



Integrating Lean and Six Sigma

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Both the Lean and the Six Sigma methodologies have proven over the last twenty years that it is possible to achieve dramatic improvements in cost, quality, and time by focusing on process performance. Whereas Six Sigma is focused on reducing variation and improving process yield by following a problem-solving approach using statistical tools, Lean is primarily concerned with eliminating waste and improving flow by following the Lean principles and a defined approach to implement each of these principles.

The impressive results companies such as Toyota, General Electric, Motorola, and many others have accomplished using either one of them have inspired many other firms to follow their example. As a result, most companies have either a Lean or Six Sigma program in place. However, using either one of them alone has limitations: Six Sigma will eliminate defects but it will not address the question of how to optimize process flow; and the Lean principles exclude the advanced statistical tools often required to achieve the process capabilities needed to be truly 'lean'. Therefore, most practitioners consider these two methods as complementing each other. And while each approach can result in dramatic improvement, utilizing both methods simultaneously holds the promise of being able to address all types of process problems with the most appropriate toolkit. For example, inventory reduction not only requires reducing batch sizes and linking operations by using Lean, but also minimizing process variation by utilizing Six Sigma tools.

Therefore, many firms are looking for an approach that allows to combines both methodologies into an integrated system or improvement roadmap. However, the differences between the Six Sigma and Lean are profound:

Table 1: Comparing Lean And Six Sigma		
	Lean	Six Sigma
Goal	Create flow and eliminate waste	Improve process capability and eliminate variation
Application	Primarily manufacturing processes	All business processes

Approach	Teaching principles and "cookbook style" implementation based on best practice	Teaching a generic problem-solving approach relying on statistics
Project Selection	Driven by Value Stream Map	Various approaches
Length Of Projects	1 week to 3 months	2 to 6 months
Infrastructure	Mostly ad-hoc, no or little formal training	Dedicated resources, broad-based training
Training	Learning by doing	Learning by doing

Developing an integrated improvement program that incorporates both Lean and Six Sigma tools requires more than including a few Lean principles in a Six Sigma curriculum or training Lean Experts as Black Belts. An integrated improvement strategy has to take into consideration the differences and use them effectively:

- Lean projects are very tangible, visible, and can oftentimes be completed within a few days (whereas Six Sigma projects typically require a few months). An integrated approach should emphasize Lean projects during the initial phase of the deployment to increase momentum.
- Lean emphasizes broad principles coupled with practical recommendations to achieve improvements. For example, Lean suggests a technique to analyze and reduce changeover time that does not require sophisticated analysis and tools. However, Lean principles are oftentimes inadequate to solve some of the more complicated problems that require advanced analysis. Therefore, Six Sigma needs to be introduced during the first year of the deployment to ensure that the improvement roadmap includes a generic problem-solving approach.
- An integrated improvement program needs to be fueled by a vision of the future state and by a pipeline of specific projects that will help close the gap between current and future state. Lean introduced Value Stream Mapping as the central tool to identify the gaps and to develop a list of projects that can be tackled using Lean or Six Sigma methodology.
- Whereas the Six Sigma process and tools can be applied to virtually every process and industry, the Lean approach is much more specific and the content needs to be adjusted to industry needs: For example, reducing set-up time in a plant that has



lines dedicated to a single product is pointless. Therefore, the Lean curriculum needs to be adjusted to meet the needs of the specific business.

- Training is effective but only when combined with application. Lean principles are typically taught as separate workshops, with each workshop combining a short training session on the principle with direct application on the shop floor. Six Sigma training is broken down into the phases of the DMAIC process with time between each training session to apply the tools learned to the project. The extensive analysis required for Six Sigma projects suggests that a workshop structure as used for Lean training would not be effective.

The integrated approach to process improvement (using Lean and Six Sigma) will include:

- Using Value Stream Mapping to develop a pipeline of projects that lend themselves either to applying Six Sigma or Lean tools.
- Teaching Lean principles first to increase momentum, introducing the Six Sigma process later on to tackle the more advanced problems.
- Adjusting the content of the training to the needs of the specific organization - while some manufacturing locations could benefit from implementing the Lean principles with respect to housekeeping, others will have these basics already in place and will be ready for advanced tools.

From a training perspective, the Lean principles would be taught first, using the simpler projects identified through the Value Stream Map as training projects for the Lean workshops. A Black Belt therefore would learn how to apply these lean principles working on a real life problem. In addition, a Lean Black Belt would complete a large Lean project over the course of the training to become certified. The Six Sigma process will be introduced once the Lean principles have been taught. Again, the training participants would work on one specific project identified by Value Stream Mapping.

As a result, a Lean Black Belt in this example would receive in total 30 days of classroom training, would participate in five Lean workshops, and complete one large Lean and one large Six Sigma project over the course of one year. Such a Black Belt would be capable of applying Lean and Six Sigma tools to a variety of business problems and choosing the appropriate approach to address the problem at hand.

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