

Optimization of productive management using six sigma in small scale industries

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Abstract: Overall operational excellence is the key requirement of any business to have global competence and sustained growth. Indian industries are not the exception to this. Six Sigma has emerged as one of the most effective business improvement strategies worldwide. Nothing much has been published so far illustrating an overall experience of Indian industries with Six Sigma. This paper presents an analysis of the impact of Six Sigma on developing economy like India. The paper provides an insight in to what kind of benefits Indian industries are gaining from Six Sigma as a whole. With the ascent in interrogation of growing customers and presuming for resplendent quality of their product, some of giant Indian organizations are inspiring their suppliers to employ Six Sigma in order to improve the quality of their process and products for embellishing competitive advantage. The study further highlights similarity and differences of benefit gained by different scales and sectors of Indian industries through Six Sigma. This exhaustive analysis of the benefits drawn by Indian industries through Six Sigma can assist other industries in India as well as those in other developing countries, who have yet not experimented with Six Sigma, to become more focused regarding their expectations from this improvement drive.

Keywords: Six Sigma, DMAIC, Benefits, Critical to Quality, Impact, Successful implementation.

INTRODUCTION

Six Sigma has emerged as one of the most effective business improvement strategies over the years. This quantitative approach aims at improving efficiency and effectiveness of the organization. It is the methodology having statistical base focusing on removing causes of variations or defects in the product or core business processes. The improvement focus is on business outputs which are of critical importance to the customers. In the current dynamic industrial scenario, quality alone is not the wining criteria; consistent supply of quality goods as per the committed delivery schedules makes the customers happy. Six Sigma methodologies addresses the major root causes and guarantees the targeted results, both in terms of improvements desired and time span fixed. It is a disciplined, data-driven approach and methodology for eliminating defects in any process – from manufacturing to transactional, from products to services. This breakthrough improvement strategy delivers results of productivity, profitability and quality improvements based on its highly effective approach (Desai, 2008).

From the researches and surveys conducted and published so far, it appears that Six Sigma is not being explored by the developing economies to its full potential and Indian is not an exception in this. Indian industries have experienced periodic impacts of transformation, both, before and after industrial reforms. Initially, the focus was on large-scale public and private sectors, mainly in the core infrastructural production. The main thrust was on productivity based on Taylor's principles of Scientific Management. After globalization and liberalization, quality surfaced as one of the major area of concern along with productivity. With opening up of the geographical barriers and the pressure of competing in the global market, overall operational excellence becomes the necessity for the Indian industries to remain globally competitive. Many Indian industries have successfully exploited this breakthrough business improvement strategy to their overall benefits. Still the penetration Six Sigma in Indian industries is not as encouraging as it should be. There are certain issues preventing the full use of Six Sigma as an overall business improvement strategy by Indian industries. And there are certain advantages too for Indian industries, which can be further strengthened to have an edge in the global market by effectively utilizing Six Sigma strategy.

This paper illustrates the results obtained from a cross-sectional study of the benefits obtained by entire Indian industries as a whole by implementing Six Sigma in their organizations. The paper also discusses the similarity or otherwise in fetching the benefits from Six Sigma programmed by different size and sector of Indian industries. The basic objective of this research study is to highlight the spectrum of benefits the Indian industries could achieve by Six Sigma and thus to encourage other industries who have yet not attempted Six Sigma for the breakthrough improvements.

Six Sigma - A brief overview

As per Park (2002) Six Sigma implies three things: statistical measurement, management strategy and quality culture. It tells us how good products, services and processes really are, through statistical measuring of quality level. It is new management strategy under leadership of the top management to create quality innovation and total customer satisfaction. It is also a quality culture. It provides the way to do things right the first time and to work smarter by using data information. Antony, Kumar and Madu (2005) stated that Six Sigma provides business leaders and executives with the strategy, methods, tools and techniques to change their organizations. As per them, there are four aspects of the Six Sigma strategy that are not emphasized in other business improvement methodologies and total quality management (TQM). First of all, Six Sigma places a clear focus on bottom-line savings. Second, Six Sigma has been very successful in integrating both human aspects (culture change, training, customer focus etc.) and process aspects (process stability, variation reduction, capability etc.) of continuous improvement.

