SIX SIGMA & LEAN SIX SIGMA REVIEW*

BY

1PRATIK PATIL♣, 2DR. MILIND M. KULKARNI, 3SAMEER AGRAWAL

[1,2,3]*Ajeenkya D Y Patil University, Pune, Maharashtra, India.*

Email: [1]pratik.patil@adypu.edu.in, [2]milind.kulkarni@adypu.edu.in,

[3]sameer.agrawal@adypu.edu.in

ABSTRACT

Six Sigma is a methodology used for process improvement. It was introduced by an American engineer while working in Motorola Company in late 80's. This process has a significance of carrying out process in such a way that in a million opportunities carried out 3.4 opportunities are non-conforming. Lately Six Sigma has spread worldwide and become well known in corporate industry. Term Six Sigma in applied in industries to show the measure of excellence and quality in an organization. Six Sigma study only shows the formless perception and technical aspects of the process but there is more to it, it's not just a training program but a kind of culture an organization can develop by its implementation. Lean Manufacturing is a technique that is used to reduce waste in manufacturing processes. In lean manufacturing the goal is to give the customer exact quality, quantity & price point as expected by the customer.

KEYWORDS

Six Sigma, Lean, DMAIC, DMADV.

I.INTRODUCTION

Six Sigma (6σ) is a set of tools and techniques for process improvement. It was first implemented in 1987 by an American scientist named as Bill Smith While working in Motorola. The six sigma has a 3.4 defective feature per million part, which says that it has an accuracy of 99.99997%. Six Sigma is a methodology used to improve business processes by utilizing statistical analysis rather than guesswork. Processes are improved by controlling variation and understanding the intricacies within them. This results in more predictable and profitable business processes [1]. Six Sigma is more than "training"; it is an approach based on data and geared toward projects with quantifiable business outcomes. This proven approach has been implemented within a wide range of industries to achieve both hard and soft money savings,

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♣ Corresponding Author

while increasing customer satisfaction. For instance, in 1999 GE Capital was able to save $2 Billion with Six Sigma [2].

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There are two main Methodologies of Six Sigma.

1.DMAIC

DMAIC is used for projects aimed at improving an existing business process.

2.DMADV

DMADV is used for projects aimed creating new product or process designs.

These methodologies are inspired by W.Edwards Deming's Plan-Do-Study-Act Cycle, each with five phase.

Lean Manufacturing was first introduced in the book The Machine That Changed the World (1991) by James P. Womack, Daniel T. Jones and Daniel Roos as lean thinking. The main objective of this concept was to reduce the wastage from every aspect possible to make an optimal product for the customers, this also includes reducing the cost that we would put in over engineering the non-necessary aspects of product hence reducing the overall cost of the product. Lean manufacturing is more of a problem solving approach than a cost reduction program. The main idea is to reduce waste and achieve efficient production by a compressive approach. Lean approach is reviewing the operations, processes or products that add cost rather than value [3].

II.LITERATURE REVIEW

[1]Priya Sharma 'Six Sigma: A Case Study Of Amazon.Com'

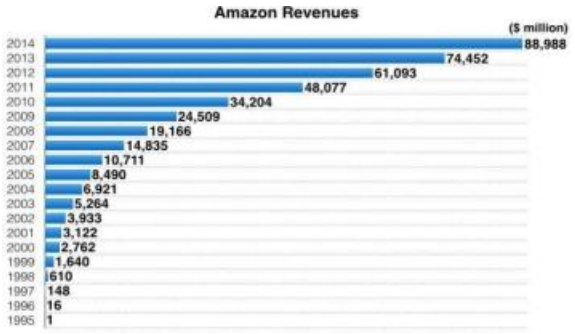
Six Sigma is a set of techniques and tools for process improvement by reducing the defects; it means maintenance of the desired quality in processes and end products.

