A lean marriage

It's getting more common for manufacturers to adopt both lean and Six Sigma. Annie Gregory asks where the two meet and how well they marry together in practice

If you Google 'Six Sigma' you will currently come up with around nine million entries. 'Lean' however flashes up a mighty 47 million. What does this tell us (apart from the folly of having a name beginning with Z if you want to be a successful lean consultant)? Well, if volume is any indication of appetite, lean is still the clear winner among industrial methodologies.

But what about this: when you Google 'lean Six Sigma' you come up with over 12 million entries. Clearly, this is no more than a cursory indication. It may, however, indicate that the notion of Six Sigma is a lot more enticing when it is married to the comfortable and familiar concept of lean.

The trouble with any new notion appearing in the industrial arsenal is that it's difficult to distinguish bandwagon from breakthrough. Pure Six Sigma has passionate adherents. But it has also spawned a lot of consultancies promising to turn those with sparse mathematical abilities into fully-fledged blackbelts at the drop of a calculator. It's not an easy approach to manufacturing improvement and industry is littered with Six Sigma programmes that have gone nowhere. Harnessing it to lean is not necessarily going to make it any easier.

Let's take a quick look at the basics. Six Sigma was originally developed by Motorola, which reports savings of over $17 billion through its use, and it has successfully been adopted by a lot of major companies, notably General Electric which is positively messianic about the results. It employs a variety of methods, most of them statistical, to identify and remove the causes of variation and defects to achieve stable and predictable process results. The Six Sigma gold medal goes to operations showing fewer than 3.4 defects per million opportunities. The underpinning conviction is that improvements need to be made on the back of verifiable data rather than assumptions, with the emphasis on reducing variation. This is at sharp variance with the overriding mantra of lean, which centres on reducing waste through mapping value streams. And where lean tends to pick off incremental improvements across all operations, Six Sigma tends to focus on a small number of large projects, using specialised solutions.

It is common to find Six Sigma and lean programmes running separately but concurrently – and often competitively - in the same big organisation. Presumably the head honchos can see the point of this but, frankly, the logic escapes me. One of the primary justifications for marrying lean to Six Sigma is to circumvent the difficulties of managing and motivating parallel activities, one (lean) involving the entire workforce and one (Six Sigma) operating through a team of champion, black, yellow and greenbelts that can easily be perceived as elitist by the shopfloor.

This assumes, of course, that manufacturers even know the difference. Sylvain Briand and Andy Lawson, specialists at London Manufacturing Advisory Service (MAS), say that they often go into businesses that have heard of neither: "What would [then] be the point of arguing with them about the benefits of using either, or both? Ultimately, it is down to identifying

the business issues first." They point to a typical situation where a manufacturer believes it could double production output by investing in expensive equipment. On investigation, however, they discover the output from the current equipment still sits on the shopfloor or in a warehouse before moving to the next stage of production.

Doubling the output would only double the work-in-progress and not bring any benefits to the business or its customers," they explain.

"Clearly, in these cases, a holistic lean-based approach to smooth the flow of products throughout the operations and, perhaps at a later stage, through the extended supply chain would be more beneficial than investing in the first place. At the same time, Six Sigma projects could be launched to remove the causes that turn certain processes into bottleneck operations."

Lawson cites another example of a happy marriage in the work he and Briand carried out with a manufacturer of high-tech food sorting equipment prior to its move to a new site. The old one was organised into specialised process clusters rather than product streams which made product flow very difficult. The pair helped it relay its new facilities on lean principles, to its immediate advantage. At the same time, they all used Six Sigma tools and techniques to identify and control the sources of process time variation on a key sub-assembly process that was severely impacting both the overall assembly process and the quality of the end product. They also employed the standard Six Sigma framework of DMAIC (Define, Measure, Analyse, Improve, Control) to put corrective actions into place. Lawson points out that without lean techniques they would not have improved product flow and output; without Six Sigma, they could not have combated the subassembly variations that were also damaging the end product. "Ultimately, understanding what the business issues are and how lean Six Sigma can be applied is key to selecting the right course of action," they maintain. Beyond that, does it really matter what you call it?

