An exploration of Lean six sigma methodology in Industries

#D.Harishkumar, #E.Senthilkumar, *K.Sathiyasilan

*#UG final year students, *Assistant professor, Dept. of Industrial Engineering,*

Madras Institute of Technology,

MIT Road, Radha Nagar, Chromepet, Chennai, India.

ABSTRACT

In worldwide, the lean manufacturing process is one of the most common development tools in a continuous manner. It also emerges in the field of reshaping the manufacturing practices, working as a key element and involving the basic principles normally. Since 1990s this methodology is used in many fields like automobile engineering industry and many other manufacturing industries globally. Ultimately, the concept of lean manufacturing has been concentrated on the philosophy of uninterruptedly refining performances by eradicating wastes in the industrialized floor systematically. Lean philosophy was announced to encompass the impression from the industrialized floor to a business process level. Lean six sigma approach is not like traditional sig sigma approach. It is different and uses certain approaches from lean manufacturing along with the sig sigma approach. This paper is envisioned to provide an outline on the impression of lean thinking and six sigma approach in the manufacturing industries. Lean Six Sigma precedes the basics of Six Sigma and integrates the cost reduction values of Lean Manufacturing. This study also reveals the fair study among Lean versus Six Sigma or mixture of both. By means of the market place constricts and companies are violent for each and every cost of profits, they essential to accept advanced methods to produce more competent processes that will contribute them a economical edge of their contiguous rivals and this is the foundation for Lean Six Sigma.

Keywords: *lean manufacturing, automobile industry, Six Sigma, Lean Six Sigma, efficient process.*

1. INTRODUCTION

In the recent years, Lean Manufacturing and Six Sigma have been joined together in the development tools for the benefit of manufacturers. The lean manufacturing philosophy accentuates that the chief “thrust” is consuming all of the tools functioning together to produce a rationalized, high quality system that creates products at the request of the client with slight or no leftover. In some administrations Lean Manufacturing and Six Sigma have transformed into a new subsection of tools under the label of Lean Six Sigma. Lean Six Sigma is fetching the important endless growth method used by corporations in different manufactures. From manufacturing to healthcare to IT, Lean Six Sigma exploits effectiveness and helps in governing each step of the progression. Lean Six Sigma is a methodology that is concentrated on enlightening quality, growing productivity and decreasing cost in any organization. This is a reasonable description since Lean Six Sigma is the mixture of two dissimilar, but admiring, methods to continuous development - Lean and Six Sigma.

Six sigma methods is totally varies from other quality programs in its top down effort in its demanding approach that comprises of complete exploration, conclusions based on evidences, and a control plan to confirm continuous quality control of a process. Six sigma in engineering industries has been providing important assistances, but there is no transparency in procedure concerning the exact factors for six sigma operation in industries. All the establishments required to improve their construction abilities and management processes in order to endure long time in the market. This can be accomplished by zero defects, improving practices, decrease in process variability, reduction in costs, improved profits, increase product quality

and develop productivity and growing customer contentment. The continuous mission for business development philosophies and approaches like Six Sigma reports the inexpensive pressure and tasks that all commercial part aspects to confirm their sustainability in the global market. Six Sigma is a excellence enhancement approach that pursues to discover and eradicate cause of faults or mistakes in business procedures by concentrating on outputs that are of critical significance to customers. As a result, practice performance should be improved, customer gratification should be enhanced and the bottom-line should be compressed through cost savings and augmented profits.

One of the most generally chatted about manufacturing methodology in the region for almost past three decades is the lean method despite the disagreement on the approach individuality in association with other substitute manufacturing approaches. Creating from the automobile industry, the confinement of lean approach has significantly stretched from the heavy manufacturing production to several industries such as banking, mining, public service, hotel, and health care. This approach purposes towards serving customers with the particular products or services required with advanced quality, lower price and smaller respond sensible way. Fundamentally, the lean approach focused on the attitude of uninterruptedly increasing process concerts by analytically eradicating waste which supports with the source of economics, a company must continuously recognize and eradicate the non-value adding movement within its association.

