



Discussion on Integration of Lean Production and Six Sigma Management

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Abstract

The paper introduces the emergence and development of Lean Production and Six Sigma management, compares and analyzes on Lean Production and Six Sigma management, it also analyzes the necessary and feasibility in integration of Lean Production and Six Sigma management, and points out the ways for integration of Lean Production and Six Sigma management: integration of organizational management, integration of implementing process, integration of process method, integration of using tool, Establishing conformable environment for Lean Six Sigma. Finally, the paper presents nine main parts that integrating Lean Production and Six Sigma management should be paid attention to.

Keywords: Lean Production, Six Sigma management, Lean Six Sigma

Lean Production and Six Sigma management are the two management methods of broad impact. The two methods have brought tremendous benefits to the enterprises which have successfully implemented the two methods. Lean Production and Six Sigma management cannot only be used alone, also be combined, each has its own advantages and disadvantages, and the two have complementary strengths. They are reinforced and linked mutually. If Lean Six Sigma can be integrally used, it will have a bigger effect.

1. Introduction of Lean Production and Six Sigma management

1.1 Lean Production

Lean Production originates in the Japanese Toyota Motor Corporation. It comes from the study and further development of management of American Ford Motor Company. Its core idea is to remove all non-value-added activities of links of enterprises, to create value of production as much as possible with less manpower, less equipment, in a shorter time and venues, further to meet customer production or service requirement. It emphasizes on reducing wastage and non-value added chain to reduce cost. Lean is not only the most productive way of the of impact on human society, but is a symbol of the new era of industrialization.

1.2 Six Sigma Management

Six Sigma management was put forward in the mid-1980s Motorola. Motorola summed it up by practice in order to be against the pressure on enterprise development and improve the quality standard. It is based on in order to improve the quality standard and total quality management theory and mathematical statistics on the total quality management theory and mathematical statistics. Its core idea is making all business work as a process, basing on data and facts. The use of quantitative methods in the flow of the factors affecting quality. Identify key factors to improve and continue to reduce volatility so that their ability to operate is the best and achieve customer's satisfaction. It follows the process by streamlining processes, controls flow variations, eliminates variability of the quality products in the process, thereby saving costs. Followed MOTOROLA, GE, so many world's top multinational companies like DELL, TOSHIBA, HP, SONY, CITIBANK, DESNEY, Hilton Hotel have adopted Six Sigma management to strengthen management, improve their management level, reduce costs and improve customer loyalty, increase sales and increase their core competitiveness

2. Lean and Six Sigma integration of the necessity and feasibility

2.1 Lean Six Sigma and the need for integration

From the above two comparative analysis can be seen, Lean and Six Sigma management have their own advantages and disadvantages of each other if they absorb each other's merits, the performance will be better. First, Lean Production specializes in systems analysis, the success of enterprises depends on the effective functioning of a good process, no matter how hardworking the staff, are they can't go beyond the design capacity of the process? Lean process management provides a framework for the project management of Six Sigma. Secondly, lean production needs experts' unique talents of knowledge, lacking of knowledge of the normative. Six Sigma management integrate various tools and solving problems in a standardized DMAIC process provide strong operability management tools for the project management. Again, Lean's

expert analysis on the scene, manage to quickly overcome the problems exposed at the scene, and focus on Black Belt .Six Sigma management under the guidance of quantitative analysis for the complex issues underlying causes can be found to solve the complex process the problem, but it needs a longer time to solve the problem. Different problems, need to combine the two, choose a different approach to solve the problem can increase the efficiency and capacity. Finally, from the operational level, the two management models of training, system improvements, and so need to integrate the way, one of the single use are defective (Zhou, He & Gao, 2006, 6,1-4).

2.2 The feasibility of integration of Lean Production and Six Sigma

First of all, both are the model of continuous improvement and pursuit of perfection. This is the homogeneity of their essences that is the reason why can there be possibility of integration.

