” The company is implementing the SyteLine forecasting application to help manage the changes in the ordering process required by the new, longer lead times.

Production perturbances

In a conventional (non-flow) plant, production control and capacity planning applications provide the tools to schedule and manage the flow of work through the plant. When that flow is interrupted because of schedule changes (change in demand, late order change, late engineering change), material or part shortages, or because of production problems (machine breakdowns, unscheduled maintenance, personnel issues, etc.), the scheduling system will react immediately to adjust to the changed conditions. Once the scheduler is made aware of the change in production status, the impact on job completions can be seen immediately. If there are possible work-arounds (alternate work centers that can complete the operations, outside vendors to off-load the work to) that impact can be simulated to get new estimates of completion and shipments. In any case, the system can tell you when work will be completed under the new situation so you can alert customers, if necessary. In addition, schedules can and should be adjusted for all other resources in the plant to keep them productive while the problem is being rectified.

In a flow shop, it's not so easy to adjust to disruptions. In some cases, it may be possible to change the product mix to work around changes in demand or supply but generally changeover has a considerable cost and unplanned changeovers should be avoided if at all possible. In most cases, then, it is best to attack supply and equipment problems directly, in order to get the process back on-line as quickly as possible. Once again, preparation is the key. If there are alternate suppliers or substitute materials, now is the time to activate them – your planning system can show the impact of the disturbance and simulate the recovery alternatives so you can choose the best approach. It is also of critical importance to utilize enterprise asset management and maintenance management systems to proactively avoid equipment breakdowns and unplanned outages.

For production problems, options are limited. When a line is down, it's down. The system can show the impact on projected customer shipments and, if it is a feeder line that's down, immediately identify the products, customers and shipments that will be affected and by how much. Simulation of potential failures can help you be better prepared by clearly identifying the impact and helping you choose compensatory strategies to result in the best customer service and minimum overall cost.

Design dilemmas

Late order changes and late engineering changes – those that occur after the start of production – are a difficult but unavoidable fact of life for many manufacturers. There are two strategies that can help here – prevention and effective change control.

Enhanced engineering processes might help avoid 'late' changes by shortening the engineering process and improving the quality of the initial release. Integrated engineering control and release applications manage documents, specifications and workflow. They enhance the ability to coordinate with other departments – procurement, production, finance, and customer service – to improve the manufacturability and appropriateness of the design, and manage the release process so that all areas of the business are on board with the release of the product or change. Collaboration enhancements help you include customers and suppliers in the design and development processes to exploit their expertise and capabilities as well. If it is a change to an existing product or an item already in production, the integrated tools can help assess the impact of the change and assist in determining the best break-in point to minimize waste, scrap, and obsolescence.

In cases where there is a change after production has started, the important thing is to put the change into place as quickly and effectively as possible. Effectively, in this instance, means full coordination with all affected departments and resources, careful consideration of the impact of the change, management of the change implementation process for minimum waste and disruption, and good communication so that all parties are on board with the change as it goes into effect. It should be obvious that integrated information management systems are essential for accomplishing a smooth engineering change implementation. The workflow function manages the communication and coordination as well as the updating of files and schedules. The integration supports impact analysis and planning.

Quality quandaries

Regardless of varying demands, supply disruptions, production problems, or all of the aforementioned challenges, quality is and will remain a basic requirement for all manufacturers in all industries. Although modern management theory dictates that quality should be designed in and built-in rather than added on through inspection and old-fashioned QC, it is imperative to measure, monitor and, in most cases, document quality through all stages of the product lifecycle. Integrated quality applications help get this important job done with minimal impact on production and operations.

In the context of variation and uncertainty, solid quality processes and quality management can help reduce surprises – more reliability of incoming parts and materials (fewer rejects through working closely with suppliers to insure quality), fewer production disruptions (early detection of control issues, often before bad products are produced or production must be disrupted), and reduced rework and rejects on completed products.