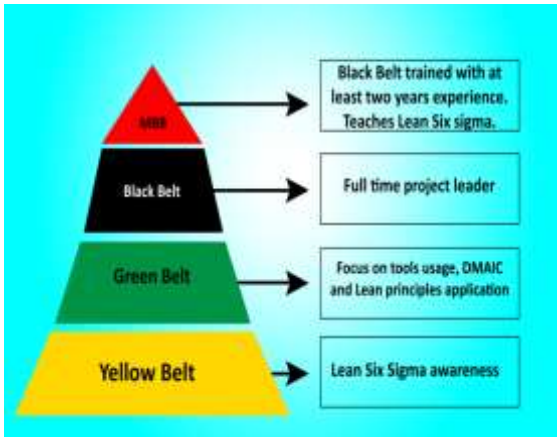

Fig.1: Lean six sigma organization structure

2. SIX SIGMA APPROACH

Six Sigma has been established over the last three decades and has grown into the genuine methodology to eradicate defects from a process and progress the quality of the engineering process. The goal of the approach is the application of a measurement-based policy that concentrates on process development and deviation reduction. Six Sigma is a commercial management approach that was primarily established by Motorola in the 1980's, which is used by many prosperity 500 companies. It is used principally to classify and correct errors and weakness in a manufacturing or business process. The six sigma system uses a number of excellence approaches and tools that a reused by Six Sigma skilled professionals within the society. The DMAIC (Design, Measure, Analyze, Improve, and Control) problem cracking method can be used to assist with any dispute that arises typically by those professionals in the organization who have extended green belt level. The Six Sigma method appears at receiving administrations to achieve their developments in a more efficient way to decrease faults. The next step for establishments is not only to develop methods but to create them more cost efficient or to accept more efficient new practices; is the beginning for Lean Six Sigma. Six Sigma's purpose is to eradicate waste and incompetence, thereby growing customer satisfaction by distributing what the customer is imagining.

- Six Sigma is an extremely well-organized process that supports us to emphasis on emerging and distributing near-perfect products and services
- Six Sigma follows a regulated procedure, and has distinct roles for the participants.
- Six Sigma is a data driven approach, and involves perfect data gathering for the processes being evaluated.
- Six Sigma is about setting consequences on Commercial Declarations.

Six Sigma is a business-driven, multi-dimensional planned method to:

- Improving Processes
- Depressing Defects

- Reducing process variability
- Reducing costs
- Increasing customer satisfaction
- Increased profits

3. LEAN VS SIX SIGMA IN APPLICATIONS

Many corporations are accepting Lean Six Sigma and consuming great achievement not only in manufacturing but in other productions including service industries. This is due to the fact the Lean looks at6 the needs of the consumer and constructing the customer happy not only profits the relationship with that customer but the procedure used to accomplish that will help to increase customer gratification for current as well as forthcoming customers. Lean Six Sigma is an approach that syndicates process speed with excellence. Lean, itself, concentrates on speed. It accentuates decreasing the amount of time between actions, procedures, and cycles. The smaller the cycle time, the more cycles you can complete in a given amount of time. Lean also recognizes areas where progression waste and bottlenecks can be eliminated. There are 8 types of waste that can be removed from business processes to reduce costs and time:

- Waiting- whether it is for the resulting movement, process stage, or information, process delay time can be 90% or more of the processing cycle.
- Overproduction- over generating products or facilities onward of the requirement can effect in product termination or excess inventory
- Rework- modifying faults, blunders and mistakes
- Motion- disproportionate association/handover of people, provisions, resources, and documents
- Over Processing- of facts, data, and analysis
- Inventory- conserving unnecessary amount of goods that could hypothetically terminate.
- Intellect- worsening to use the abilities and knowledge of the organization
- Redundant Transporting of equipment, people, etc.,

