The Right Culture- Backbone of Six Sigma Success “Industrial Engineering & Management”

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Abstract—Six Sigma archetypally start off well like weight loss program, spawning enthusiasm with great headway, but too frequently nose-dive to have a lasting impact as members slowly lose inspiration and fall back into deep-rooted routines. A closer look to the successful organizations point towards underlying winning culture propounded by leaders of those companies. Many companies have embraced Six Sigma, a quality-control system designed to tackle problems related to production defects and striving for lean manufacturing that aims to remove all processes that don’t add value to the final product. But many of those companies have come away less than happy. Recent studies, for example, suggest that nearly 60% of all corporate Six Sigma initiatives fail to yield the desire results. We studied six sigma programs at companies including academic institutions to gain insight into how and why so many of them fail. They fail because the culture that support high performers is lacking, thereby reducing organization resilience. On the other hand the leadership that systematically nurture culture of customer centricity, accountability, collaboration and initiative are not only able to weather storm but quite successful at the end.

Index Terms—Six Sigma, winning culture, lean, organization resilience, customer centricity.

I. INTRODUCTION

Six Sigma implementation is a complex process which necessitates significant changes in the way that companies function and involves many tricky issues. Organizational culture has been recognized as one major challenging task to the Six Sigma execution. Six sigma was launched by Motorola in 1987. It provides an atmosphere for solving many CTQ (critical-to-quality) problems through team efforts [1]. CTQ could be a critical process, characteristic to quality, or a critical reason to quality characteristics. The culture of the company is the invisible but play crucial role in implementing six sigma successfully. Taking cultural aspects into account is seldom mentioned as a success factor in implementing Six Sigma. Former CEO Jack Welch transformed General Electric from company’s analytical, bureaucratic and hierarchal culture to speed, simplicity and self-confidence. This initiated dialogue at every level about how employees could make the organization successful and also succeed personally at the company was the core behind company’s success.

Six sigma is a level of quality, based on statistical measure of variation in processes, a problem solving methodology that can be applied to any processes, a management philosophy, and customer-based approach to doing business.

In six sigma the focus is on reducing defects and variations in processes, where initially the percentage of rejection of paste was nearly 3.09 %, which got reduced to about 2.26 % within two months by applying the six sigma [3]. Bandyopadhyay and Coppens (2005) presented a model of Six Sigma approach to health care quality management for hospitals. In Lean manufacturing involvement of each factor suggested by Isikawa for zero error is must and there is need of motivation of workers [4]-[7].

Six sigma generally consists of five phases: Define Measure, Analyze, Improve, Optimize and Control. Define the projects, goals and the deliverables to customers. Describe and quantify both the defect and the expected improvement. Measure the current performance of the process. Validate data to make sure it is credible and set the baselines. Analyze and determine the root cause(s) of the defects. Narrow the causal factors to the vital few. Improve the process to eliminate defects. Optimize the vital few and their interrelationships.
Six sigma is a methodology for improving key processes, and a tool box of quality and management tools for problem resolution. Six sigma has two key methodologies: DMAIC and DMADV. DMAIC is used to improve an existing business process. DMADV (Define, Measure, Analyze, Design, Verify) is used to create new product designs or process designs in such a way that it results in a more predictable, mature and defect free performance. Six Sigma management strategies require process improvement through identifying problems, root causes, process redesign and reengineering, and process management. Six sigma follows a model known as DMAIC (Define, Measure, Analyze, Improve, and Control).

Therefore, Six Sigma starts by analyzing defects and lean initial focus is on customer, process flow, and waste identifications. Hence, applying both Six Sigma and Lean tools sets results in far better improvements than could be achieved with Six Sigma methodology which implements according to DMAIC (Define-Measure-Analyze-Improve-Control) quality strategy for continuous process improvement. In order to reduce process variability and quantity of nonconformities/defects which leads to reduction of Cost of Poor Quality, the first step is to detect major defect types and then finally unclose their root—causes. As the requirement for Statistical Process Control (SPC) implementation, Analysis of Measuring system must be performed to ensure that measured values are correct and relevant for analysis based on SPC. The process of Six Sigma initially requires activities over and above the routine activities and later changes the routine activities to a higher level. This process thereby needs strong support from top management that understands the importance of right culture.

