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Six Sigma DMAIC Methodology

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Abstract: ***This postulation incorporates Literature Review & key findings from the previous research papers. Writing Review had talked about process improvement strategies utilized in development industry and broke down the essential highlights what's more, standards of Six Sigma. The methodology of the Six Sigma depends on quality, execution and the board angles.***
This investigation guards that there is no uncertainty about the constructive outcomes of Six Sigma on development ventures. Especially, Six Sigma can give a more extensive quality idea, point by point execution estimation, facilitated and repeatable procedure/execution improvement. It has expanded quality straightforwardly/in a roundabout way and effects affects creation effectiveness. Since development industry incorporates loads of unrepeatable errands and distinctive procedure structure methods, Six Sigma doesn't appear material all in all administration approach in development industry. Moreover, it tends to be incorporated to the current administration techniques of organizations. Bringing everything into thought, clearly Six Sigma has a great deal so as to quicken basic and social difficulties development industry needs.
Keyword: DMAIC, DMADV, Six Sigma, DPMO

I. INTRODUCTION

A. Overview of Six Sigma

Six Sigma was created in 1980s in assembling industry and got well known as a process improvement technique. Be that as it may, the reception of this idea is new in development industry and the point of this examination is to assess Six Sigma as a procedure improvement strategy inside development setting. Six Sigma is certainly not a totally better approach to deal with a venture, however it is an altogether different way. Fundamentally, Six Sigma standards powers change to happen deliberately. Six Sigma began as a critical thinking way to deal with decrease variety in a creation and assembling condition. Variety implies that a procedure doesn't create a similar outcome without fail. It would be ideal if you note that the Six Sigma standards are not about quality in the conventional sense. Quality is characterized generally as conformance to interior prerequisites. This has little to do with the Six Sigma. Six Sigma is tied in with helping associations get more cash-flow by improving client worth and productivity. To connect this goal of the Six Sigma standards with quality, we'll have to take a gander at another definition quality. With regards to Six Sigma standards, quality is characterized as, "the worth included by a beneficial undertaking." The Six Sigma standards allude to a profoundly trained procedure that centers around creating and conveying close immaculate items and administrations reliably. It is a factual idea that quantifies a procedure with respect to deserts. The expression "Sigma" is utilized to assign the circulation about the normal of any procedure. In Statistics, "σ" is the image to delineate populace standard deviation. The Six Sigma standards are a lot of dependent on insights. Six Sigma is a nonstop improvement process. The motivation behind why it is alluded to as a nonstop improvement process is that the Six Sigma standards give organizations an organized way to deal with dissecting how they are at present performing and how they can improve their procedures to carry out the responsibility all the more productively and adequately on a continuous premise. Proficiency is about profitability and adequacy is about the nature of your work. These ideas are emphatically dug in the Six Sigma standards.

B. Advantages of Six Sigma

Six Sigma offers six significant advantages that pull in organizations −

1) Creates continued achievement
2) Sets a presentation objective for everybody
3) Improves an incentive to clients
4) Quickens the pace of progress
5) Advances learning and cross-fertilization
6) Executes key change

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II. LITERATURE REVIEW

A. Nishaant Ha, Swethaa.B, Chris Anto.L, (December, 2018), "Concreting For Construction- Quality Control by Six Sigma Approach" IJITEE

The paper focuses on one critical to quality factor i.e. Compressive Strength of concrete. They collected data of compressive strength of concrete of the days 3, 7 & 28 days. Data is tabulated & analyzed. Different types of cements are also used. They give control charts for future concreting as a guidelines.

B. Dr.Divakar.K, Nishaant.Ha (June 2018), "Achieving Total Quality Management in Construction Project Using Six Sigma Concept" IRJET

Paper gives concept that was applied to construction activities to avoid delay. From data present of site was analysed. DMAIC methodology was applied this stage. Variations in schedule was observed. All delays are considered as "defects". Defects per Million Opportunities were calculated. From this value six sigma level was calculated. For conclusion pareto chart was made. The conclusion from recommends ways to overcome the delays.

