



Lean/Six Sigma: The quest for efficiency in manufacturing

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Management slogans often boil down to little more than platitudes in slick consultancy packaging. But some corporate lingo stands for more than a passing fad. "Lean manufacturing", a shorthand for a commitment to eliminating waste, simplifying procedures and speeding up production, is one such concept. Six Sigma, the quality-assurance principles that are often paired with lean efforts, is another. The principles and techniques that the two terms encompass have been shown to deliver impressive bottom-line results in industrial manufacturing.

To be sure, the taint of best-seller management slogans lingers over lean and Six Sigma, leading many executives to dismiss the terms as mere jargon or consultancy buzzwords.

"The western hemisphere is full of program-of-the-month syndrome," says Anand Sharma, president and CEO of TBM Consulting Group, a U.S. firm that helps companies adopt lean and Six Sigma principles. "It's more fashionable today to talk about 'lean' than to do it."

But manufacturers that have gone beyond words to deeds and embraced lean and Six Sigma report tangible, sustained gains.

"This is not a program," says Denny Van Zanten, manufacturing vice president at Pella, a major American window and door maker that first adopted lean methods 10 years ago and is still reaping the returns. "Lean is a part of Pella's culture."

Adds Stephen Printz, Pella's chief information officer: "Here, lean is a way of life."

Emerson Electric is another proponent.

"Lean is clearly a significant strategy for us," says Steve Hamby, Emerson's vice president of IT shared services. "It's a concept, a strategy and a philosophy. This thing is real."

Learning lean lessons

At the heart of lean manufacturing is a focus on the reduction of inventory and lead times. Production is driven by real customer orders, rather than forecasts that anticipate market demand. This means that demand "pulls" a product through production, rather than management forecasts "pushing" it onto the shop floor. Six Sigma, by contrast, is oriented to improving product quality and consistency by reducing the flaws that occur in manufacturing.

For many manufacturers, linking lean with Six Sigma is a perfect marriage, providing the tools needed to meet real demand with high-quality products in the shortest time possible.

"They are really complementary things," says Bob Parker, research vice president at Boston's AMR Research. "The whole is greater than the sum of the parts."

Lean and Six Sigma have gained a following where other management cures have failed, largely owing to word of mouth and the demonstration effect of industry success stories.

"It starts with a CEO waking up in a cold sweat," says Parker. "Maybe they know someone at GE and they've seen the amazing results."

Internal pilot programs are also persuasive. A few divisions of U.S. manufacturer Emerson Electric began applying lean principles five or six years ago.

"Following that, as senior management saw different results at different locations, they began to raise lean's visibility" within Emerson, says Chris Stephen, director of systems planning and e-business development. "They appointed a vice president at the corporate level with full-time responsibility to put together several plans and measurable results for lean."

The impulse to adopt lean methods can also come from business partners.

After years of working with lean and Six Sigma principles, many companies realize that, to continue improving, they need to get suppliers and even customers involved — such as happened with Toyota.

"Companies get their suppliers into Six Sigma," says Georg Reindl, Oracle's European director of high-technology industry business. In Europe's largest countries, he says, manufacturers "are all working in this direction and using lean."

Once companies have adopted lean and Six Sigma principles, some benefits come quickly, others more slowly. But the beauty of lean manufacturing is its focus on continuous improvement, and, thus, on a steady flow of benefits. The most advanced users of the two techniques expand the concept well beyond the manufacturing process, and apply them to every corporate activity, even communications and processes involving suppliers. Here the focus is on a "lean enterprise" rather than simply on "lean manufacturing."

Among the chief benefits are:

Cost efficiency: Many companies initially look to lean methods as a means to reduce manufacturing costs.

Indeed, an Economist Intelligence Unit survey of 83 manufacturing executives showed that 90 percent of respondents — the largest group — saw reduced costs as a goal of lean/Six Sigma programs (see Table 1).

But lean veterans warn that focusing solely on costs is shortsighted. The savings come, to be sure, but an exclusive focus on cost reduction can leave a manufacturer with unsustainable improvements.

"Companies that take a narrow approach to lean get some cost improvements," says AMR's

Parker, noting that some companies use lean as an alibi for layoffs or to squeeze lower prices out of suppliers. "But the results are not sustainable," he warns.