II. DEFECT RATE AND PPM AND EFFECT OF CULTURE IN ITS MEASUREMENT

The defect rate, denoted by p, is the ratio of the number of defective items which are out of specification to the total number of items processed (or inspected). Defect rate or fraction of defective items has been used in industry for a long time. The number of defective items out of one million inspected items is called the ppm (parts-per-million) defect rate. Sometimes a ppm defect rate cannot be properly used, in particular, in the cases of service work. In this case, a DPMO (defects per million opportunities) is often used. DPMO is the number of defective opportunities which do not meet the required specification out of one million possible opportunities. (Park, 2003). The attitude and culture of honesty to measure DPMO correctly at various levels to set the mile-stones of improvement become the corner stone of six sigma success.

III. DIFFERENT SIGMA QUALITY LEVELS AND CULTURE OF CONTINUES LEARNING

Specification limits are the tolerances or performance ranges that customer's demand of the products. Figure 1(a) and (b) shows the specification limits as the two major vertical lines “[Park, 2003]”. The sigma quality level (in short, sigma level) is the distance from the process mean (μ) to the closer specification limit. In actual practice, it is desired that the process mean to be kept at the target value. However, the process mean during one time period is usually different from that of another time period for various reasons. This means that the process mean constantly shifts around the target value. To address typical maximum shifts of the process mean, Motorola added the shift value ±1.5 to the process mean. This shift of the mean is used when computing a process sigma level. To
understand the above requires continues loop learning. It is an incremental change process which reminds a technical variant of the learning organization. Continuous improvement occurs through procedural practices (the DMAIC-cycle) which form a structure for sustaining learning.

IV. PROCESS IN SIX SIGMA METHODOLOGY/SIGMA LEVELS AND IMPORTANCE OF CULTURE

Six Sigma has two methodologies
1 DMAIC- For existing products
2 DMADV- For new designs

The DMAIC methodology has five phases:
• Define the system, requirement of customer and goal of the project
• Measure the present process and collect relevant data from it.
• Analyze the data collected and verify cause-and-effect relationships and find out the root cause for the problem.
• Improve the present process based upon data analysis using different techniques. Set up pilot runs and the process capability.
• Control the newly implemented process for future.

The DMADV methodology also known as DFSS ("Design for Six Sigma"): First three phases (Define, Measure and Analysis) of DMADV and DFSS are same as that of DMAIC methodology and rest two are given below:
• Design a new and improved alternative, best suited as per analysis.
• Verify the design by doing pilot runs. Record the results and handover to the production team.

Sigma Levels
If two products are not conforming (outside standard limits) out of total 100 products, and then for one million parts 20,000 parts will be non-conforming. So, sigma level for the product will be between 3 & 4. Preciously it will come as 3.51σ. The broad classification of sigma level is shown below which is also known as defects per million (DPMO).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Sigma level</th>
<th>PPM Defectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1σ</td>
<td>6,91,000</td>
</tr>
<tr>
<td>2</td>
<td>2σ</td>
<td>3,09,000</td>
</tr>
<tr>
<td>3</td>
<td>3σ</td>
<td>67,000</td>
</tr>
<tr>
<td>4</td>
<td>4σ</td>
<td>6,200</td>
</tr>
<tr>
<td>5</td>
<td>5σ</td>
<td>230</td>
</tr>
<tr>
<td>6</td>
<td>6σ</td>
<td>3.4</td>
</tr>
</tbody>
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The success of above methodology along with Six Sigma tools such as Isikawa fishbone diagram, Histogram, Pareto analysis, Statistical process control mandate to enhance open communication and free flow of information that refuse to accept attacks on others and ask each employee to take responsibility with atmosphere of thanks and praise for those who meet high standards while helping poor performers. The methodology requires involving diverse cross cutting teams to work together and striving to reduce inequities, raise aspirations to encourage realistic stretch goals and have reward initiatives by demonstrating that positive change is possible.
General Electric and Motorola developed certification programs as part of their Six Sigma implementation, verifying individuals' command of the Six Sigma methods at the relevant skill level (Green Belt, Black Belt etc.) to provide effective recognition and pride. Following this approach, many organizations in the 1990s started offering Six Sigma certifications to their employees.