A Six Sigma has two methodology mentioned

1.DMAIC

2.DMADV

Amazon is a shining example of Six Sigma. This paper mentioned the case study of the Amazon.Com, Six Sigma application in Amazon.com and impact of Six Sigma on Amazon.com.



Amazon Revenues– 1995 to 2014

The impact of Six Sigma on Amazon.com can be seen through the statistical representation.

[2]Prabhu Kolochi, Ragul Murugesh, J.Makesh 'Six Sigma implementation through DMAIC'

In the following paper the impact of DMAIC methodology of Six Sigma was reviewed in the production facility of submersible pumps. During this research, execution of DMAIC procedure of Six Sigma was carried out for eliminating ovality in a component called stage casing. During this study the calculations examined shows a significant growth in sigma level from 3.90 to 3.97. From the above observations we can say that implementation of six sigma could help small and medium sized organizations to improve their process and product by increasing the sigma level with the implementation of DMAIC approach of Six Sigma.

[3]Délvio Venanzi, Diogo Luis Faustino, Orlando Roque da Silva, Haroldo Lhou Hasegawa 'LEAN SIX SIGMA – MULTIPLE CASE STUDY'

Lean Six Sigma is set of instructions or tools that are set on boosting quality and productive performance in operating systems. This article mentioned the foundation of this technique through two of its methodologies used for management by understanding its concept namely Six Sigma and Lean Manufacturing. In this article integration of these two concepts and the outcome is shown. It has 3 case studies from three different companies located in Sorocaba, São Paulo (Brazil). Lean Manufacturing was introduced in Toyota in late 80's by Taichii Ohno's initiative under the conceptualization of Toyota Production System (TPS). After the World War 2 when Japan was getting back on its feet's

Toyota realized that investing in manpower is important than investing in expensive machineries. This will motivate the employees and the employees would give their maximum efforts in improving the process. They achieved this by training their employees. They implemented Lean manufacturing to their process to add value to their products. It further states how Toyota was able to become a benefit rather than burden by developing a culture, organization & operating system.

Lean Manufacturing can be better understood as a concept including a variety of industrial practices that are oriented towards identifying and implementing value adding process from the perspective of customer to enable a streamline flow of the process at the pull of customer through the organization. Main objective of lean manufacturing is to create an product that meets customer requirements while eliminating the waste to almost zero.

The different conceptual measurements that were carried out throughout the process of implementing lean manufacturing are mentioned below:

1.Supplier feedback

2.Just-In-Time (JIT) delivery by suppliers

3.Supplier development

4.Customer involvement

5.Pull production

6.Continuous flow

7.Setup time reduction

8.Total productive/preventive maintenance

9.Statistical process control

10.Employee involvement.

III.METHODOLOGY OF SIX SIGMA USING DMAIC.

A.Define.

Define the customer group, their requirements and expectations from the product, goal of the project and process, specifically.

B.Measure.

Measure key aspects of the current process without making any changes, collect all the data from the process, calculate the process capabilities “as-in”.

C.Analyze.

Analyze the data collected, investigate the process for cause and effects. Try and define the correlation between the causes and effects, make sure all data was taken into consideration. Look for root cause for the effects.

D.Improve.

Improve or correct the process based on the data collected from analyzing the process using tools such as poka yoke, mistake proofing and design of experiment. Use the standard work procedure to create new work and establish the process. Set up pilot runs to find out process capability of improved process.

E.Control.

Control the stated process and make sure that all the deviations made for improvement are targeted and corrected before they result in defects. Set up control systems to continuously monitor the process. The above mentioned process is repeated until desired level of sigma is obtained.

IV.METHODOLOGY OF SIX SIGMA USING DMADV

A.Define.

Define design goals that are significant with customer demands and organization strategy towards the product.

B.Measure

Measure and identify the set process for critical aspects to quality, measure process capability & production measures of risk.

C.Analyze.

Analyze to develop the set process and design alternatives which would give better results with respect to existing process.

D.Design.