4. LEAN SIX SIGMA METHODOLOGY

In simply, lean and six sigma cooperatively develop the business with its original standards without waste of the resources. Together they produce a procedure which if trailed will intensely increase business processes, the assertiveness of people in the corporate and the outcomes for customers in terms of quality and delivery. The crucial effect is the business can decrease costs, rise earnings and acquire more fulfilled customers. It ensures this by using simple tools and methods to recognize where we have disputes in the business and then cracks these difficulties in an organized way, using data and some easy techniques to eradicate the matters everlastingly. The techniques, tools and procedures have been around for decades and we will know some of them. The modest truth is there is no excellent resolution to business complications. We just have to work at them in a systematic and organized way with the assurance of staff and with qualified and active people. Lean Six Sigma contributes a structure to create the developments.

Lean Six Sigma is a business development method which combine tools from both Lean venture and Six Sigma. Lean get rid of the waste in your process, while Six Sigma make sure superiority from side to side the removal of difference in your procedure and also provide a prearranged data driven arrangement to solve evils and put into practice sustainable change into your business. We consider therefore that the best come up to for any business is to use bend Six Sigma rather than one or the other. The reimbursements from taking this come up to are proven to our way taking only one come up to at a time. To appreciate Lean Six Sigma let us first give details the two methodologies.

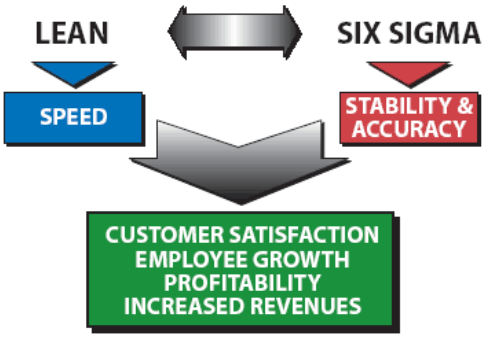

Fig.2: Lean six sigma methodology

Six Sigma is a set of practices formerly established by Motorola to scientifically develop processes by eradicating faults. A defect is defined as unconventionality of a product or provision to its qualifications. In additional words every time you do an activity you get exactly the same outcome, the same quality. In worldwide, the Top companies including Motorola have used sig sigma for the beneficial way of life and for their business. This necessitates assurance to the tactic from top administration down. If this is accomplish then implementation and approval is at ease and indications to enormous investments. It confirms that everybody concentrates on decreasing variation in every feature of the business from satisfying in forms to create a part. All accomplishments in a business of any kind can be dignified, evaluated, enhanced and organized and thus using some simple tools can contribute a reduction in variation leading to developed quality and costs.

Lean is the manufacture of products or services expending the minimum of the whole lot - human strength, investment in record, machines, space, tackles, time, improvement, and transport association. It is however very simply the decrease of waste from your procedures it has facilitated Toyota to develop one of the leading and most trustworthy car companies in the world. Lean is then the identification and stable eradication of waste through the implementation of flawless first time quality methodologies to work, regularization of procedures, flattening of flow, elasticity of work, long term affiliations with consumers and supplies and reduction in time prominent to cost reduction and business development. To accomplish this number of tools have been established which simplify the elimination of waste from procedures and a number of approaches to implement the moralities.

Waste or non-value added work is whatever which doesn't add worth to your manufactured goods or service. When you scrutinize your developments in real aspect you determine that the vast popular of what we do is non-value added. If we evaluate the whole thing we do to this range we see that most of our accomplishments are waste. To remove waste we must observe three features - the design and scheduling of our activities, the variability at our processes such as quality and capacity and thirdly the waste in our developments themselves in the association of people and provisions and the machines they use. When you observe your progressions in this way you can be said to be, learning to see and can start to eradicate the waste and develop the processes. To create things easier there are 7 ways to consider about waste.

