

Journey from Six Sigma to Lean Six Sigma: A Literature Review

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ABSTRACT : This paper reviews the published literature related to six –sigma and lean six-sigma. The paper shows that how the methodology changes with changing trend and competition. Nowadays, the pressure of competition from multi-national companies had increased and among them is the automotive industry. It is the impact when the level of competition is intensifying as the manufactured vehicles shifts from being national to global. As a part of competition, the important of understanding the implementation of LSS concept is really useful to be a good competitor. The review gives why the industries fail to implement as well how they can overcome it.

Keywords: Six Sigma, Lean, LSS (Lean Six Sigma), DPMO (Defects Per Million Opportunities)

I. Introduction

What is Six Sigma? Imagine yourself as a head of management of an organization. Ask yourself, what is it that your organization produces using different processes. Are the requirements tested? Are the customers satisfied? Is everything working as per desired? There are so many questions that might pop up but crunching all of them to one single answer is not easy. For a successful business, it is essential to keep track of all processes involved and take adequate actions that satisfy the end user and helps maintain an everlasting relationship.

1.1 Six sigma

Motorola engineers expanded on the term in the 1980s when they decided that the traditional quality levels (measuring defects in thousands of opportunities) were inadequate. Instead, they wanted to measure the defects per million opportunities. By using statistical analysis to minimize variation, Six Sigma enables data-based process improvements, but gained momentum after its adoption by General Electric in the mid-1990s. Motorola developed Six Sigma to drive defects to zero, but did not explicitly address the elimination of unnecessary tasks. *Six Sigma* is a data-driven process improvement methodology used to achieve stable and predictable process results, reducing process variation and defects. Snee (1999) defined it as: ‘a business strategy that seeks to identify and eliminate causes of errors or defects or failures in business processes by focusing on outputs that are critical to customers’. Six Sigma methodology is to accelerate the company’s rate of improvement in quality and productivity. *Our conclusions are that Six Sigma is only a distant second to Lean in terms of popularity.*

In one research out of the 17 surveys examined, it was possible to estimate the percentage of organizations implementing Six Sigma based on only eight studies. Based on the four large sample studies we could conclude that the uptake of Six Sigma among organizations has been low, ranging from 5.0% to 15.5%.

Barriers to implement six sigma are that it is too complex to use, difficulty in collecting data, etc. In recent years, companies have begun using Six Sigma Methodology to reduce errors, excessive cycle times, inefficient processes, and cost overruns. The goal of the project was to streamline and standardize the establishment and maintenance of costing and planning for all business activities.

1.2 Lean

The first applications of Lean were recorded in the Michigan plants of Ford in 1913, and were then developed to perfection in Japan (within the Toyota Production System). Lean manufacturing inspects the process by analyzing each task or activity to determine whether it is value-added, is not value-added but necessary, or is not value-added. A value-added activity is something for which the customer is willing to pay. An example of a value-added activity is the maintenance of a satellite operations center. If a contractor was maintaining this center, then an example of a non-value added but necessary activity is an invoice payment. Activities that neither add value nor are necessary should be eliminated.

II. Methodology

2.1 DMAIC (Six Sigma)

Six Sigma as a whole can function primarily in three different mannerisms: As a metric, management system, and methodology. As a metric, Six Sigma can be a scale of how good a company's quality is. To have "Six Sigma" quality standard, a company must only have 3.4 DPMO. As a management system Six Sigma pulls in the concepts of Six Sigma into a corporate business strategy. As a methodology, Six Sigma is represented by the DMAIC model (Goodman, 2012). DMAIC method is applicable in both manufacturing and non-manufacturing industries. DMAIC is defined as follows:

Define – To identifies the problems.

Measure – Gather the right data to accurately assess a problem.

Analyze – Use statistical tools to correctly identify the root causes of a problem.

Improve – Correct the problem (not the symptom).

Control – Put a plan in place to make sure problems stay fixed and sustain the gains.

2.2 Waste elimination process (Lean)

Lean similarly is an approach for improvement in an organization focusing on waste elimination. This waste is of seven types: (1) Overproduction, (2) Waiting, time in queue, (3) Transportation, (4) Non-value-adding processes, (5) Inventory, (6) Motion, and (7) Costs of quality: scrap, rework, and inspection (Pande and Holpp, 2002). In short it is all about maximizing the added value to the customer.