Secondly, Lean Production and Six Sigma management are both closely connected with TQM, and their implementation are very similar to PDCA model, which provides a basis for the integration.

Again, although there are many differences between lean production and Six Sigma management on the operational level, they are not mutually exclusive. Take the culture for example, today's management emphasizes the integration of eastern and western cultural, and absorption of the advantages of different cultures for easy management; training methods and improvement methods of system all can be integrated (Zhou, he & Gao, 2006, 6,1-4).

3. Integration approach of Lean Production and Six Sigma

3.1 Integration of management

Matrix-type organization can be used in Lean Six Sigma. Figure 1 shows the structure.

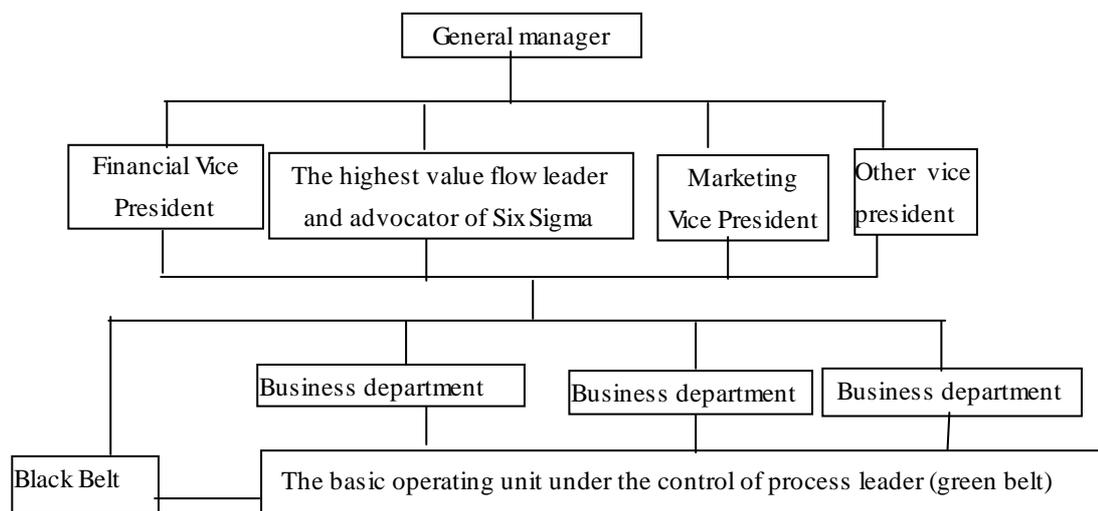


Figure 1. Organization structure graph of Lean Six Sigma

There are two lines in the system, one is mainly value flow managers at all levels throughout the business process; the other is mainly Black Belt and green belt throughout the project management. They are cross-combined. The first line is relatively stable and the staffs are full-time, while in the second line, the staffs are part-time except black belt. Lean theoretical content must be increased in Black Belt, Green Belt and other staffs training. The highest value flow leader must be a vice president (he can be operating manager), who is also an advocator of Six Sigma management (Zhou, He & Gao, 2006, 6,1-4).

3.2 Integration of implementation process

The principle of Lean should be integrated with DMAIC of Six Sigma management under the strategic framework in the process of integration. The new implementation process of definition - Measurement - Analysis - improvement - control is used and known as DMAIC . The difference between DMAIC and traditional DMAIC is Lean philosophy, methods and tools are added in the process. (He, Zhou & Gao, 2006, 1,13-17) Table 1 shows the implementation steps of Lean Six Sigma.

3.3 Integration of Methods

Six Sigma management uses DMAIC and SIPOC process analysis model developed from Deming's PDCA circular. Lean production uses the value flow analysis in the course of product realization method which is very similar to SIPOC, but it has not put forward DMAIC model as Six Sigma management in resolving specific issues. Therefore, the integration of them can be adopted.

