

Review Article

A Basic Approach to Six Sigma in SMEs to improve Production, Quality & Management System

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Abstract

The fast changing economic conditions such as global competition, declining profit margin, customer demand for high quality product, product variety and reduced lead-time etc. had a major impact on manufacturing industries. To respond to these needs various industrial engineering and quality management strategies such as ISO 9000, Total Quality Management, The Six Sigma approach has been increasingly adopted worldwide in the manufacturing sector in order to enhance productivity and quality performance and to make the process robust to quality variations. This paper discusses the quality and productivity improvement in a manufacturing enterprise through a case study. The paper deals with an application of Six Sigma DMAIC (Define–Measure-Analyze-Improve-Control) methodology in an industry which provides a framework to identify, quantify and eliminate sources of variation in an operational process in question, to optimize the operation variables, improve and sustain performance viz. process yield with well-executed control plans. Six Sigma improves the process performance (process yield) of the critical operational process, leading to better utilization of resources, decreases variations & maintains consistent quality of the process output.

Keywords: Six Sigma, Quality, Production, Management and Improvement

Introduction

Six Sigma programs in big manufacturing sector, it is urgently required to replicate this strategy in small scale sector too. The contribution of small scale industries to the Indian economy cannot be ignored as this sector is strategically placed in the industrial population of the country and in the global economy as a whole. The increasing demand for high-quality products and highly capable business processes by large organizations has left no choice on the SMEs to consider the introduction of Six Sigma business strategy. From the literature, six sigma helps to improve the area of application in all types of organization. Defects rate of product plays an important role for the improvement of yield and financial conditions of any company. The objectives of this paper are to study and evaluate processes of the case organization, to find out current sigma level and finally to improve existing sigma level through productivity improvement. According to the objectives, current sigma level has been calculated and given suggestions for improvement. This has been done by using six-sigma DMAIC cycle. Especially in improve phase of DMAIC cycle, different improvement tools are used like 5s, supermarket and line balancing etc. By using these it has been possible to improve productivity by reducing defect rate. This research work has been carried out in a fan manufacturing company to show how to

improve its productivity and quality by using Six-sigma. This paper related to work is not only applied to fan manufacturing company but also in any other types of organizations. By implementing Six-sigma a perfect synchronization among cost, quality, production time and control time will be observed.

Literature review of Six Sigma for SME Industries

Six Sigma is a business performance improvement strategy that aims to reduce the number of mistakes/defects to as low as 3.4 occasions per million opportunities. Sigma is a measure of variation about the average in a process which could be in manufacturing or service industry.

Six Sigma improvement drive is the latest and most effective technique in the quality engineering and management spectrum. It enables organizations to make substantial improvements in their bottom line by designing and monitoring everyday business activities in ways which minimizes all types of wastes and NVA activities and maximizes customer satisfaction. While all the quality improvement drives are useful in their own ways, they often fail to make breakthrough improvements in bottom line and quality. Voelkel, J.G. contents that Six Sigma blends correct management, financial and methodological elements to make improvement in process and products in ways that surpass other approaches.

The Six Sigma based methodology has been used to optimize the variables of SAW Boom machine operational

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process. The results obtained after implementing the improvement measures at various stages of the SAW Boom machine operational process are described below:

1. *Sigma impact* – The sigma level has been increased to 3 (corresponding to improved process yield of 93%) from 1.8 (previous process yield of 61.8%). The higher the sigma level, the better the process is performing and the lower the probability that a defect will occur. The DMAIC methodology of Six Sigma has resulted into a quantum improvement in Sigma value.
2. *Impact of Cost/benefit* – A company that reduces its cost of doing business, meets the expectations of its customers more effectively and efficiently, inspires its employees, fosters a culture of dedication and pride, and earns a reputation for quality.
3. *Impact of Customer satisfaction* – Customer satisfaction is achieved by providing the products and service of right quality, in the right quantity at the right time, right place and right cost, fulfilling customers (external as well as internal) stated and implied needs. By providing defect-free products and services of consistent performance and quality, the Six Sigma practice definitely enhanced the customer satisfaction.
4. *Impact of time* – Considerable time is saved by eliminating non-production (idle) time and by not producing the defective product and by eliminating rework/reprocessing.
5. *Impact of top line* – Organizational reputation in the market and society at large is improved by providing products and service of good quality without any deviation in terms of performance and reliability.
6. *Impact of Bottom line* – Six Sigma is a process control technique. By ensuring that the process is under control, the product can never be defective. Rejection or rework saved is straight away added to the bottom line in terms of profit of the organization and ROI.
7. *Improvement in yield/productivity* – Time saved in reworking is time utilized for effective production of products and services; which is added to the productivity. The yield or productivity is improved by optimum utilization of resources along with the reduction in wastages. Higher productivity lead to more production, lower cost of production and better quality and competitiveness in the marketplace.

