

APPLICATION OF SIX SIGMA IN REAL ESTATE PROJECT DELIVERY

¹Rutuja Deshmukh, G. H. Rasoni University Amravati, Department of Civil Engineering
GHRU Amravati, Maharashtra

²Prof. Pranav Lende, G. H. Rasoni University Amravati, Department of Civil Engineering
GHRU Amravati, Maharashtra

Abstract - This paper discusses the implementation of six sigma methodology in real estate industries. The DMAIC analysis to six sigma has been used in infrastructure industries to improve the total quality performance. High performance also add other factors like global competitors, diversity in range, lead time and customer demand in terms of quality. Six sigma deals with all this needs. This has resulted in improving sigma level by implementing this methodology, with less investment. Implementation of six sigma methodology has resulted in large financial saving and achieving higher quality for infrastructure industries.

Key Words: DMAIC methodology, real estate industries, six sigma.

1. INTRODUCTION

The quality of construction is one the matters of great concern with most construction project. Quality management is defined as any approach used to achieve and sustain a high quality productivity conforming to requirements and meeting customer satisfaction. This paper describes the Six Sigma principle and framework as a quality improvement strategy through the successful business.

In the recent history of the quality development, the quality improvement program of six sigma has been successful. Six sigma was created at Motorola became the first recipient of America's Malcolm baldrige national quality award in 19889.(1) six sigma is of of the additional in the field of quality improvements method and business process improvement. Although it has been implemented for many years mainly in large companies, like Motorola, GE and Honeywell etc.

2. SIX SIGMA DEFINATION

Past definitions of quality were found to have focused on "conformance to standards" where companies strived to create products and services that fell within certain specification limits. In Six Sigma, the definition of quality is broadened to include economic value and practical utility to both the company and the customer. Six Sigma recognizes that business quality is the highest when costs of delivering products and services to meet customer requirements are at the absolute lowest for both the producer and the consumer. Six Sigma is therefore developed as a business strategy and philosophy built around the concept that companies can gain a competitive edge and stay ahead of the competition by

reducing defects in their industrial and commercial processes (Harry and Schroeder 2000).

2.1 Various authors have defined Six Sigma in the following ways:

- Harry and Schroeder (2000), who are the key developers and proponents of the Six Sigma program at Motorola, defined Six Sigma as "a disciplined method of using extremely rigorous data gathering and statistical analysis to pinpoint sources of errors and ways of eliminating them."
- Snee (2000) indicated that "Six Sigma should be a strategic approach that works across all processes, products, company functions and industries.
- Chowdhury (2001) explained that Six Sigma represents a statistical measure and a management philosophy that teaches employees how to improve the way they do business, scientifically and fundamentally, and how to maintain their new performance level. It gives discipline, structure, and a foundation for solid decision-making based on simple statistics.
- Pande et al. (2000) defined Six Sigma as a way of measuring processes, a goal of near perfection represented by 3.4 defects per million opportunities (DPMO); and more accurately, a comprehensive and flexible system for achieving sustaining, and maximizing business success. It is uniquely driven by a close understanding of customer needs, disciplined use of facts, data, and statistical analysis, and diligent attention to managing, improving, and reinventing business processes.
- Pande and Holpp (2002) defined Six Sigma as a statistical measure of the performance of a process or a product: goal that reaches near perfection for performance improvement; and a system of management to achieve lasting business leadership and world-class performance.

2.2 DMAIC Process

The tool of six sigma are most often applied within a simple performance improvement model known as define-measure- analyse- improve- control. DMAIC is used when a projects goal can be accomplished by improving an existing product, process, or service. DMAIC is summarized in table 1

Table -1: Sample Table format

Sr. No	DMAIC steps	Process
1	Define	Define the requirements and expectation of the customers. Define the project boundaries. Define the process by mapping the business flow
2	Measure	Measure the process to satisfy customer's need. Develop a data collection plan. Collect and compare data to determine issues and shortfalls.
3	Analyse	Analyze the causes of defect and sources of variation. Determine the variation in the process. Prioritize opportunities for future improvement.
4	Improve	Improve the process to eliminate variation. Develop creative alternatives and implement enhanced plan
5	Control	Control process variations to meet customer requirements. Develop a strategy to monitor and control the improved process. Implement the improvements of systems and structures.

3. LITRATURE REVIEW

Wen-Bin Chiu¹, Luh-Maan [3]

The aim of this research was to undertake a process improvement project for construction turnkey operations. A process improvement program (PIP) is a performance improvement program and aimed at reducing the defects in quality, rework, waste time and cost in a construction project. The authors created 3 matrices primary, secondary and tertiary. Primary dealt with the present conditions, secondary addressed the quality aspect and third the delay. The authors used the voice of the customers to define the expectations and mission of the PIP. The initial results of the PIP were found to be of positive nature. By applying the Six Sigma Techniques which included the fishbone diagram, cause and effect matrix through DMAIC phases, statistical methods and design of experiments, the authors determined the final probable causes. The key recommendation for eliminating or reducing the probable causes and achieving this PIP objective were given.

