Lean Six Sigma Approach for Quality and Business Performance

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Abstract

Lean manufacturing is one of the initiatives that major businesses all around the world have been trying to adopt in order to remain competitive in the increasingly global market and Six Sigma was an American “invention”. The Central idea behind Six Sigma is that if you can measure how many “defects” you have in process, you can systematically figure out how to eliminate them and get as close to “Zero Defect” as possible. The combination of Lean Practices and Six Sigma methodology can lead to superior benefits including process variation reduction and dramatic business improvement. Ultimately that Lean manufacturing and Six Sigma can be combined for optimal results first the Six Sigma process are changed from slow to fast by Lean Manufacturing. Last, Six Sigma and Lean manufacturing provide the structure easily for optimum flow. In plain language that the ultimate goal for the company is to create value to the customer hence the customer settles the quality for the product. The quality of the product is its ability to satisfy and preferably exceed the needs and expectations of the customers. Lean Six Sigma’s growing prevalence and importance in industry, presently companies have acknowledged that Lean and Six Sigma share a common objective: to create value based end customer requirement.

Keywords: Lean manufacturing; Six Sigma; Lean Six Sigma; Business Performance.
1. Introduction
The prominence of Lean Six Sigma in the field is undeniable as many corporations are currently jointly implementing Lean Six Sigma approaches (shah et. al., 2008) [1]. Mader, D.P. (2008) is the first peer reviewed article that describes the evaluation of Lean Six Sigma in detail. Demonstrating and analyzing how the separate bodies of knowledge from Six Sigma and Lean integrated to Lean Six Sigma [2]. Lean Six Sigma is the application of Lean technique to increase speed and reduce waste and process complexity, while employing processes to improve quality and focus on the voice of the customer (Brett and Queen, 2005) [3]. Lean Six Sigma builds on the knowledge, methods and tools derived from decades of operational improvement research and implementation on Lean approaches focus on reducing cost through process optimization. Six Sigma is about meeting customer requirements and stack holder expectations and improving quality by measuring and eliminating defects. The Lean Six Sigma approach draws on the philosophies, principles and tools of both. However, Lean Six Sigma's goal is growth, not just cost cutting. Its aim is effectiveness not just efficiency (Bryne et al., 2007) [4]. Lean emphasizes process flow and Six Sigma concentrates on process defects (George, 2002) [5]. Last but not least, Six Sigma and Lean both focus on performing improvements, mainly through projects.

2. Similarities About Six Sigma and Lean Manufacturing
Concept of Lean manufacturing and Six Sigma are striking concept of manufacturing which appeared on demand of customer saving cost and time. Applying Six Sigma and Lean manufacturing tool needs Team. For Six Sigma we have Six Sigma project teams and for Lean manufacturing we have Kaizen teams. Both of the team requires a specialist under which work has to be done, such as master belts or Lean consulting specialist. Lean manufacturing and Six Sigma both applying changes in organization such as behavior change and system change in organization and the change is must as to improve & to be effective. Most dominating and important similarity is both tools show us possibilities to achieve our required goals. Such as important in Cost, Quality and time. Therefore the similarities of both tools may be successful in producing tools that both customer and companies demand.

3. Differences Between Lean Manufacturing and Six Sigma
Arrived due to Reducing variation, Improving process, Zero defects. Lean manufacturing focuses on eliminating waste and improving flow in manufacturing whereas Six Sigma focuses on eliminating defects but does not explain the improvement of the problem & how to improve process flow. Lean manufacturing do not explain statistical tool to prove results, which were achieved by Six Sigma.
4. Lean Six Sigma by DMAIC Methodology-
Lean Six Sigma is more detailed from can be showed by DMAIC methodology. *DMAIC - Define, Measure, Analyze, Improve and Control*

4.1 Define phase
Most important phase and first step of Six Sigma and Lean manufacturing. In this phase "customer demands" are considered. We shall now introduce SIPOC flow chart to look over demands & requirement of Lean Six Sigma. SIPOC shows the linkage between Suppliers, input, process, output and customers. This flow chart classify all of the mentioned above.

![SIPOC Diagram](image)

*Figure 1: SIPOC.*

It also helps us identify those processes that have greatest input on customer satisfaction.

4.2 Measure phase
Measure phase is second phase of DMAIC process. In this phase both methodologies gather quantities and qualitative data to review a clear current situation. Now the gathered information is being used in organization where the organization is prepared to change and eliminate wasting process and problems for this phase Lean Six Sigma manufacturing methodologies understand process and various data.

4.3 Analyze phase
Analyze phase is usually primary concern of Six Sigma. In analyze phase Six Sigma needs various analytical technologies to get causes about the problem but in comparison with Lean manufacturing does not use various analytical and statistical technique like Six Sigma. Lean manufacturing basically focuses on eliminating waste. So if our Six Sigma technique used integrated the Lean manufacturing process, the synergy effect will be the most powerful tool of the both tools. Six Sigma in this phase requires FMEA & various skills & whereas Lean manufacturing need the value stream mapping that focus strictly on time saving and process efficiency techniques. We introduce ANOVA (Analysis of Variance) a statistical test which is very important to Six Sigma processes. ANOVA is a statistical test of significance in difference between samples. ANOVA technique subdivides the total variation of a set of data into meaningful component parts associated with specific sources of variation for the purpose of testing some hypothesis of various parameters of a model or estimating variance components.
4.4 Improve phase
This is phase of change where both Six Sigma and Lean manufacturing gather information and decide on a specific solution about the various defects and waste generated during analyze phase. The analysis done and the solution obtained is now implemented in manufacturing method. This gives as a benefit implemented solution helps us to ensure prediction about elimination defects and waste. For the important phase Six Sigma uses "DOE" and Lean manufacturing uses "KAIZEN". Six Sigma & DOE - DOE is a design of experiments and play important role in quality improvement which is long process &usually involves various variables. Lean manufacturing & Kaizen basically is a Japanese language term, means - "alter or change".

4.5 Control phase
This is the last phase of DAMIC which aims at improvements implemented. Control phase is used to control plan. Because the control checks continuously & report variation and some variation is out of control. Six Sigma and Lean manufacturing are more dependent on this phase. Six Sigma uses statistical process control & the Lean manufacturing on other hand needs 5S because the 5S helps to keep us value added efficiency and help to keep waste minimal. The 5S are - Sort, Store, Shine, Standardize, and Sustain lean manufacturing is strong in some steps such as principles, flow and control than Six Sigma, but Six Sigma is strong in some phases such as measurement, analyze and improvement with its statistical skills then Lean manufacturing.

5. Benefits from Combination of Lean Manufacturing and Six Sigma (Lean Six Sigma)
The Six Sigma processes are changed from slow to fast by lean manufacturing. Lean manufacturing helps identify the highest impact by Six Sigma. Lean manufacturing provide the structure easily for optimum flow.

<table>
<thead>
<tr>
<th>Six Sigma Program</th>
<th>Quality Performance</th>
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<tbody>
<tr>
<td>A combination of Lean and Six Sigma</td>
<td>High Level Performance</td>
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<tr>
<td>Lean Manufacturing</td>
<td>Business Performance</td>
</tr>
</tbody>
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**Figure 2**: Combination of Lean, Six Sigma.
References