Six Sigma has set a new direction for quality and productivity management. Six Sigma shifts the paradigm quality as the cause of good business performance and not the effect. Earlier all process and product improvement techniques were aimed at continuous improvement of quality. Six Sigma proves to be an effective strategy of finding solutions to eliminate the root causes (critical Xs) of performance problems in processes that already exist in the concern & thereby eliminating the unwanted defects (Ys) produced by the process. Six Sigma propagates that all-round quality performance is bound to result in the attainment of the desired business excellence in terms of reduction in cost of production, maximization of productivity, customers (external as well as internal)

satisfaction, profitability and ROI by achieving reduction in cost of production and processing by continuous process improvement, reduction and elimination of wastages, rework and excess consumption of resources.

Practices of Six Sigma in SMEs

Indian manufacturing SMEs has strong foundation in the form of ISO 9000. But except a few, many have not yet adopted advanced breakthrough quality improvement strategy like Six Sigma and other continuous process improvement techniques. Probably this can be one of the important reasons for companies not able to gain access to the international market and contribute significantly to the Indian economy. Thus, Indian SMEs are required to build their capability in respect of knowledge of global products, and global quality and technical standards. Desai, D. A. *et al.*, pinpointed the results obtained from a cross-sectional study accomplished for the rate of response and benefits of Six Sigma implementation from different key sectors of the Indian industries. The manufacturing sector is on the top in implementing Six Sigma with 69% contribution in India. Anupama Prashar, 2014 deals with high warranty claims due to field failures of relief valves resulting in higher customer dissatisfaction. Present days many of the small scale manufacturing industries in India are facing problems in order to become competitive in global market. One of the reasons is the manufacturing activities are outsourced to low labour cost countries like China. Now a Days due to an large scales competition companies are looking forward to reduce total cost, lead times and increasing the product quality. This has created a need to implement lean and six sigma strategies in manufacturing organizations. Six Sigma approach to business process improvement helps companies distinguish themselves from competitors by manufacturing products with less waste, faster, better and at lower cost. Six Sigma is a methodology, when it implemented properly the company improves efficiency and gain competitive edge. Today small scale industries are using different tools and techniques to improve and sustain in the market. Currently, Six Sigma tools and Lean Management are recognized as most popular continuous improvement initiatives and companies are using them widely. Six Sigma project initiatives start with understanding the current state of the Business processes in organization, then setting up targets for future state of all activities. Six Sigma uses DMAIC (Define, Measure Analyze Improve and Control) framework.

India is emerging as one of the key components manufacturing Centre in Asia and is projected to play a significant role in the global supply chain in the near future. Manufacturing competence of the Indian manufacturing SMEs is much higher than that of electronics, machinery, and process industries. Some researches hints on this subject by stating that Six Sigma promote many SMEs as identical benefits as larger companies and there is nothing inherent in Six Sigma that makes it incompatible for smaller companies. So, this would allow for constructing a potent immoral for Six Sigma implementation in SMEs, which will lead the

enterprises to yield generous results and confront customer satisfaction.

Lastly, this research provides effective guideline for selecting an appropriate tool in each stage of DMAIC Six Sigma programs to reduce variation or waste from the processes and encourage for successful implementation of Six Sigma methodology in various Indian manufacturing SMEs. This is particularly significant because today's competitive environment demands that companies reduce variation (waste) to meet or exceed efficiency and responsiveness requirements of customers.

Production Management Improvement through Six Sigma in SME industries

Six Sigma has a powerful management strategy to resolve problems by strategically management process for an any system . Production management is a system comprises of an organization structure, procedures, processes and resources to meet the productivity policy objectives. It is primarily designed to satisfy the internal managerial needs of the organization and therefore it may vary from one organization to another. Production management should be viewed as a formal integrated management system. Edosomwan [1987], defines it as an integrated process involving both management and employees with the ultimate goal of managing the design, development, production, transfer and the use of various types of products or services in both the work environment and the market place defines it as formal management process involving all levels of management and employees. Production improvement for a planned, formally structured and systematic system to approach in planning, deployment and usage of many different resources to achieve system performance. It calls for a systematic evaluation so as to identify areas for improvement and a control mechanism to monitor progress of implementation programmed to achieve improvements in different areas. There are six stages in the cycles of production improvement, which are:

1. Production : Policy
2. Production : Organization & Planning
3. Production : Measurement
4. Production : Measurement Evaluation
5. Production : Improvement
6. Production : Audit & Control

Productivity Significance

The concept of productivity is of great significance for undeveloped and developing countries. In both the cases there are limited resources which should be used to get the maximum output i.e., there should be attempts to perform a job by cheaper, safer and quicker ways. The aim should be optimum use of resources so as to provide maximum satisfaction with minimum efforts and expenditure. Productivity analysis and measures indicate the stages and situations where improvement in the working inputs is possible to increase the output.