Third, Six Sigma methodology (DMAIC) links the tools and techniques in a sequential manner. Finally, Six Sigma creates a powerful infrastructure for training of champions, master black belts, black belts, green belts, and yellow belts. As per Voelkel (2002) the business-oriented definition of Six Sigma states that it blends correct management, financial and methodological elements to make improvement to process and products in ways that surpass other approaches. While as per Magnusson, Kroslid and Bergman (2003) Six Sigma is a business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimize waste and resources while increasing customer satisfaction by some of its proponents. Linderman, Schroeder, Zaheer and Choo (2003) in defining Six Sigma stress up on process improvement and new product development by stating that Six Sigma is an organized and systematic method for strategic process improvement and new product and service development that relies on statistical methods and the scientific method to make dramatic reductions in customer defined defect rates. In statistical terms, Sigma (σ), as we know, is a letter in the Greek alphabet that has become the statistical symbol and metric of process variation.

Productivity Management

Productivity management is a system comprises of an organization structure, procedures, process, and resources to meet the productivity policy objective. It is primarily design to satisfy the internal managerial needs of an organization and therefore it may vary from one organization to other. Productivity management should be viewed as a formal integrated process.

There are six stages in the cycle of productivity management and these are refer

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

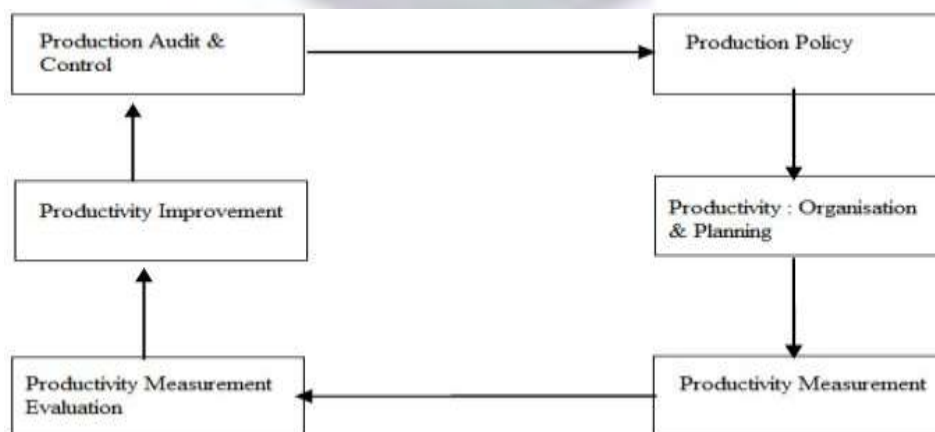


Figure 1: Closed Loop Cycle of Productivity Management

Research objectives and methodology:

The basic objective of this study was to explore the benefits drawn by Indian industries as a whole by implementing Six Sigma improvement drive at their organizations. To make the study exhaustive, entire spectrum of Indian industries were considered as population for the study. Thus, a specific questionnaire was sent out to all size and type of the Indian industries.

The specific objective of the study are listed as below:

- To know the overall benefits drawn by Indian industries as a whole by implementing Six Sigma.
- To find out whether Six Sigma is bringing similar benefits to large as well as small and medium sized Indian industries.
- To find out whether Six Sigma is bringing similar benefits to different sectors of Indian industries.
- To know the benefiting criteria of Six Sigma implementation where large as well as small and medium scale Indian industries have similar and totally different experiences.
- To know the benefiting criteria of Six Sigma implementation where different sectors of Indian industries have similar as well as totally different experiences.

As learnt in the previous section that wide-ranging research study exploring the implications of Six Sigma implementation in Indian industries as a whole is not available so far, the objectives are framed accordingly to cover complete cross-section of Indian industries. The first objective signifies the overall impact of Six Sigma in Indian industries as a whole. This is the macro illustration of benefits reaped by Indian industries by implementing Six Sigma. The second and third objectives combined dig into the micro details of impact of Six Sigma in different size and sectors of Indian industries. These two objectives of the study explore the experiences of different sizes of the industries as well as different sectors, such as manufacturing, services, IT etc. This can uncover the strength of Six Sigma improvement strategy to bring similar benefits irrespective of the size and type of the industries. The last two objectives though appear as redundant with respect to the results expected from second and third objectives; they are there to provide further detailing on the specific benefiting criteria where different sizes and sectors of Indian industries have gained similar or totally different benefits from Six Sigma. They provide insight into size and sector specific benefits of Six Sigma implementation.

