Six Sigma Approach towards Lean

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Abstract— Globalization, growing competition and with emergence of new technologies, change shows economic profile of nations & knowledge driven economies have created a scenario where quality is no more a desirable strategy –it has become a survival strategy. Six Sigma is widely used in material & service organizations to enhance quality & to reduce cost but the time has come to move one step further to Lean Six Sigma approach to achieve rapid transformational change at lower cost.

Key words: Lean, Six Sigma, Scale of Defects, Quality Improvement

I. Introduction

With increasing competition, changing business condition, globalization and more quality conscious customers created a scenario where companies need Lean Six Sigma, to help product costs down without compromising on quality. The present study has made an attempt to understand Lean Six Sigma approach. In this paper three aspect of Six Sigma dealt, what is Six Sigma? What is Lean? How they can be integrated? Lastly the benefits for implementing six sigma are discussed.

II. Six Sigma Methodology

Six Sigma is a quality improvement program with a goal to reduce defects to as low as 3.4 parts per millon (Juran Institute ,2003). Six Sigma devoloped at Motorala in 1985 to reduce defects in its processes.

SIGMA	DEFECT RATE (PPM)	COST OF POOR QUALITY (% OF SALES)	COMPETITIVE LEVEL
6σ	3.4	<10%	WORLD CLASS
5σ	233	10% - 15%	
4σ	6,210	15% - 20%	INDUSTRY AVERAGE
3σ	66,807	20% - 30%	
2σ	308,537	30% - 40%	NON-COMPETITIVE
1σ	690,000	>40%	

Table 1: The Six Sigma Scale of Defects

III. Application of Six Sigma

Six Sigma works on a simple equation Y = f(x), where Y is the product or service that has to be improved & 'x' is a set of factors that influence 'Y'.Y (x) is the function that defines relationship between 'Y' and 'x'. Six Sigma is all about finding the critical 'x' which affect the 'Y' or output of the process product or service. Traditionally quality professionals have focused on output of the process 'Y' to improve the process but Six Sigma focuses on the 'x' to improve the process and reduce the defects or errors (Reddy & Sreedhar,2005).

Six Sigma counts the number of defects per million opportunities (DPMO) at six levels. If company works at the 'one' sigma level it is making about 6,90,000 defects per million opportunities whereas if it works at 'six' sigma level it is making about 3.4 defects per million opportunities

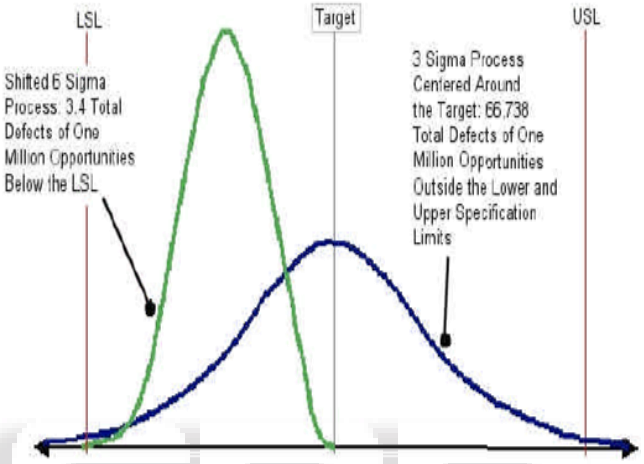

Fig. 1: Comparison of six sigma and three sigma

IV. Lean

Lean is an approach that seeks to improve flow in the value stream and eliminate waste. It's about doing things quickly with more efficiency.

Lean means "using less to do more" by "determining the value of any given process by distinguishing value added steps from non value added and eliminating waste so that ultimately every step adds value to the process" (Miller 2005).

Hopp & spearman define lean very precisely as " production of goods and services is lean if it is accomplished with minimal buffering costs" (Womack , et al. ,1990).

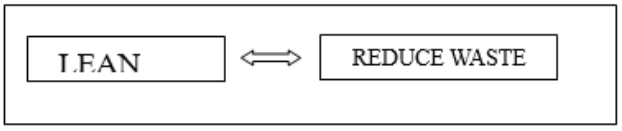

Fig. 2: Approach of Lean

Here Buffering costs include

1) Inventory Buffers (stocking more WIP or finished goods)
2) Capacity Buffers (excess capacity)
3) Time Buffers (increased lead time)
4) Lean production was innovated by Taichii Ohno at Toyota in 1889, described by him as "Toyota production system"

V. Integration of Lean & Six Sigma

A combination of two methodologies can provide the philosophy and the effective tools to solves problems and

create rapid transformational improvement at lower cost. Potentially this could increases productivity, improve quality, reduce cost, better flow and meet customer expectations (Miller,2005).

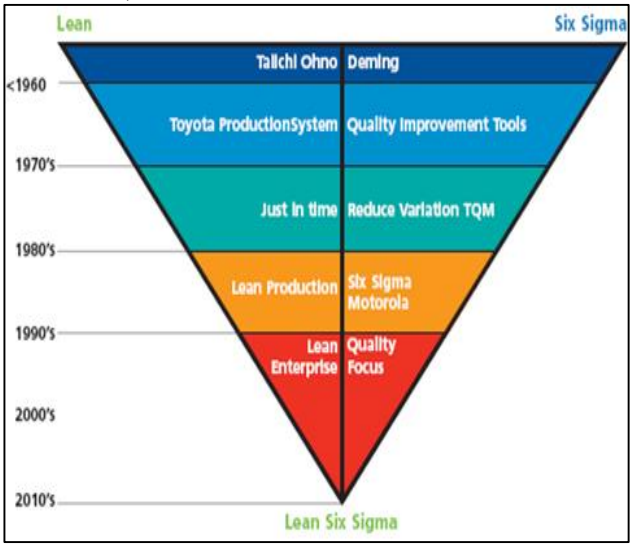

Fig. 3: Evolution of Lean Six Sigma

Lean and Six Sigma have developed in manufacturing environment and have grown separately but in today's scenario both require each other for solving quality problems and to create rapid transformational improvement at lower cost.