C. Darpan Keshore, Dr Nitin Joshi, Harish Kumar Dwivedi, (November – 2017), "Implementation of Six Sigma for Quality Evaluation of RMC Plant with Dmaic Methodology" IJERT

In this paper a study is carried on RMC plant located at Indore. Firstly, they found out the level of six sigma of that plant. For measurement of customer satisfaction RII method is used. Due to poor six sigma level, they adopted the DMAIC methodology to improve the level. Their aim is to identify major quality factors. They use excel & linear regression analysis for improvement & solutions.

D. Shantanu Sathe, Dr. Satish B. Allampallewar, (November 2017), "Application of Six Sigma in Construction" International Journal of Innovative Research in Science, Engineering and Technology

The paper is on application of Six Sigma in construction industry. Paper proposed a framework to organize & implement strategic process. DMAIC method is applied for improvement. The paper concluded that Six Sigma is widely accepted improvement technique. The awareness should be made among all employees of the organisation.

E. Surya Bhan Yadav, Niraj Kumar, Raman Kumar, (April 2017), "Quality Control Process for Ready Mixed Concrete Plants" International Conference on Emerging Trends in Engineering, Technology, Science & Management

The paper aims at various quality control processes done at RMC plant. Quality assurance programme is used to achieve desired quality of concrete as output. Paper gives a model for RMC plant for quality control.

F. Dhayanandhan.B.V, Sasikumar.M, (March 2017), "Quality Control and Management Practice in RMC" International Journal of Engineering Technology, Management and Applied Sciences

The paper is adopted the best & effective quality system at RMC. Paper also look for reasons that are affecting the quality of concrete. Paper suggests an operation model. Paper mentioned various factors affecting overall quality of plant.Quality improvement programme & best management practices should adopted & applied.

G. E.Poovaragavan, K.Chandra Sekar (April 2016), "Continuous Process Improvement in Ready Mix Concrete Plants" IJSER

This paper uses SPC (Statistical Process Control) as tool for the standardisation & quality improvement. Basically, SPC tool is used for decision making & to check whether a process in on the right path. Simplicity is the strength of SPC tool. Paper uses several tools like – RII, systematic flow chart, cause & effect diagram.

C. Lade, A. S. Nair, P. G. Chaudhary, N. R. Gupta, (Mar - Apr. 2015), "Implementing Six Sigma Approach for Quality Evaluation of a RMC Plant at Mumbai" IOSR-JMCE

This paper shows a study on RMC plant at Mumbai. Mumbai RMC plant had six sigma level about 1.23. They found production process was neither capable nor stable. Through this paper they recommended solutions for process improvement. They conducted VOC for quality evaluation. DMAIC method is applied to existing process. DMAIC methods helps them to identify the root cause & how to eliminate that cause.

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D. Ahmad A Mousa, (10 September, 2015), "Six Sigma DMAIC for Shaking Stagnant Construction Cultures – A Conceptual Perspective" ICEES

A stagnant construction culture is reformed using six sigma DMAIC methodology & this paper is focuses on this concept. This paper gives some ideas about stagnant culture and problems associated with it. Paper gives perception of sustainability in stagnant construction culture. DMAIC is conceptually incorporated into Kotter's model. The approach is complementary to Kotter's model.

E. Mr. Ganesh P. Jadhav, Mr. Sandeep B. Jadhav, Mr. Amol Bhagat, (December-2015), "Six Sigma DMAIC Literature Review" International Journal of Scientific & Engineering Research

The paper is based on literature review of DMAIC methodology in Six Sigma. Paper stated that Six Sigma is a recent concept & used widely for the productivity improvement, quality performance. Paper has conclusion that DMAIC methodology has wider applications like hospital, educational institutes, etc.