The overall significance of above research objectives will help both, academic as well as industrial community. The study can generate sizeable data base on implications of Six Sigma among Indian industries. These data can further be analyzed for academic purpose to augment Six Sigma principles and practices. Industrial population can use the results of this study to understand the Six Sigma in better way and can customize the benefits of its implementation based on their respective size and type of operation.

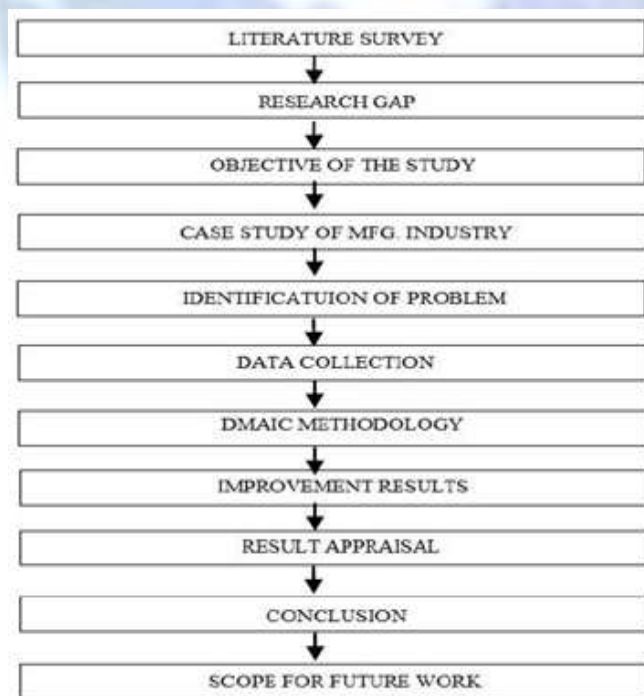


Fig. 2: Research objectives and methodology

Tool Used:

- a) Gauge R & R Study
- b) Run Chart Study
- c) Histogram
- d) Process Capability Analysis
- e) Fishbone diagram
- f) Bar chart

Objectives of the Study:

- To provide a sound discussion on six sigma methodology & see how it fits in with quality & operational excellence initiatives in a small manufacturing industry.
- To analysis the tangible as well as intangible benefits of six sigma implementation over manufacturing industry (with a case study in small sector).
- To justify the significance roll of six sigma implementation in small scale industries (with a specific case study of manufacturing unit) & remove the myth on monopoly of only large industries over six sigma implementation.
- To explore the versatility of six sigma implementation & its benefits at low cost bases with the usage of simple statistical tools across different industries in Indian context.

PROBLEM FORMULATION

Present study was carried out in a unit manufacturing bolt at Rohtak in Haryana India. The main product of unit if fasteners (nut bolts). Screw broken before shoulder face after Some times of applying torque.

- 1. Screw broken before shoulder face after some times of applying torque
- 2. Defect: Head Height Less

And the main components in it are shown in figure:



Figure 3: Learning From Failure & Success

Study & Analysis the rejection/ failure problem utilizing Six Sigma DMAIC Mythologies

Six Sigma DMAIC Methodology use to solve screw rejection problem to achieve the quality level of 3.4 PPM from the present level of 7.3 percent. The project registration was the first activity which showed formal approval from the management to initiate the project with out there backing it was never possible to involve people & implementation suggestions.

- a.) Define
- b.) Measure

- c.) Analysis
- d.) Improve
- e.) Control

OCCURRENCE CAUSE: Possible reasons of screw broken are :

- (1) After black plating, there was no provision to reduce excessive friction generate during torquing.
- (2) Less time given in hydrozen de-embrittlement of material.
- (3) Less TRD, results core dia u/s.
- (4) Surface hardness of the parts at higher side.

