Lean Manufacturing

Lean Manufacturing: The Advantages of Adopting Agile Operations

Holly B. Martin | Mar 17, 2020

Agile methodologies were born out of the need to regulate and reduce the cost of frequent changes in the software development process. Now, the idea of agile is taking hold in a host of other sectors, including manufacturing.

What exactly is agile manufacturing? How is it connected to lean manufacturing? And how can your business take advantage of both approaches?

Agile development began in 2001 when a small group of software developers met and agreed on the ***Agile Manifesto***, which outlined four core values for software development. Those values stressed human interactions and customer collaboration and placed a greater emphasis on responding quickly to change rather than following a set development plan.

> **"Lean is a way to be more agile, because lean, at its core, is the elimination of waste."**
> Adrian Pask
> Vice President, International Development, Vorne

The original four agile values were later expanded to ***12 principles*** and adopted by other areas of the IT business, such as hardware, operations and support.

As agile has evolved, various organizations have sought to combine the approach with lean manufacturing methods—the ***Scaled Agile Framework*** group, for example—but the two approaches are not identical.

Lean vs. Agile Manufacturing

"Agile manufacturing means remaining flexible in order to respond to new opportunities in an efficient and effective manner, whereas lean manufacturing is about minimizing waste," explains Joseph Sarkis, a professor of manufacturing technology management at Worcester Polytechnic Institute.

Agile Meets Additive Manufacturing

If there's one place where an agile process fits well, it's in additive manufacturing, says Joseph Sarkis of Worcester Polytechnic Institute.

In additive manufacturing, where an object is produced layer by layer over time, "you have the flexibility to put a new design program in your machine and produce a different part, and you don't have to hold a lot of finished inventory," he notes.

Of course, additive manufacturing requires holding more raw materials in storage, rather than machined components, which may add more expense than a low-inventory lean system, but there's also more flexibility in what can be produced from that shop.

"If you're going to try to be as flexible as possible and respond to unknown needs, then agile manufacturing may be better than lean for additive," Sarkis says. "And the MRO environment may be appropriate for that because you can produce whatever product you need from the raw material much more quickly."

Depending on the part design and material, the cost of additively manufacturing a part may still run higher on a per-unit basis than it would cost in a mass manufactured situation, but the benefits could definitely outweigh the costs, he says.

"While lean would say, 'Let's get rid of the excess capacity because it's costly to keep it around,' being agile means building flexibility into your system, and that may even mean holding extra slack capacity."

Stable demand and a stable environment are necessary for lean to really work, Sarkis says. That's so you can minimize waste and give customers the best low-cost solution, he adds.

"However, for agile, effectiveness is probably more important—being able to produce whatever the customer needs whenever they need it and addressing that market opportunity," Sarkis says. "Agile allows you to focus on the dynamics of the situation and being able to offer a much wider variety to your customers."

Read more about "Transforming to Lean Manufacturing."

How Agile Manufacturing Can Play Out

MRO—or maintenance, repair and operations—can be an ideal fit for agile manufacturing practices, although the effectiveness of MRO under those practices depends on the shop in question.

Some shops may have more consistent demands for parts or repairs, so they would do well as lean businesses for managing costs and efficiencies.

Other shops, such as aircraft repair, may need certain parts that are more expensive to make or buy, including used parts that might be difficult to obtain. These shops must manage a lot more uncertainty

in their supply chains: Will they be able to deliver what the customers want on time? Agile systems are better positioned to respond to that uncertainty, Sarkis says.

“Those one-offs—those parts that rarely fail—have to be held in inventory just as much as those that fail more often,” he says. “And when you’re keeping a lot of inventory, clearly that’s not fully lean.”

Balancing Lean Manufacturing and Agile Manufacturing

The idea of agile is to be fast and iterative, so when a customer wants something, you make it. But for that process to work you have to be confident in your company’s ability to produce the product on time and in full, says Adrian Pask, vice president of international development at Vorne, a company that uses agile for software development.

“If my customer says, ‘I want these 10 machined metal widgets, and I need them soon,’ if I am agile and can produce those widgets in two days, that’s a good thing,” Pask says. “But you do have an associated cost with that because you’ll have to tool up and ramp up very quickly—or else find more machine capacity somewhere.”

These competing demands create a tension between using your machines at maximum capacity and holding back some capacity to respond to new orders, he adds.

“As a manufacturer, I want my machines to be utilized as efficiently as possible, so I want less variation and longer production runs,” Pask says.

But long runs also mean you could be creating work in progress, which refers to any material that is only partway through the production process. Lean manufacturing aims to minimize WIP by working in small, distributed batches. Why? Because any WIP indicates bottlenecks in areas such as post-processing or shipping. These bottlenecks can affect customer service, productivity and efficiency, and ultimately cost money.

Managing the MRO Trade-Offs

Companies will likely adopt agile practices according to their needs, Pask says.

“Part of their approach may be movement from lean towards agile, where the benefit is greater responsiveness and more flexibility,” he says.

Doing so will help the company manage the risk of not being able to deliver what the customer needs in time because of a lack of resources, personnel or machine capability.

“If you’re making a single piece and that piece costs thousands of dollars, you’re not going to keep that in inventory. You are going to make it on demand,” Pask says. “In that case, you just want to be as responsive as possible, and lean efficiencies might buy you some responsiveness, but you also need the agility provided by reserve machining capacity, labor and materials.”

The company that can tool up its equipment quickly and offer the lowest lead time will have an advantage in this situation, he says.

“The way I would see the relationship here is that lean is a way to be more agile, because lean, at its core, is the elimination of waste,” Pask says.

The Language of Lean

There are a variety of workplace organization methods within lean manufacturing. Here are four examples that will increase efficiency and improve working conditions from the shop floor to the front office.

Poka Yoke

(mistake-proofing) in lean manufacturing prevents errors and improves safety. For example, use electrical sockets that allow plugs to be inserted only in one direction or machine enclosure interlocks that prevent operation while the door is open.

5S

(standards and discipline) methodology inspires those who like a clean, well-organized workplace. Implementing 5S (Sort, Straighten, Shine, Standardize, Sustain) often provides significant benefits, potentially increasing overall efficiency by 10 to 30 percent.

PDCA

(Plan, Do, Check, Act) is a four–step project management model for carrying out change. Just as a circle has no end, the PDCA cycle should be repeated continuously for improvement.

SMART Goals

(Specific, Measurable, Attainable, Relevant and Time-Specific) are valuable tools for measuring performance but should be balanced against W. Edwards Deming's Point #11 detailed in his book *Out of the Crisis* where he describes that excluding workplace quotas is only contingent upon successful transformation.

Final Thought

"You know that lean is working when the shop is clean and well-organized; no one's in firefighting mode. Everyone shares information, with clearly defined metrics, and pride of ownership."—*Mike Petkewich, senior knowledge expert and team manager for Lean and Manufacturing, Boston Consulting Group*

How has your shop incorporated agile processes in its operations? What unique challenges have you faced making this transition?

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