III. Results

Lean is clearly the most popular performance improvement programme with 36% to 40% of the respondents implementing this programme. Six Sigma is the second most popular performance improvement programme with just over 15% of the respondents implementing it. As already mentioned in the introduction, Six Sigma techniques focus on reducing the variation in a process, making them the ideal tools for tackling an incapable but stable process, whereas Lean tools focus more on the elimination of waste and would be the first port of call for streamlining an unstable process. Priority should be given to unstable processes, using Lean tools to eliminate the waste and simplify the process. Once it has stabilized, more advanced statistical tools from the Six Sigma toolbox, can be used to reduce variation and make the process capable. Thus, Lean-Six Sigma came to exist so that we can take the benefits of both of them.

3.1 Lean Six sigma

The management of the company will always be looking for opportunities that will enhance the effectiveness of the company's processes. Lean Six Sigma is one of the significant methodologies of quality management, this seeks to increase productivity and improve quality of process outputs. It emphasizes that imperfection is an opportunity for improvement.

Lean Six Sigma is rooted in the manufacturing industry as well LSS starts with top management. Lean Six Sigma (LSS) is a combination of historical methods for process improvement that focuses on the bottom line and critical-to-customer requirements and that takes both suppliers and customers into account. Lean Six Sigma is a business improvement methodology that aims to maximize shareholders' value by improving quality, speed, customer satisfaction, and costs. It has been widely adopted widely in manufacturing and service industries.

The benefits of Lean Six Sigma in the industrial world (both in manufacturing and services) have been highlighted extensively in the literature and include the following:

1. Ensuring services/products conform to what the customer needs ('voice of the customer').
2. Removing non-value adding steps (waste) in critical business processes.
3. Reducing the cost of poor quality.
4. Reducing the incidence of defective products/transactions.
5. Shortening the cycle time.
6. Delivering the correct product/service at the right time in the right place.

Every customer expects quality, speed and low cost so LSS provide these by DMAIC (Define, Measure, Analyze, Improve, and Control) project management methodology and various lean tools are utilized to streamline processes and enhance productivity. The companies that are the strongest proponents of LSS include General Electric Co., Sony Corporation, Honeywell, TRW Inc., Bombardier, Johnson and Johnson, The Dow Chemical Company, Exxon Mobil Corp., J.P. Morgan Chase & Co., Citibank, GMAC Mortgage Corporation, and John Deere.

Lean Six Sigma combines the principles of both the reduction of the seven types of wastes as well as the reduction of defects in manufacturing operations. The DMAIC cycle (Design, Measure, Analyze, Implement and Control) assists the researchers in reducing the various types of waste throughout the corporation being assessed along with the organization performing the assessment.

Why has the government largely ignore it?

Air Force Base, was recently quoted as saying, "I will tell you that in virtually every one of our major programs we are out of control on cost and schedule" [2]. LSS is designed for process improvement, but its principles can help maintain both cost and schedule control.

A total of 135 organizations were contacted, of which only approximately 10% reported the application of Lean Six Sigma. This is considered quite a negative phenomenon, because the success and prosperity of organizations largely depends on appropriate methods applied for their improvement. Lean Six Sigma does not require the application of new methods and techniques, but expects effective application of proven methods, consistently and correctly. It can bring dramatic improvements and building and developing corporate culture.

The barriers in health care to implement LSS are 1. Measurement: It is often difficult to identify processes, which is required to find out defects. 2. Psychology of workforce: It is particularly important to not use jargonistic language, as this has a high chance of being rejected or accepted with cynicism by medical professionals.

3.2 Critical success factors

Successful LSS application requires committed leadership, education, and institutionalization. Regardless of future names and improvements LSS requires each of the following activities: (1) focusing on what is critical to the customer, (2) emphasizing the bottom line, (3) validating any claims of success, and (4) institutionalizing the process through extensive training programs and certification of expertise.

IV. Conclusion

Lean Six Sigma is an approach that learns from past failures, one of them is insufficient support of management.

Focus on customer, processes, employee characterize the lean Six Sigma as a method of building and developing a new corporate culture and providing organizations with a tool for a competitive advantage.

The integration of this two principles is logical and practical which can bring dramatic improvements. It is not possible to achieve lean processes without statistical control of variables, since it is not possible to achieve a 6 Sigma process level without optimal flows and elimination of waste. However, there are no. of barriers of LSS in services, such as innate characteristics of services, as well as manufacturing origins of LSS that have conditioned service managers to consider them as physical products only.

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