VI. PRECAUTIONS TO BE OBSERVED DURING IMPLEMENTATION

Lean Six Sigma is to reduce company waste and cost while enhancing efficiency, profitability and customer satisfaction. However, Lean Six Sigma should not hurt employee sentimentalities if the company decides that the employee should figure in to the plan of cost reduction. Implementing employee removal within an organization can upset employee morale, build stress within the organization due to additional work. Thereby, less working hands results hurting the company as a whole through employee attrition and reducing revenues and customer service. Implementing lean manufacturing ruthlessy also hurts the organization as well. Businesses that do not take the time to suitably study their supply and demand substructures will find internal factors leads to lean implementation but external factors will still hurt and costing the organization more economically in the long run. Companies should perform the proper study and homework when employing a lean manufacturing environs to ensure that supply and demand is taken into narrative of the broader policy framework. Not doing desired research in the matter leads to financial loss and interruptions in actually getting product in to the industrial process. Assets and resources will be unexploited heavily and the company and stake-holders will suffer due to longer lead time from contractors and suppliers.

VII. PRACTICAL IMPLICATIONS

Organization must invest in, and assign resources to team training in order to promote learning and continuous improvement. The role of the leaders needs to be more unmistakably defined and leaders should be authorized to make decisions and empowered. Managerial inference is that the maturity of information systems is a requisite for supporting culture of continuous and enlightened learning in six sigma implementation.

VIII. DISCUSSION AND CONCLUSIONS

The organizational culture has been recommended as an illuminating variable for the level to which a company meritoriously implements its quality practices. The goal of learning was to provide a better appreciative of the relationships between organizational culture and Six Sigma execution. As the latest quality program designed to boost organization-wide continuous improvement, Six Sigma includes a wide domain of quality practices. It is a thorny and difficult task to provide a supportive cultural environment for effectively employing these quality practices. The study has important suggestions for management practices. Managers should be mindful of the cultural morals on which their company relies before trying to realize the quality practices in Six Sigma. For instance, it may be cooler for an organization that has a stouter group culture to enhance workforce management for continuous improvement than for another corporate that has a weaker group culture. Also, the findings of the current study suggest that corporations should strive to create a culture that weight on some cultural orientation(s) at the expense of the others. In order to get the full profits of a quality management execution, managers may find that it is imperative to gauge their company’s cultural inclinations and to develop necessary strategies to create a collaborating environment in which all quality practices prosper. Additionally, the consequences of this investigation lead to a task regarding developing and maintaining a culture that is well-adjusted over the group.

REFERENCES


AUTHOR BIOGRAPHY

Dr. Suresh Kumar Babbar has 22 years of experience with industry and 10 years with the education sector. By dint of his perseverance and dedication towards his coveted appointment, he earned scholarships from FORD to pursue higher professional studies. He had successfully reduced WIP of Engine Blocks from staggering 3 months to just 7 days, thereby saving millions of dollars along with improving total quality of Engine Block Section. Recently he was attended Executive Education Program for senior management professional by Harvard Business School on Customer Centricity. His educational qualifications are PhD, M. Tech, B.E., PGDM, PDBA, TQM from USA, TPM from Japan, ISO – 9000 Assessors Program from UK.

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