A healthier approach is to treat lean as a stimulus to growth.

"The key to Pella's success is our people," says Van Zanten, noting that Pella's headcount has grown significantly since embracing lean.

Rather than laying off factory staff as processes have become more efficient, the firm has expanded its product line to include doors. In fact, companies that have adopted the lean approach often find that their market share increases because quality and lead-time improvements give them powerful competitive advantages.

Inventory reduction: Carrying inventory costs a company in warehouse space, constrained capital and potential handling damage. Excessive inventory also slows down the manufacturing process and becomes a drag on lead times while reducing needed agility. Companies making smaller product batches are also more likely to spot and easily repair defects without disrupting production cycles. At Pella, as soon as the window maker began lean manufacturing in 1993, manufacturing costs dropped, inventory shrunk and there was more available space on the shop floor.

"We had fantastic results," remembers Van Zanten, adding, "You can see the strong upward trend in our sales growth."

Shorter cycle times: Through tireless elimination of waste in production, dedicated lean practitioners such as Emerson, Pella, Toyota and controls and tools maker Danaher are able to manufacture products more quickly.

“The shorter cycle times give you a lot more flexibility” to respond to market shifts, explains Parker.

Customer orders can enter the manufacturing process sooner, without having to wait for a planned lot, and materials progress through the production process faster, without waiting in lengthy queues at each workstation.

Greater flexibility: That flexibility is key in many industries today — from home appliances to large industrial equipment — where product life cycles are shrinking.

“Global companies need to become real-time enterprises,” notes Oracle’s Mr. Reindl. “If they don’t have lean processes in place, they won’t be able to meet market demands.”

Enhanced agility — the ability to respond almost immediately to customer demands — is a key benefit of a lean approach.

Challenges to lean efforts

Programs that deliver continuous improvement also require continuous effort, however, and companies should shed any illusion that reaping the benefits of lean/Six Sigma is easy. As with all change, achieving a transformation to lean manufacturing takes hard work, inspired leadership and indefatigable dedication.

A first challenge is to move beyond slogans to deeds, and actually implement lean principles. Only half the companies that say they are adopting lean and Six Sigma principles are actually doing so, estimates Sharma. A key test, he says, is to check the firm’s inventory turns. If a manufacturer turns its inventory only six times a year, or once every two months, the firm can hardly be called lean. Companies committed to lean methods are more likely to have an inventory turn of 10 or higher.

“To be responsive, you have to lower lead times,” Sharma adds.

Corporate inertia is another obstacle, particularly where shop-floor personnel cling to traditional notions learned early in their careers. It’s hard, for example, for the operator of an expensive machine to discard the notion that idle machinery loses money. After decades of getting the most production possible out of all machinery, workers have a hard time understanding how much a company loses when it produces products for which there is no demand.

There are conceptual challenges for management as well. Managers need to understand that the old measures of success — efficiency and utilization — have been supplanted by agility, increased inventory turns and reduced cycle times, along with top quality. The measures needed to effect this change in mind-set can upset many longstanding processes, including performance reviews and pay rates, and raise strong emotions. Indeed, half of the respondents to the Economist Intelligence Unit survey identified company culture as a key challenge for lean/Six Sigma, and 45 percent cited a lack of resources for staff training as a stumbling block.

The upheaval inherent in Lean/Six Sigma programs means that the engagement of senior management is required for successful implementation. Adequate resources must be allocated

to train employees, and resolve is also necessary to push through reorganization in production processes and inventory management.

“A lot of companies want to go down the lean path but they waver on the senior team commitment,” says Pella’s Printz.

Using technology to get lean

A final challenge comes in employing technology to create a rapid and efficient flow of information between all the parties in a supply chain. Such a seamless information flow is essential to reaping the benefits of lean/Six Sigma. IT allows lean manufacturers to stay in sync with suppliers, says Parker, while helping to tackle the unwieldy challenges of modeling, calibrating, operating and improving manufacturing.

“Technology can look forward to tell you how to smooth production and optimize customer service levels,” says Sharma.

IT can also help with “what-ifs” in, for example, reconfiguring a factory floor or determining the optimal location for inventory.