Susmy Michael, Sahimol Eldhose.[4]

The aim of this research was to implement six-sigma in construction processes and operations to improve the overall quality. The parameters that affected the delivery quality of a building were lack of knowledge, labour, low quality of tools

and materials. After analyzing the results the authors found that the sigma level of the process was very low. The main causes of the problem have to be identified and they have to be eliminated.

S. Sriram's & A. Revathi's [5]

This study was Implementation of Six Sigma Concepts in Construction Project for Ensuring Quality Improvements. One of the major challenges faced by them was that the construction firms has to deliver the product within the stipulated time without compromise in quality. The authors have selected the tiling activity and have analysed the activity for the following parameters, namely, uneven surface, right-angle at corners, hollow sound, staining, colour shade variation, skirting are in line, bad pointing, damages due to plumbing and sanitary fittings, proper slope maintained for floors to prevent water logging. The study shows us that the execution of works with the Standard quality requirements reduces rework and hence the cost for it. Their study helps us to understand that the DMAIC process can be helpful to increase quality and quantity at the same time and it will affect technical and financial success of project considerably.

Tushar N. Desai [6] This study emphasizes the changing economic condition such as global competition, customer satisfaction in product variety and reduced lead time. This paper proposed that productivity and quality improvement in manufacturing industries. The application of Six Sigma (DMAIC) methodology provides a framework to quantify and eliminate source to optimize the operation variables and improved performance

Sneha P. Sawant [7] T

he aim of this research is to discuss the quality improvement in construction industry. We take a residential building in which 18 buildings are considered and check internal finishing work then applied six sigma principal. Suggested the proper training, management support and change current work procedure thus helps ultimately customer satisfaction and improve the finishing work which is most important for us.

Dr. N V R Naidu, [8]

The implement of Six-Sigma approach in manufacturing of piston rings to reduce the defect. First define the problem then choose Data Analysis, Pareto chart, Failure Mode Effect Analysis and Design of Experiments and find the cause of the problem and carrying out experiments to resolve the problem. Using DMAIC cycle he can easily short out the problems and reduce defects.

Muharrem Firat Yilmaz [9]

The objective of this study was to evaluate implementation of six-sigma in the construction industry. The study aims at understanding the complex nature of construction activities from the process improvement point of view. The authors reviewed many papers and interviewed people who were directly related to the construction industry to gain

knowledge about the same. The theory covers the following aspects related to the use of six-sigma in construction, types of process improvement methods, theoretical similarity and dissimilarity of six-sigma with construction, what can be done for the better implementation of six-sigma, what benefits can six sigma provide for the construction industry. The study by the authors concludes that the DMAIC methodology has been implemented efficiently in the context of construction industry.

4. CONCLUSIONS

1. DMAIC cost reduction techniques used in manufacturing industry as well as service industry.
2. Six Sigma can be applicable to varieties of sectors that want to improve business excellence and operating excellence. Being a breakthrough improvement methodology, quantum gains in quality, productivity and profitability can be achieved.
3. By using Six Sigma we can reduce defects from any processes and can deliver close to target products. Improvement in quality, productivity, profitability, market share and customer satisfaction can be achieved by using this methodology.
4. Six Sigma can reduce defects from any processes and can deliver close to target products.
5. Improvement in quality, productivity, profitability, market share and customer satisfaction can be achieved by using this methodology.

REFERENCES

- [1] Karin sch n, bjarn berquist and bengt,2010- the consequences of six sigma on job satisfaction:international journal of six sigma,2010pp99-188.
- [2] Hongbo Wang, "A Review of Six Sigma Approach: Methodology, Implementation and Future Research", IEEE Xplore. February 1, 2009
- [3] Wen-Bin Chiu, Luh-Maan Chang: Application of Six Sigma Process Improvement Method on Construction Turnkey Projects: International Journal of Chemical, Environmental & Biological Sciences (IJCEBS) Volume 1, Issue 1 (2013) ISSN 2320-4087 (Online).
- [4] Susmy Michael, SahimolEldhose: .Defects Reduction in High Rise Residential Building using Six Sigma: A Case Study:Volume 4 Issue 3, March 2016.
- [5] S. Sriram, A. Revathi, Implementation of Six Sigma Concepts in Construction Project for Ensuring Quality Improvements, International Journal of Innovative Research in Science Engineering and Technology ISSN 2319-8753, ISSN(Online) : 2319-8753
- [6] Tushar N. Desai and Dr. R. L. Shrivastava, "Six Sigma – A New Direction to Quality and Productivity Management" Proceedings of the World Congress on Engineering and Computer Science 2008.
- [7] Sneha P. Sawant and Smita V. Pataskar, "Applying Six Sigma Principles in Construction Industry for Quality Improvement" Proc. of the Intl. Conf. on Advances In Engineering And Technology - ICAET-2014
- [8] Dr. N V R Naidu, "Performance improvement of manufacturing industry by reducing the Defectives using Six Sigma Methodologies" IOSR Journal of Engineering Vol. 1, Issue 1, pp. 001-009. 2015
- [9] Muharrem Firat Yilmaz Stockholm 2012 Six Sigma within Construction Context as a quality initiative, Performance Indicator/Improver and Management Strategy.