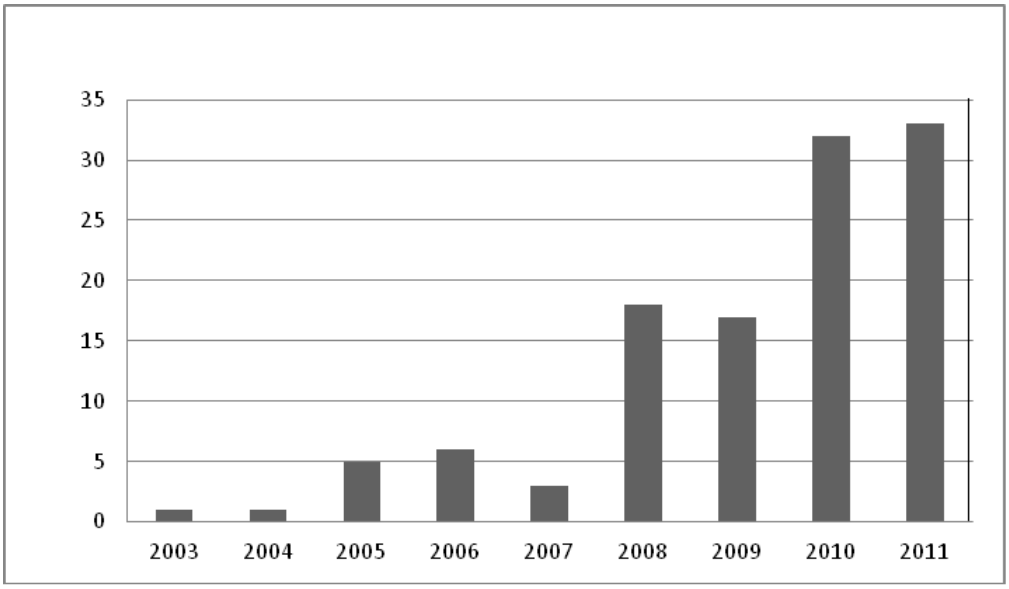

Fig.3: Lean six sigma: year wise analysis

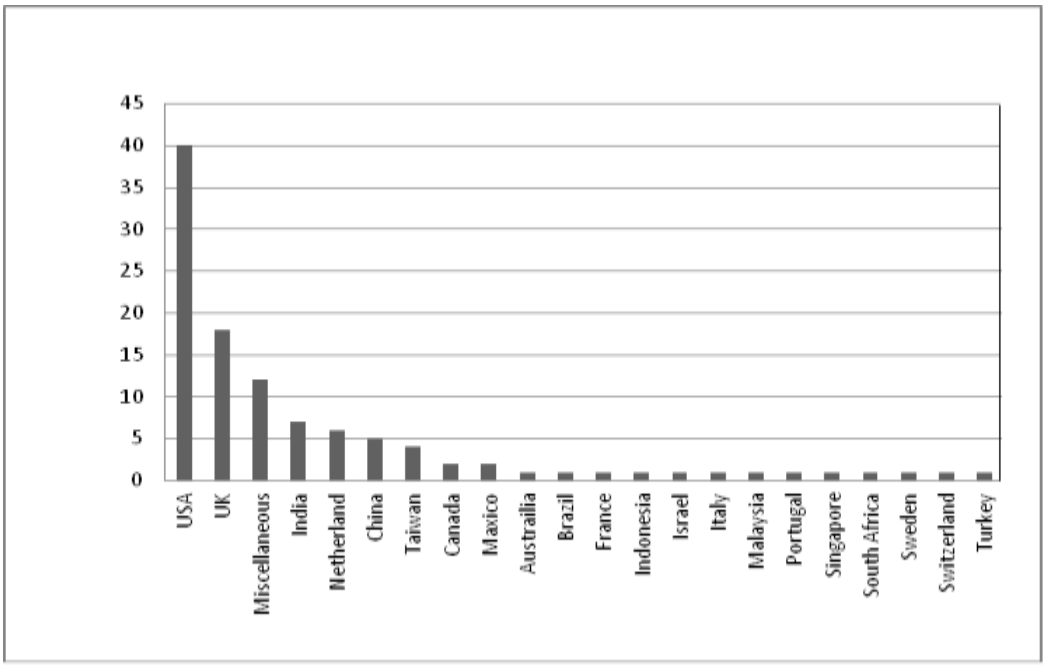

Fig.4: Lean six sigma: country wise analysis

The above two graphs showed that the year-wise and county-wise analysis of Lean six sigma approach. Figure 3 shows that LSS research is insignificance for developed and developing countries. USA is leader in LSS associated research following is the UK. Various group in the fig. comprises different other countries with reasonably less research on Lean Six Sigma. Figure 3 shows that the research and application on Lean Six Sigma. Subsequently, research is uninterruptedly growing as organization know better about the prosperous stories of world top executing the organization using Lean six sigma.

CONCLUSION

The study on lean six sigma is on primary stage. Lean Six Sigma has been similarly valuable both for engineering or service concerns and Big or small scale establishments. It is somewhat advantageous for different industries with little alterations as per industry condition. It is recommended to exploration on SME sector for application of Lean Six Sigma where the commercial proficiency is a difficulty. The main prominence of Lean is on wounding out redundant and extravagant steps in the formation of a product so that only steps that openly add value to the product are taken. Basically, Six Sigma and Lean systems have the equivalent goal. They both seek out to eradicate waste and generate the most efficient system probably, but they take different methodologies toward how attaining this aim. In simplest terms, the main difference between Lean and Six Sigma is that they recognize the root cause of waste contrarily. Lean consultants consider that waste comes from redundant steps in the construction process that do not add value to the completed product, while Six Sigma exponents declare that waste results from difference within the process. Of course, there is fact in both of these valuations, which is why both Lean and Six Sigma procedures have been so prosperous in enlightening overall business performance in a variability of fields. In fact, these two restraints have established