Especially at large organizations, where so many departments, plants and subsidiaries need to operate together to achieve a common goal, technology can help to keep everyone moving in step with, for example, flow scheduling.

“Information can help quicken and sustain the adoption of lean,” says Manish Modi, Oracle’s senior director of manufacturing applications development. “Technology truly helps you move to a make-to-demand model.”

A good technology backbone system acts as a repository for customer and production data and provides the key performance indicators that are used to measure success in both lean and Six Sigma initiatives.

Corporate business systems need to be flexible enough to allow the data flow to map closely to business processes; otherwise, errors and inefficiencies can creep in. Flexibility is also key to the “controlled experiment,” a core lean/Six Sigma principle that calls for testing a variety of possible outcomes to determine an optimal solution. If information cannot be captured accurately for such scenarios, the results may be distorted or completely useless. Advanced technology systems now include multiple business process flows that enable companies to run such tests.

These “best practice” business flows can inspire other companies to jumpstart their own process mapping.

For all the pluses, companies using technology to achieve Lean/Six Sigma goals need to heed two guidelines:

First, an emphasis on simplicity means that the adoption of lean methods does not necessarily entail higher IT spending. Emerson’s IT Shared Services department has been able, in fact, to use lean methods to reduce costly or unnecessary IT use.

Lean manufacturing aims to reduce transactions to a minimum, so it can eliminate needless transactions that raise reporting and labor costs — without adding value.

Second, it’s crucial that business needs, rather than technology, determine the actual map of information flow.

“You have physically to change your process first and then bring in the technology to help,” says Sharma. “You cannot depend on technology alone. Using technology as a panacea gets a lot of companies into trouble.”

Pella’s Van Zanten concurs.

“Simplify the process first,” he recommends, “and then technology is a beautiful thing.”

SIDEBARS

The origins of “lean”

“Lean” was a Japanese invention, inspired by a plant tour of Ford Motors in the 1950s. After watching an American assembly plant build cars in a more efficient way than they used at home, two Japanese executives developed the Toyota Production System (TPS). This approach propelled Toyota from a modest domestic firm to a global car giant.

Indeed, while much of the car industry has suffered from a lackluster economy, Toyota saw its net income increase 23.2 percent in the half year to September 2003 from the same period the previous year — on a revenue increase of 8 percent.

“Today, even when everyone else is struggling, Toyota continues to make money,” says Anand Sharma.

Once TPS was well established within Toyota, the firm recognized that many potential gains would go unrealized if its partners weren’t also involved. So in the 1970s, Yoshiki Iwata and other lean pioneers from Toyota created Shingijutsu, a consulting company with the mission of bringing the TPS gospel to outside firms. As early as 1989, Shingijutsu worked with Danaher’s Jacobs Equipment Company brake plant and helped to establish it as the first facility in the U.S. to go lean. TPS eventually came to widespread notice in the US with the 1992 opening of a Toyota Supplier Support Center (TSSC) in the

U.S. state of Kentucky.

In the years since TPS was developed, lean principles have expanded beyond Japanese car making to other industries and around the globe. In Asia, most multinationals are already involved in lean programs, and “there is a big uptake among indigenous” local manufacturers as well, says Brad Perkins, a senior director in discrete manufacturing industries at Oracle in Singapore.

In the U.S., carmakers have a lead, but other industries are waking up to the opportunity, says Manish Modi, Oracle’s senior director of manufacturing applications development.

U.S. manufacturing companies that had been firmly focused on other techniques such as just-in-time manufacturing were quick to adopt and rapidly refine lean manufacturing. Industry segments where margins are very thin, such as automotive and industrials, lead the way.

Six Sigma is often paired with Lean principles in manufacturing efforts to ensure flawless product quality and repeatable execution. It originated in the U.S. in 1986, when Bill Smith, a senior engineer and scientist at Motorola, devised a standardized way to count defects. The name is inspired by the Greek letter sigma, used to denote standard deviations in statistics. Six Sigma programs, employed by firms as diverse as GE, Allied Signal and Tyco, use detailed data analysis to improve all business processes, with the aim of achieving a defect rate no higher than 3.4 per million. Coupling lean and Six Sigma helps deliver value to customers in a repeatable manner.