Stewart Donnelly, practitioner with MAS West Midlands, is himself one of the five Six Sigma blackbelts in the organisation, yet he takes an even more pragmatic approach: "It's definitely got its place but even while we were training, we kept bringing in all the lean tools, pointing out that if we controlled variation beforehand, we wouldn't need to spend time with smart Six Sigma tools." He believes that if you have systems in place, stick to them, standardise what you do and embrace all the lean tools such as 5S and TPM (total productive maintenance) then most of the problems of variation can be solved. Then it may be worth turning to Six Sigma for the more intractable issues: "I liken it to a Cruise missile – a powerful weapon to target a particular problem. But lean is still the overwhelming force. Get it embedded into the culture so that everyone is doing it. Then,

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whatever variation is exposed, you can use Six Sigma to eliminate it."

The work he is currently doing with a lockmaker is a good example. It is suffering from variations in a single slot within the cylinder of the lock that regularly jam the key. Unfortunately, this isn't discovered until all the tumblers have been assembled. Under the current process, the slot isn't measured before it goes into the assembly process; the company relies on the machine getting it right. Nor did it know if the variation build into the slot production is within design tolerance, nor whether the tolerance built into tumblers, slot and key marry up or whether one or all of them are outside operational parameters. "Now, Six Sigma tools and techniques can certainly help narrow that down," explains Donnelly. "We can map the normal distribution curve for the process capability of the machine, what is produced, the tumblers and the key and pull them together. Then we can see what the total spread is and bring the whole process under control. But you can't get to that stage until all the other basics are in place."

Target and improve

He says this is typical of something MAS WM often finds on the shopfloor. Often there is a system in place but it isn't always followed and many smaller companies don't even have standard operational procedures. "Let's get all the basic tools in place and when they are sustained, you will be left with variation that needs to be tackled. Then you can use the very good DMAIC process of Six Sigma to target and improve."

He particularly likes the systematic approach enforced by DMAIC. "You do it because the customer demands it and there is a defined project and payback. It must be financially driven – otherwise what is the point of putting all the effort in? But the discipline of root cause analysis makes you learn lessons in one area that can be applied in others." For example, you may discover an ambiguity in the way a computer field is being filled in, or a variation caused by insufficiently robust gearing. The correction can then be applied to all similar operations, processes and transactional areas. The main barrier to this, however, is the company

itself. Donnelly says that far too many are content with finding a solution to a particular problem. In this respect, lean is a far better first step since it engenders an overall culture of improvement that encourages a wider spirit of enquiry.

Data gathering, however, can create as many problems as it resolves. One company he worked with collected huge amounts of data on its customer returns but used it simply as a reporting mechanism rather than an improvement tool. For example, it had a whole section on free-of-charge replacements, breaking them down into warranty claims and sales errors. But it didn't use the information to analyse the root causes of failure in service which could be anything from a design problem to a manufacturing fault or even, as in one case, the salesman specifying the wrong material for the application through lack in training. "The first step was to get them to re-evaluate their database so it actually helped them to fix the problem," recalls Donnelly.

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Getting results from Six Sigma does demand careful handling of the workforce to avoid the 'us and them' barriers that can easily arise. Donnelly points out that you can't expect someone to have the necessary knowledge to apply the tools and techniques without thorough training and it's not for everyone: "Pragmatically, you need to train your more academically capable people, probably from the quality department, because of complexity of interpreting the data. You must have the knowledge to know if the statistics are telling you a lie." In his view, taking people off the shopfloor and training them on the basics of variation can bring real advantages; after all, no-one knows the processes better. Whereas, however, lean is often spearheaded by a workforce 'champion', the highest levels of Six Sigma don't fit easily on the shopfloor. He doesn't think you need a dedicated champion: "If it's part of the business plan and the company recognises that the potential improvements warrant paying somebody to do it full time, it will have a payback. But most companies don't think that way and, pragmatically, it isn't vital." What is vital, however, is also training the person in lean tools: "The two go together."

He sees it as "mission critical", however, that the workforce be fully involved in data collection: "Often they are the people who can tell you how to measure something." He recalls a situation from his work at Goodyear where he wanted to check the accuracy of rubber extrusions. Some had hidden dimensions that couldn't be reached by laser scanner. The operator, however, suggested cutting a small sample at regular intervals and offered to measure them using a shadow graph. He knew what was possible and was motivated enough to want to help. Donnelly believes that there are two vital factors without which any improvement process will fail: top level commitment and shopfloor involvement.

In essence, if you engage your people, they will become a driving force for the success of any improvement initiative whether you call it lean, Six Sigma, lean Six Sigma, or St Monica (for the uninitiated, the patron saint of difficult marriages). As in most marriages, lean Six Sigma will only work if everyone in the family wants it to. ■

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