Recognizing change – and assessing the impact

As with most things, the earlier a problem or situation is recognized, the easier it is to fix and the impact will be minimized. It is far better to identify a potential future shortage than to find out the supply is exhausted when the part is needed. Preventive action is nearly always less expensive and less disruptive than corrective action. Therefore it is important to always know what is happening within the plant, and as much as possible, up and down the supply chain.

Identifying or predicting a change in demand at the outset can prevent a lot of unsold product or shortages later on. Further, demand changes have a profound impact on production schedules and the need for parts and materials, so early detection of a change in the trend is a signal to adjust all production and procurement plans to accommodate the change. But not just blindly and mechanically – one of the defining characteristics of a Lean operation is level production, so any change in plans to accommodate demand changes should be carefully considered in light of the demand of most efficient production.

Early detection affords the luxury of time to assess the potential impact of the change. In many cases, a quick adjustment will avoid the majority of the disruption and difficulty. Absent the ability to make the adjustment quickly, simulation and planning systems can identify the costs – money, production schedules, and/or customer service – that will result from the disruption.

Finding the proper response

Sometimes the proper corrective action is obvious – if demand is turning down, reduce production and procurement. If demand is moving up, do the opposite. But it's not always that simple. Sometimes supplies are limited or production cannot be increased enough. Or it might not be desirable to simply reduce production for various reasons. In those situations, it is extremely helpful to be able to conduct simulations – 'what if' analyses – to model the result of various actions.

Planning applications can model an entire supply chain and complete 'what-if' analyses that can be shared with suppliers so that all participants are prepared for likely scenarios. Contingency plans with suppliers (and your own production facilities) make it easier and quicker to make the necessary adjustments – you already know what to do and it's just a matter of putting those contingency plans into effect.

Simulation lets you try out any number of alternative strategies and determine which keeps production flowing smoothly with minimum extra costs (expediting, premium freight, overtime, etc.). You can specify the relative importance of each factor and 'trade them off' to find the solution that is most acceptable.

Implementing the response

Plans are good but they must be executed. The final step is to complete the actions outlined above and monitor the results. Because the plans and simulations are part of the same system that manages the process, passing the new instructions to all affected parties is quick and easy – and all departments are tied in and coordinated. It is important to monitor all activities during and after the response is implemented to insure that everything is proceeding as planned, the response is the right one, and production objectives (and customer service) are being achieved. Also, the cause of the disruption merits continued monitoring to confirm that the change occurred as predicted, is continuing, and has not mutated even more than anticipated. It is a continuing process, and changes continue to disrupt the best laid plans.

Summary

Manufacturers and distributors have embraced the Lean philosophy to great benefit in improved performance, shorter lead-times, better quality and lowered costs. The tight controls necessary for success with Lean, however, leave companies more vulnerable to supply disruptions, production problems, quality issues, and abrupt changes in demand.

All indications are that variability, chaos, uncertainty, change – however you choose to characterize it – will continue to be an increasingly challenging fact of life. It is essential that companies first understand the impact external changes have on their operations, plans and competitiveness, and then proactively prepare themselves to thrive and grow in this new reality. Manufacturers, therefore, must be prepared to recognize impending change as early as possible, assess the potential impact, determine the optimum strategy for dealing with the change, and implement that strategy in the most effective way possible.

The key to that four-step operating philosophy can be found in broad-based, integrated information management systems like Infor ERP SL. With forecasting and comprehensive measurement systems to detect change, advanced planning systems and simulation to assess the impact and formulate a response, integrated enterprise and supply chain applications and workflow to communicate through the supply chain, manage the response and monitor quality and performance, Infor ERP SL gives you the visibility, tools, and capabilities to meet the challenge and succeed.

While it is important to have Lean operations – it is now also important that manufacturing operations and the supply chain are flexible and prepared to react to change. Together, this Lean, flexible, and efficient operation will allow your facility to continue to reduce operational costs, increase cash flow, increase company value whether public and private, and most importantly, grow your business on a global basis.



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