Six Sigma methodology is a data driven methodology which reduces variations among practices, subsequently reducing defects. It consist of five phases. This methodology can be used in lean manufacturing for the activity that is concerned with cost, timeliness and quality (Dasgupta , 2003).

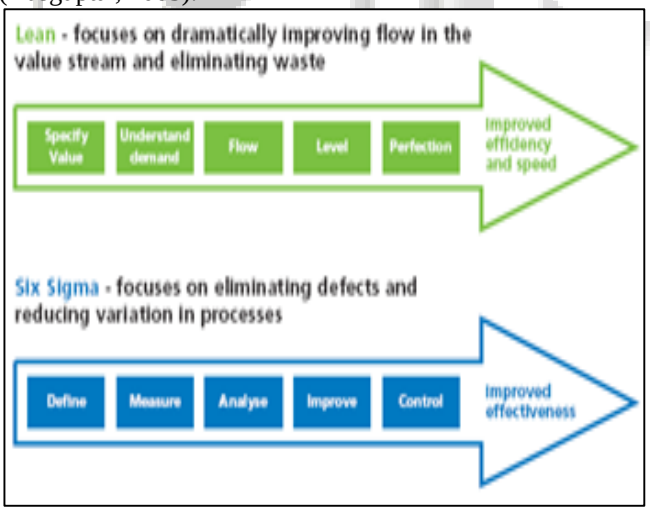

Fig. 4: Integration of Lean and Six sigma (Juran Institute)

Lean and six sigma use both customer focused improvement methodologies

Methodology	Lean	Six Sigma
Theory	Reduced Waste	Reduced Variation
Application guidelines	Identify value Identify value stream Flow Pull Perfection	Define Measure Analyse Improve Control
Focus	Flow	Problem
Assumptions	Waste removal will improve performance. Many small improvements are better than systems analysis	A problem exists Figures and numbers are valued. System output improves if variation in all processes is reduced
Primary effect	Reduced flow time	Uniform Process output
Secondary effects	Less Variation	Less waste

Table 3: Six Sigma and Lean Methodologies

However the two follow different approaches as shown:

Lean	Six Sigma
Specify Value : What is important in the eyes of the customer?	Define: What is important?
Identify the value stream: What is the entire value stream?	Measure: How are we doing?
Flow: How will the material and information flow through our process?	Analyse: What is wrong?
Pull: How can we let the customer pull products, rather than pushing products?	Improve: What needs to be done?
Perfect: How can we optimize our processes?	Control: How do we sustain the improvements?

Table 4: Comparison of Lean and Six Sigma Approach

The theory of Lean Methodology is to reduce waste and it focus on flow while the six sigma theory is to reduce defects and it focus on problems (Agarwal,2005).

VI. Benefits of Implementing Six Sigma in Lean

Demanding customers, higher demand variability and inability to balance push and pull environment, an integrated lean six sigma approach respond to these challenges and demands. The full benefits of Lean Six Sigma will only be realized when applied at both strategic and operational levels. Six Sigma approach in Lean make manufacturing operations more efficient by eliminating waste and reducing variations and thus enhancing value.

Fig. 5: Lean Six Sigma Cycle

VII. CONCLUSION

Six Sigma approach is integral to any successful Lean manufacturing implementation. Once Lean manufacturing techniques eliminate wasteful activities, six sigma offers a sequential, problem solving procedure to continuously measure, analyse , improve and control the processes. Working together, the two methodologies guarantee a dramatic improvement in productivity

REFERENCES

[1] Agarwal, A. (2005). Implementing Lean Techniques in India.
[2] Dasgupta, A. (2003) .Going the six sigma way, India Management, 42 (3) 24-31
[3] Juran Institute .(2003). Quality Improvement pocket guide
[4] Miller. (2005). Going Lean in Health care, IHI White paper
[5] Reddy L. Gaddam and Amancha Sreedhar.(2005). Six Sigma in Distance Education, ICDE International Conference.
[6] Womack P. James , Jones T Daniel, Roos Daniel.(1990). The Machine That Changed The World, Macmillan.
[7] Hines, P., Rich, N. & Esain, A. (1997), "Creating a Lean Supplier Network: A Distribution Industry Case," Proceedings of the Logistics Research Network Conference, Huddersfield, U.K.: University of Huddersfield, pp. 60-77.
[8] Keyte, B. & Locher, D. (2004), "The Complete Lean Enerprise: Value Stream Mapping for Administrative and Office Processes," NY, Productivity Press.
[9] Shah, R. and Ward, P.T. (2003), "Lean manufacturing; context, practice bundles, and performance", Journal of Operation Management, vol. 21 pp. 129-149.
[10] Smith, B. (2003), "Lean and Six sigma - A One-Two Punch", quality Progress, vol. 36, no. 4, pp. 37-41.

