



Six Sigma, Lean and Lean Six Sigma: A Generic Solution for All Sectors

¹ PROF.D.K.DAVE

¹ Asst.Professor, Production Engineering Department , Government Engineering College ,Bhavnagar, Gujarat

ABSTRACT: In this paper author would like to give a basic introduction of lean manufacturing, six sigma methodology and lean six sigma in manufacturing there is a need of a road map how to integrate lean manufacturing and six sigma to achieve a best result in manufacturing as well as in a service industry .lean six sigma is a unique approach through which we can obtain a good quality product at consistent rate and time.

Keywords— Six Sigma, Lean manufacturing , Lean Six Sigma.

I: INTRODUCTION

The objective of this research is to provide a unique methodology for integrating lean manufacturing and six sigma methodology in manufacturing and service industry. Lists of objective that we achieved for the successful completion of this research are given below:

- Derive a step-by-step, unambiguous roadmap that a manufacturing facility should follow towards its goal to achieve lean six sigma.
- Develop tools and methodologies to improve the communication between project teams and facilitate lean & six sigma technology transfers between multiple organizational units.
- Extend the tool by making it more prescriptive (as to which step one needs to concentrate on given their existing level of implementation); by integrating assessment tools.
- Extend the scope of the tool by imparting the capability to do data analysis (Example: Design of Experiments, Value Stream Mapping, Multi-Vari Analysis, Process Capability Studies, Part Grouping, Control charts, Pareto Charts, Histograms, Brainstorming, Force Field Analysis etc.).

II Six Sigma

Six Sigma is set of tools and methods for advanced problem-solving that focuses on eliminating defects. Six Sigma methods integrate principles of business, statistics to achieve breakthrough cost reductions and quality improvement. These tools have been used to improve the processes, products, and services of a variety of organizations.

Statistically, the term sigma represents the standard deviation, the variation around the process mean. The objective of Six Sigma is to achieve a quality level of at most 3.4 defects per million opportunities (DPMO). Six Sigma means that there are 6 standard deviations from the process mean to the specification limits when a normally distributed process is centered (See Figure 1).

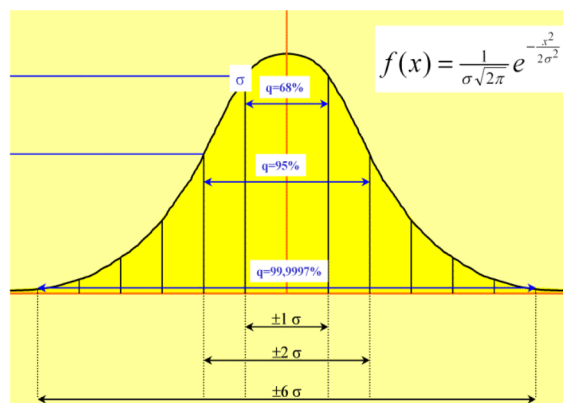


Figure 1: Sigma variation shown on normal curve. (From Itil & ITSM World, 2003)

111 Lean

Lean Manufacturing evolved into Lean Thinking and focuses on removing the non-value added delay, waste, and rework from your processes. It comes from the Toyota Production System (TPS) but can be used in any industry or business.

The ten steps and a brief description are given below:

Step 1: Reengineering the Manufacturing System

Restructure/reorganize fabrication and assembly systems into cells that produce families of parts/products. The cells should have one-piece parts movement within cells and small-lot movement between cells, achieved by creating a linked-cell system.

Step 2: Setup Reduction and Elimination

Setup time for a cell should be less than manual time, or the time a worker needs to load, unload, inspect, deburr etc.

Step 3: Integrate Quality Control into Manufacturing

The operation should be "Make-one, check-one, and move-on-one" type; and the quality of products output from the system should be 100%.

Step 4: Integrate Preventive Maintenance into Manufacturing

There should be no equipment failure and the workers should be trained to perform routine low level process maintenance.

Step 5: Level, Balance, Sequence and Synchronize

Fluctuations in final assembly should be eliminated, output from cells should be equal to the necessary demand for parts downstream and the cycle time should be equal to takt time for final assembly.

Step 6: Integrate Production Control into Manufacturing

Cells respond to demand by delivering parts and products only as they are needed, or just in time.

Step 7: Reduce Work-In-Process(WIP)

Minimize the necessary WIP between cells, and parts are handled one at a time within cells.

Step 8: Integrate Suppliers

Reduce the number of suppliers and cultivate a single source for each purchased component or subassembly.

Step 9: Autonomation

Inspection should become part of the production process (100% inspection) and there should be no overproduction.

Step 10: Computer-Integrated Manufacturing

Production system to be as free of waste as the manufacturing system

IV About Lean Six Sigma

Blending the concepts of Lean Thinking with traditional Six Sigma methodology is the hottest trend in business today. It is an assertive and robust method for improvement in speed, quality and cost. By combining the tools and methods of breakthrough problem-solving with the solid tools of process flow, many businesses have earned great cost savings.



Fig.2 lean six sigma:a baby of lean and six sigma

The key concepts of lean six sigma are the following:

1. The voice of the customer and “CTQ”.
2. The six sigma metric.
3. Elimination of waste and non-value added activities.
4. Process.
5. Unintended variation is the enemy.
6. Value Streams.
7. The “DMAIC” improvement process.