Analysis of rejection problem utilizing six sigma DMAIC Methodology

Identified facts result of verification, cause analysis, manufacturing quality status on the Applicable date.
 Process Flow:

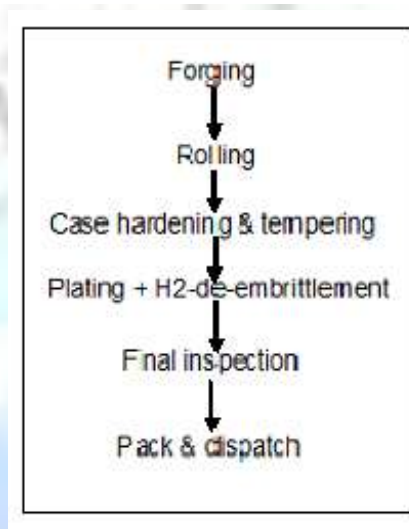


Figure 4

Cause and Effect diagram

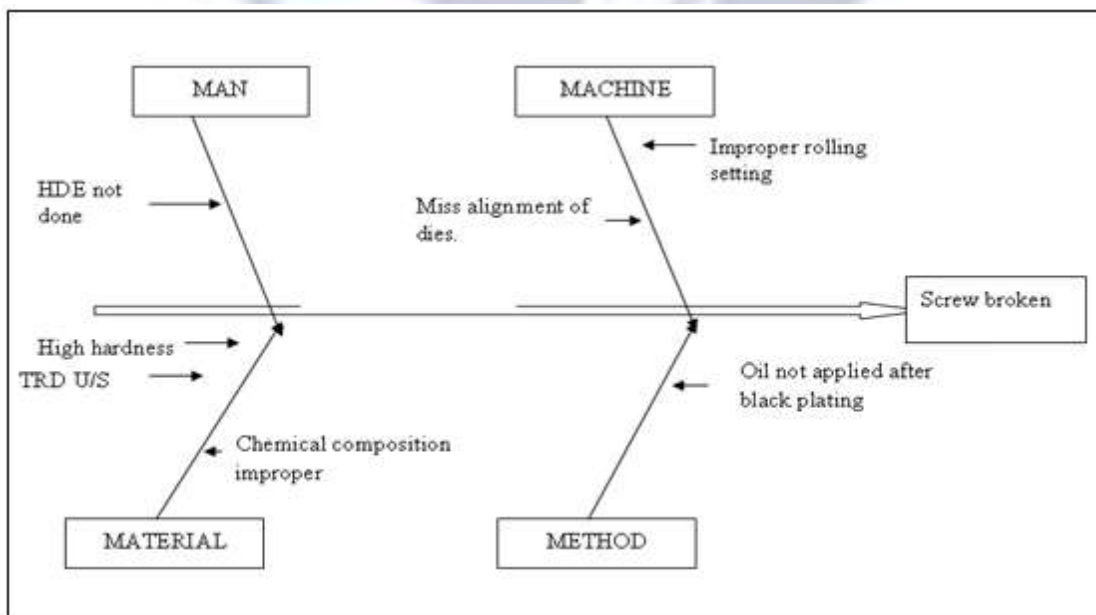


Figure 5

CONCLUSION

In the present research work, an initiative has been taken to apply six sigma in a small organization manufacturing for the fasteners sectors. The result of the study amply so that six sigma is a versatile strategy to achieve productivity improvement has a lot of potential for the small industries which are being continuously threatened by modern economic turbulence.

- Counter Measures Taken (measure contents, expected Results).

OCCURRENCE

- (1) Light oil applied on screws after black plating to reduce the friction.
- (2) Hydrozen de-embrittlement done 8 hrs against 6 hrs
- (3) Blank size of TRD increased in forging to increase the core dia.
- (4) Surface hardness reduced 500 hv against specification of (450-750) hv. This has to be controlled at min. side to avoid H2D effect.
- (5) New thread rolling dies procured and trial feed back to be given.

Feedback: contents to be reflected in the change of system/ procedures CP, Drawing, FMEA Updated.

Outflow Countermeasure:

Torsional strength test done for improved samples and imported samples observation was 1.6 - 2.05 NM in improved lot and 1.6 - 2.0 nm in imported samples.

SCOPE FOR FUTURE WORK

Application of six sigma in Indian industries is still in nascent stage and during research review, it was observe that the awareness level on the latest quality tools and statistical technique is limited among management of some large Indian organization only. In this context the following aspects need attention for future research:

- Apart from manufacturing sector, process sector is highly cost intensive and energy intensive and includes industries like paper mills, sugar mills, fertilizer plants etc. where an attempt can be made to implement Six Sigma, over various systems & sub system to considerably improve the productivity of the whole system.
- Six Sigma can also be implemented over other SME industries such as foundries, Power looms, Rolling Mills etc., to improve the productivity level
- Six Sigma implications can be study & explored even over organizations like hospitals, school, colleges etc.

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