Design an alternative which is improved than the previous iteration. Set analytical results for the process best suited for the production from analytical perspective.

E.Verify

Verify the design, set up pilot runs, look for changes possible, implement it in the process, optimize the process and hand it over to the owner.

V.METHODOLOGY USING LEAN SIX SIGMA

The search strategy taken was the multiple case studies. The choice of this approach is in accordance with the Yin propositions (1994), because it aims “to investigate a current phenomenon inside of its real context, when the distinctions between phenomenon and context is not clearly defined and using many sources of evidence”. The Field research, conducted

through case studies, used a qualitative method of descriptive study (or explorative), adopting the matching strategy between multiple cases studies. Yin (1994), the qualitative methods are characterized by a strong focus on comprehension of facts instead of its measurement. A pair of studies from each research was considered as a pattern. A set of questions were set for interviewing the managers of each organization. The interviews were carried out, after recording the interview feedback from managers were evaluated with the research and transcribed to a magnetic device with individual observation, where the observation was carried out to address the issues to structure the work that were attached to the article. The document examination was also the subject of the study. In each case study, a member of strategic level (directors) and tactical (managers) was interviewed, aiming an analysis of the answers of the questions to a better understanding of the vision of each interviewee. It is worth mentioning that these interviewees have at least 10 years of experience in companies. A data analysis was used to collect all the data. Content analysis, in addition to performing interpretation after data collection, is developed through more or less refined techniques. Thus, content analysis has been shown to be one of the most used data analysis techniques in the field of administration in Brazil, especially in qualitative research (DELLAGNELO; SILVA, 2005). A semi- structured questionnaire was sent to the employees (three managers and three Lean / Six Sigma engineers) in each of the two companies surveyed, the companies are classified as large companies having more than 2000 employees each. The interviews were recorded after the interviewed opinion, evaluated with the researcher and transcribed to magnetic medium, and analyzed the main issues and issues addressed for the structuring of the work. The documentary exam was also the subject of the research.

CONCLUSION

The awareness of Six Sigma has spread out throughout the world, it helps industrial sector to grow its roots in the market. It helps the management of the organization in various aspects such as: Customer focus, process improvement, philosophy of excellence, total quality management and the awareness of process measurement rather than depending on gut feeling. It is about making every department of organization able to meet the needs of the customers, market and latest technologies implements in recent market. This will not only benefit the organization but also employees, customers and further the stake holders. Like every other process Six Sigma also has some loopholes, it can be observed that it is a time consuming process, requires skilled man force which also can be expensive. As we all know Six Sigma was implemented in late 80’s they say that it has nothing new. But as the history says it has benefited many organizations via its result to embrace their roots in the market. It can also be

seen through all its loopholes and drawbacks that its concept is capable in process improvement. After viewing all the stats of amazon.com, we can say that Six Sigma is key to success for upgrading business strategies. The Six Sigma approach embraces two main activities. One is the execution of project to solve quality failures by applying DMAIC phases (Easton and Rosenzweig, 2012). Other activity is the creation of belt-based training infrastructure by assigning designations namely Champion, Master Black belt, Black belt and Green belt (Shafer and Moeller, 2012). The process of creating belt-based training infrastructure has been consuming a lot of money in organisations while implementing Six Sigma projects. This created an impression that Six Sigma is an expensive approach which is not economical to implement in small and medium size manufacturing companies for achieving continuous quality improvement. Overall, this research work has revealed the implementation of DMAIC alone is prone to aid the manufacturing companies to move towards achieving zero defect manufacturing by overcoming defects by carrying out the Six Sigma projects. In the case of the Lean, the initial strategy of conducting isolated kaizens in areas, sectors or processes generated specific results awoke the companies to the necessary organizational culture change that should accompany the introduction of these programs. In case of Six Sigma it requires a capable staff empowerment that are skilful enough for implementing statistical tools which are aimed for partial or full devoted for process improvement. Lean Six Sigma proved to be useful and adequate in business improvement.

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