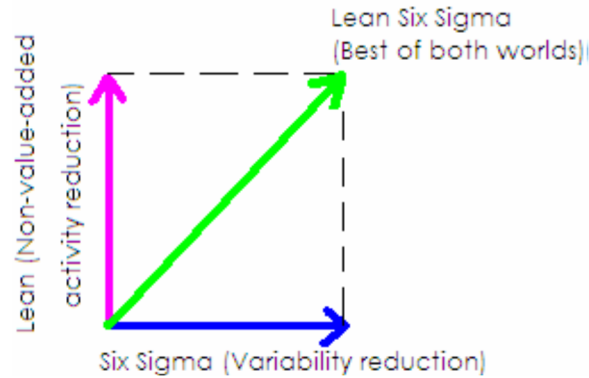


Figure 2: Lean Six Sigma (Best of both worlds)

According to George [9], the principle of lean six sigma is that activities that cause the customer’s critical-to-quality issues and create the longest time delays in any process offer the greatest opportunity for improvement in cost, quality, capital, and lead time. Table 3 shows the fundamental differences between six sigma and lean production methodologies.

Issues/Problem Objectives	Six Sigma	Lean
Focuses on VSM	No	Yes
Focuses on creating visual Workplace	No	Yes
Creates Standard worksheets	No	Yes
Attacks in WIP	No	Yes
Focuses on Good House keeping	No	Yes
PPC	Yes	No
Variation reducing and achieve uniform process outputs	Yes	No
Use of Statically tools and techniques	Yes	No
Identification of Waste	No	Yes
Well planned Problem Solving Methodology	Yes	No

Table 3 Difference Between Lean and Six Sigma

V Benefits of Lean Six Sigma

Dramatically reduce the cost of delivery of internal services.

Improve service delivery time.

Expand capacity without adding staff.

VII. DMAIC METHODOLOGY

As mentioned above, the DMAIC methodology focuses on improving an existing process or product. These are mostly “real-life” problems, which need to be solved. The improvement should be scoped such that it can be completed in approximately three months and be able to sustain this improvement for long period of time. The methodology consists of five phases: a) Define business opportunities, b) Measure performance, c) Analyse opportunity, d) Improve performance, and e) Control performance [4]. The DMAIC methodology is being used as one vehicle to proceed through the proposal, implementation, and hand-off stages in the project. The DMAIC methodology helps to tackle a process improvement project in a structured manner.

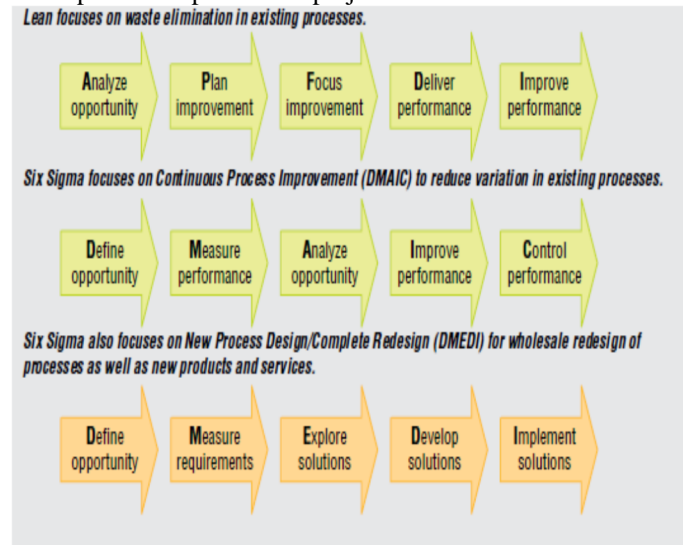


Fig.3.2 DMAIC Methodology

Conclusion

According to George [9], the slow rate of corporate improvement is not due to lack of knowledge of six sigma or lean. Rather, the fault lies in making the transition from theory to implementation. Managers need a step-by-step, unambiguous roadmap of improvement that leads to predictable results.

This research provides a roadmap that tells the lean six sigma implementation team “what to do?”, “How to do?” and help them in doing it.

REFERENCES

- [1] Bhote K R, 2002, “The Ultimate Six Sigma : Beyond Quality Excellence to Total Business Excellence”, AMACOM.
- [2] Bhote K R and Bhote A K, “World Class Quality : Using Design of Experiments to make it happen”, AMACOM.
- [3] Black J T and Hunter S L, 2003, “Lean Manufacturing System and Cell Design”, SME.
- [4] Bossert J, 2003, “Lean and Six Sigma – Synergy Made in Heaven”, Quality Progress, vol. 36, no. 7, pp. 31-32.
- [5] Chen F F, Flexible Automation and Lean Manufacturing Technology, Center for High Performance Manufacturing, Center-Designated Project (07/2003-06/2004), “A Decision Support and Analysis Tool for Lean Manufacturing Assessment and Implementation”
- [6] Creehan K D and Taylor R E, Flexible Automation and Lean Manufacturing, Center for High Performance Manufacturing, Center-Designated Project (Summer 2003) “Lean Manufacturing and Six-Sigma Integration”
- [7] Devane T, 2004, “Integrating Lean Six Sigma and High-Performance Organizations: Leading the charge toward dramatic, rapid and sustainable improvement”, Pfeiffer.
- [8] Duggan K J, 2002, “Creating Mixed Model Value Streams: Practical lean techniques for building to demand”, Productivity Press.
- [9] George M L, 2002, “Lean Six Sigma: Combining six sigma quality with lean speed”, McGraw-Hill.
- [10] Roy R K, 1990, “A Primer on the Taguchi Approach”, Van Nostrand Reinhold.

[11]Sharma A and Moody P E ,2010, The Perfect Engine: How to win in the new demand economy by building to order with fewer resources, The Free Press, NY, USA.