First, pursue lean production, then draw current process chart of the enterprise, implement value flow chart analysis,

eliminate all MUDA in old process and remove unnecessary waste. On the basis, analyze remained process using DMAIC and implement continuous improvement to optimization process (Zhang, 2006, 11,14-16).

3.4 Integration of tools

The implementation of the Lean production makes enterprise order and the existing problems can be discovered in time, then Six Sigma management analyzes the data using statistical methods and technology, and looking for the causes from deep level. So the two tools can organically integrated, complementarily advantages. The integration can be carried out combining with the implementation process. Table 2 shows the specific tools.

Table 1. The implementation steps of Lean Six Sigma

Stages	Definition
Define	<ol style="list-style-type: none"> 1. Defining customer needs, analysis system, looking for waste or variation, identifying improvement opportunities 2. Analyzing organizational strategy and organizational resources 3. Determining the project including the key export items, the resources they use, and the scope of the project
Measure	<ol style="list-style-type: none"> 1. Defining process characteristics 2. Measuring process status (including the time processes or movements need) 3. Analyzing measurement system 4. Evaluating process capability
Analyze	<ol style="list-style-type: none"> 1. Analyzing the process, identifying the root causes of waste or variation 2. Identifying the process and key input factors
Improve	<ol style="list-style-type: none"> 1. Determining the relationship between input and output variables and proposing optimization program 2. Drawing up improvement plans
Control	<ol style="list-style-type: none"> 1. Establishing action norms and implementing process control 2. Testing the measurement system, process and capacity 3. Summarizing the results, standardizing successful experiences and putting forward new issues

Table 2. Tools of Lean Six Sigma at different stages

Stages	Tools/Methods
Define	Pareto chart, KANO analysis, project identifier, value chain analysis, brainstorming, balance integration method, value flow chart, resources analysis, flow chart
Measure	Measurement system analysis, process capability, action analysis, time Measurement, Customer Satisfaction, OEE, process lead-time, TAKT, capacity utilization, data collection table
Analyze	Variance analysis, multiple variance analysis, FMEA, regression analysis, residual analysis, cluster analysis, 5WH, new and old seven tools, flow chart, value flow chart
Improve	Critical path, full production maintaining, test design, Gantt Chart, benchmark analysis, similarity, improvement strategy, balanced analysis, optimization techniques, creative thinking, QFD
Control	Control chart, Poka-yuke, billboard, scene 5S, reliability verification, standard technology, visual technology, interactive audit, single-piece flow

3.5 To establish a “Lean Six Sigma” management of the environment (Zhang & Zeng, 2005, 6,25-28)

The establishment of “Lean Six Sigma” management of the environment, can set about from two aspects:

First, construct the logistics network of “Lean Six Sigma”, establish the necessary information management environment and the management of information systems technology platform. Generally speaking, the settlement of a certain product quality and process’s fluctuations and defects, use the Six Sigma management, through local processing processes and equipment adjustments can be realized. However, the process of improve the process and shorten the cycle often involve large-scale enterprises into the transformation of process, and even organizational structure changes. This requires the

enterprise existing logistics systems, such as production layout, production technology and raw material supplies, end products, and materials flow survey conducted in the building process efficiency on the basis of the evaluation criteria, and set up a customer demand-oriented fine Lean Six Sigma Logistics pulling mechanism, it is organizational guarantee of the fundamental resolution of upgrading the quality, speed and cost reduction, and this is “Lean Six Sigma” logistics network building. Meanwhile, we must establish the necessary information management environment and the management of information systems technology platforms, and realize CAD, CAM, MRPII, APS integrated with PDM. These advanced manufacturing technology is the realization of the picture, visualization control method’s basis, which together constitute Lean Six Sigma management of the logistics network environment.