The productivity indicators can be used for different purposes, viz. comparison of performances for various

organizations, to study performance of the organization overtime, to compare actual productivity with its planned productivity, contribution of different input factors, bargaining with trade unions etc. Productivity is a key to prosperity. Hence an autonomous organization was established in India, known as National Productivity Council (NPC). It was established in 1958 and has 5 regional productivity directorates in the country managed by specialists for organizing productivity programmes. It has also established 47 local councils at various industrial centers in the country and they work as the spear head of the productivity movement.

To increase productivity, NPC supplies publications, utilities, audio-visual media films, organizes exhibitions. In collaboration with local productivity councils and various institutions, it organizes and conducts training programmes for various level of management. It also provides assistance, guidance to industries in other activities and difficulties.

Quality Improvement by Six Sixma for SMEs

A. Create Quality improvement efforts

Successful projects are those that people believe in and want to see become successful. Far too often, the people affected by a QI project (if not the QI team themselves) are told they must change in order to meet some arbitrary internal or external requirement. In these settings, the efforts routinely fail, either during the process or by immediate degradation of improvements after project completion. However, communication early in the process regarding the project value (for all customers and individuals affected by the QI) beyond meeting arbitrary requirements increases the likelihood that people will be motivated to help the efforts succeed.

B. Aim for real change, not just re-education

An all too frequent solution for improving quality in health care is to round up a group of individuals, tell them what they are doing wrong, teach them how to do better, and return them to work. Sometimes, if properly motivated, this educational approach may make initial improvements, but in the hectic world of health care, it is too easy to unconsciously return to old ways. The failure of simple education is exemplified in an effort to use the education of nurses to reduce urinary tract infections (UTIs). While the intervention generated initial improvement, within two years of the intervention not only were all improvements lost, but the hospital recorded a quarterly rate of UTI higher than any seen in the past four years .While effective Quality Improvements will include education, it must also involve an understanding of how poor quality exists in the current process and then identify ways to change the process such that sources of poor quality are eliminated. A common example of process change is the creation of central line bundles, which combine all the necessary items for proper sterile central line placement into one kit . Utilization of these bundles commonly leads to a sustainable reduction in infections associated with central lines. This intervention is rarely sufficient on its own, but, with continued focus and other process changes, hospitals can steadily reduce their central line infection rates.

C. Empower and excite

Change is most lasting when those who provide frontline care are involved and truly excited about the quality improvement they helped to develop. While it is critically important that those who formulate the strategic plan for an organization make it clear that they value and support, the health care system does not lend itself to the necessary carrots and sticks for management to easily effect change. Instead, it must be the line of front leaders who recognize a quality problem, communicate and suggest to need for change, and motivated those around them to overcome the challenges. Additionally, it is these people in the management system who understand how a process can best identify the waste or potential sources of error. By quality management system we reduce errors in productions.

D. Evaluate and Measure

It is impossible to improve quality if there is no clear understanding about the current state of performance. This likely means multiple measurements before, during, and after a QI project. Sometimes knowing how performance varies over time can prove just as informative as knowing absolute performance at any single point in time. Also, measurement should not stop just because changes are no longer occurring. Its critical to observe how well change is maintained in the months and even years after a Quality Improvement initiative.

E. Start from low to high levels-

If quality management system to implement in smes for an low to high level by step by step process and it will help to company to achieve financial targets by six sigma for long term basis.

Conclusion

Six sigma technology is very important technology for present economic and financial, for production improvement and quality improvement of product to achieve the target to increase SMEs industries in a suitable manner. In this paper mainly we discussed about productivity improvement for better production, to create better management system and quality improvement to approach better economic process for SMEs industries. The Six Sigma Quality Control Program to provide training in all level to construct for better organizational processes. In any business processes that incorporate Six Sigma must be refined and this refining process requires training. One of the greatest advantages that the Six Sigma Quality Improvement Program offers organizations is the reported return on investment. Six Sigma training to approach SMEs in a low level to high level production and quality developments. The purpose of this paper has been to better understand how to approach Six Sigma technology in small and medium enterprises.

Six Sigma technology is real requirement for Small and Medium Enterprise industries and prepare a road map to implementation to low level to high level at any conditions.

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