to be particularly successful when working in tandem - hence the establishment of Lean Six Sigma. It is determined that to become an accurately more proficient and effective association in terms of procedures and business processes, you must have both Lean and Six Sigma approaches; having one deprived of the other eventually results in process annihilation.

REFERENCES

[1] Ronald D. Snee, "Lean Six Sigma – getting better all the time", International Journal of Lean Six Sigma, Vol. 1 Iss: 1, pp.9 – 29, 2010.

[2] Roger W. Hoerl, Martha M. Gardner "Lean Six Sigma, creativity, and innovation", International Journal of Lean Six Sigma, Volume: 1 Issue: 1, 2010.

[3] Spector. R., "How constraints management enhances lean and six sigma", Supply Chain Management Review, Vol.10 No.1, pp.42-7, 2006.

[4] Mikel J. Harry; Prem S. Mann; Ofelia C. De Hodgins; Richard L. Hulbert, Christopher J. Lacke,"Practitioner's Guide to Statistics and Lean Six Sigma for Process Improvements", John Wiley and Sons, pp. 30–ISBN 978-1-118-21021-5, 2011.

[5] Amar, K, Davis, D, "A review of six sigma implementation frameworks and related literature", Proceedings of the International Multi Conference of Engineering and Computer Scientist,91-21 March, Hong Kong,(2011)

[6] ArvindJayant, V. Sahni, Ms. NishaGarg "Development of quality cost evaluation system for cost reduction" Industrial engineering journal volume 5 Issue no. 9 February 2012.

[7] DharmendraTyagi, V. K. Soni, V. K.Khare "A review on issue for implementation of Six Sigma by SMEs" IJLTET Volume 3 and issue 4 Feb 2014

[8] Hongbo Wang "A review of Six Sigma approach: Methodology, Implementation and future research" IEEE Xplore, February 2009.

[9] BikramJit Singh, Dinesh Khanduja "Ambience of Six Sigma in Indian Foundries- an empirical investigation" volume VII, 2012

[10] Daulatsingh, Dr. Tusar N Desai "Application of Six Sigma DMAIC methodology in industry" Industrial Engineering journal volume VII, issue no. 2 February 2014.

[11] Desai, D. A, Improving customer delivery commitments the Six Sigma way: case study of an Indian small scale industry. International Journal of Six Sigma and Competitive Advantage,(2009).