Second, the creation of “Lean Six Sigma” corporate culture environment. Lean thinking and Six Sigma management of common stressed, is “to determine the value of customer demand flow” and “improve customer’s satisfaction” and emphasized that “excellence”, “the pursuit of perfection”, these concepts need to staff reflected them in each links of the process flow, after long time it is “Lean Six Sigma” corporate culture that formed. Practice shows that the implementation of “Lean Six Sigma” management is successful or not, operating tools and methodologies are critical to the application, but can a “Lean Six Sigma” corporate culture, is the fundamental determining factor.

4. Lean Six Sigma management and the integration of several caveats and cautions

4.1 Give full play to leadership

Lean production and the use of Six Sigma integration, need to deal with the issue of the whole system, at the same time, it is more complex to analyze and resolve problems, with different departments need to communicate the need for more resources to support, there are no more leadership support not be successful. The support of the leader should be real support, not just a verbal commitment, it requires leader to participate in the integration of Lean Six Sigma. Only take part in them, can they identify problems and effectively promote Lean Six Sigma integration (He, Zhou & Gao, 2006, 1,13-17).

4.2 Strengthen communication

Lean Six Sigma for the integration process, the communication plays a very important role. Communication includes not only the same level of communication within the organization, the communication between the upper and lower, but also the organization of communication with external customers, suppliers and communication; communication includes not only ideologically, but also learn from each other on the way. To strengthen communication, it can greatly promote Lean Six Sigma concept spread in the organization with the rapid speed, and reduce the resistance.

4.3 Attached importance to cultural construction

Lean Six Sigma emphasis on the facts, as well as the data-based, compared with the traditional extensive experience of management, its staff requirements are higher, and more stringent. Therefore, the implementation of Lean Six Sigma is also inseparable from cultural construction, which make each staff of the enterprise forms a habit of doing things, consciously according to Lean Six Sigma approach to doing things.

4.4 Establish a perfect management foundation

Lean Six Sigma enterprise integration, we must establish a comprehensive management foundation, especially basic data management, and continuous improvement in order to provide true, reliable data to enable enterprises implemented in the right direction.

4.5 Concern System

Lean Six Sigma is the strength of the system as a whole, rather than individual projects, the implementation of Lean Six Sigma to focus not only on the projects, we must also consider the overall improvement of the operation system, the company short-term financial performance should with the company’s long-term comprehensive strategic balance to consider (Chen, 2006,11,54-56).

4.6 To process management for the center

Lean and Six Sigma management integration should be process-centric, to rid itself of the organization functions as the starting point ways of thinking. This can really found in the entire value stream which is a value, which is a waste, and efficient management (He, Zhou & Gao, 2006, 1,13-17).

4.7 Focus should be in this business

Simple copying, copy the experience of others or mechanical combination Lean with Six Sigma is not successful. Enterprises should base itself on its own characteristics, with its own characteristics and embark on a road of integration (Wang & Zhang, 2006, 1,55-58).

4.8 Selecting suitable projects

Normally the implementation of Lean Six Sigma projects takes several months to see profits. Therefore, in the selection of the first project, we should pay attention to the probability of success and the evidence of benefit. It will be helpful to enhance

the confidence of the project team and carry out the follow-up projects. In addition, not all projects require Lean Six Sigma. The result is good for some of projects individually using the method or the Six Sigma management method. We should treat the projects differently according to their needs.

4.9 Involvement of people

In order to successfully implement enterprise integration, it must have the support of all the staff. If all staff support and participate in the integration of Lean Six Sigma, the integration of Lean Six Sigma will have a solid foundation.

5. Conclusion

The integration of Lean and Six Sigma management is necessary, Lean and Six Sigma management like the wrench and pliers in one toolbox. The result will be maximal, if both of them are possessed Using Lean Six Sigma, enterprise can be closer to customers, understand the key demands of customers better and focus on the key aspects of process improvement more accurately to enhance the bottom line of quality. It will bring more revenue to the enterprise. Of course, the implementation of Lean Six Sigma process is very complex. It needs further research. We should grope in and summarize it constantly in practice.

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