[12] Kumar, M, Antony, J, and Christian, N. M, "Six Sigma in small- and medium sized UK manufacturing enterprises: Some empirical observations", International Journal of Quality & Reliability Management, 22(8), 2005.

[13] Kumar, M. and Antony, J, "Multiple case-study analysis of quality management practices within UK Six Sigma and non-Six Sigma manufacturing small- and medium-sized enterprises", Journal of Engineering Manufacture, 2009.

[14] Kumar, M, "Critical success factors and hurdles to Six Sigma implementation: the case of a UK manufacturing SME", International Journal of Six Sigma and Competitive Advantage, 3(4),2007.

[15] Piyush K. soni, Ashok kumargupta " optimizing implementation of statistical process control and six-sigma tools using matlab 8.3in a process industry" International journal of innovation in engineering research& management,ISSN:2348-4918

[16] Ravi S. Reosekar, "Design and development of six sigma implementation framework for indian industries," IJEBEA 5(2), 2013

[17] Senthilkumar. B and V. R. Sampath "Garment Manufacturing through Lean Initiative –An empirical study on T. Shirt Production unit " European Journal of Scientific Research,Vol.72,Issue 2,2012

[18] William M. Fled "Lean manufacturing tools, techniques, and how to use them" the CRC press series of resource management, 2001.

[19] Nordin N, Deros BM, Wahab DA (2010) A Survey on Lean Manufacturing Implementation in Malaysian Automotive Industry. International Journal of Innovation, Management and Technology 1: 374-380.

[20] Lila B (2012) A survey on implementation of the lean manufacturing in automotive manufacturers in the eastern region of Thailand, Proceedings of 2nd International Conference of Industrial Technology and Management. IACSIT Press, Singapore, p. 49.

[21] Chae, Myung-Jin, Yun, S., Han, S.H., Kwon, S.W., 2010 "A Case Study for Integrating Lean Six Sigma and RFID Applications in Construction Processes Through Simulation Approach" 2010 Construction Research Congress.

[22] Barnes, C, Walker, R., 2010 "Improving corporate communications: Lean Six Sigma science has broad reach", Journal of Business Strategy, Volume 31, Issue 1, pages 23 – 36

[23] Alessandro Laureani, Jiju Antony, Alex Douglas, (2010) "Lean six sigma in a call center: a case study", International Journal of Productivity and Performance Management, Vol. 59 Iss: 8, pp.757 – 768

[24] Gibbons, Paul Martin, 2006 "Improving overall equipment efficiency using a Lean Six Sigma approach" International Journal of Six Sigma and Competitive Advantage, Volume 2, Number 2, pages 207 – 232

[25] Pickrell, G., Lyons, H., Shaver, J., 2005 "Lean Six Sigma Implementation Case Studies" International Journal of Six Sigma and Competitive Advantage, Volume 1, Number 4, pages 369 – 379.

[26] Su, Chao-ton, Chiang, Tai-Lin, Chang, Che-Ming, 2006 "Improving service quality by capitalising on an integrated Lean Six Sigma methodology" International Journal of Six Sigma and Competitive Advantage, Volume 2, Number 1, pages 1 – 22.

[27] Yan-Hu, Z., Zhen, H., Xue-Feng, G., 2006 "Comparing and Integrating Lean Production and Six Sigma" Industrial Engineering Journal, June 2006.

[28] El-Haik, B., Al-Aomar, R., 2006, "Simulation-Based Lean Six-Sigma and Design for Six-Sigma" John Wiley & Sons, Inc.

[29] Byrne, George, Lubowe, Dave, Blitz, Amy, 2007 "Using a Lean Six Sigma approach to drive innovation", Strategy & Leadership, Vol. 35 Iss: 2, pages 5 – 10

[30] Bendell, Tony, 2006 "A review and comparison of six sigma and the lean organizations", The TQM Magazine, Volume 18, Issue 3, pages 255 – 26.