F. Rahul Mahajan, Reuben Buthello, (Sep. - Oct. 2015), "Quality Control of Ready Mixed Concrete" IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)

The main objective is to maintain the quality at RMC plant. Paper is helpful for the beginners in maintaining quality of concrete.Paper gives step by step procedure to achieve quality through various tests that are carried on concrete.

G. Ali Amer M. Hasan Karakhan & Dr. Angham E. Ali Alsaffar "Quality Evaluation of Al-Rasheed Ready Concrete Mixture Plant by Using Six Sigma Approach", Volume 18 September 2012, Journal of Engineering

A paper aims to evaluate the central concrete plant with the use of six sigma. Paper uses questionnaire approach for the field survey. For improvement paper uses DMAIC process cycle. For statistical analysis paper uses SPC software.

H. Benny Tjahjono, Peter Ball, B Tjahjono, P Ball, V I Vitanov, C Scorzafave, J Nogueira, J Calleja, M Minguet, L Narasimha, A Rivas, A Srivastava, S Srivastava and A Yadav "Six Sigma: a literature review", International Journal of Six Sigma and Competitive Advantage August 2010*

The paper captures current state of six sigma. The definition of six sigma, its tools & techniques, its advantages & disadvantages are discussed in this paper work. The findings from this paper open new opportunities in six sigma concept.

I. Preeprem Nonthaleerak, Linda Hendry, "Six Sigma: Literature review and key future research areas", International Journal of Six Sigma and Competitive Advantage · January 2006

The paper gives literature review on six sigma methodology.Lean six sigma concept is given in this paper.Paper reviewed 200 similar papers.Paper gives area that need to researches & reviews.

J. Sandeep Bodke, Snehal Nikam, Yogita Phad, Sayali Katkade, Kiran Kangane, "Quality Improvement in Building Construction Using Six Sigma" , IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) 2005

Paper identify the factors affecting the quality of the construction. Paper uses six sigma concept to the buildings to improve the quality of the construction. Paper suggests DMAIC methodology. For changes in current works, paper gives DFSS methodology.

III. METHODOLOGY

Six Sigma is divided into two methodologies, DMAIC and DFSS/DMADV. DMAIC (which is an acronym for Define, Measure, Analyze, Improve, and Control) focuses on improving existing processes and performance (Ferrin et al., 2002).

A. Define Phase

In this progression, characterizing issues that can be fixed is a significant key. It is critical to pick issues that are costing the organization most or are giving you the most issues. Also, characterize the clients, their prerequisites, the group contract, and the key forms that influence the clients. Objectives as well as goals of a specific procedure are then set based on the client's necessities. SIPOC point of view (which represents Providers Inputs–Processes–Outputs–Customers) can be utilized in the characterize stage to request the Voice of the Customer (VOC) and decide not just the wrongs of a specific item, or administration yet in addition to distinguish the significant data sources which lead to the yields through a progression of procedures. SIPOC outline is a calculated model used to help characterize the limits and basic components of a procedure without diving into so much detail.

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B. Measure Phase

In this step, the Black Belt calculates how many errors are made. In other words, measures the current performance of the process (yield, DPMO, sigma level, etc.).

Six Sigma offers the following formulas to calculate percentage of yield and number of defects per million opportunities (DPMO). Table 1 shows the relationship between sigma level and these metrics values while eq. (1) and eq. (2) are the formulas of calculating the yield and DPMO [12].

Yield= (correct items / opportunities) (1)

DPMO= (defects / opportunities) X 106 (2)

Table (1): Relationship among sigma level, DPMO and yield [12]

Sigma Level	DPMO	Yield %
2	308770	69.123
3	66811	93.3189
4	6210	99.379
5	233	99.9767
6	3.4	99.99966

C. Analyze Phase

In this progression, comprehend and dissect the information gathered by utilizing straightforward factual devices too as the procedure to decide the underlying drivers of the issue that need improvement. In development, the principle task is to recognize at the point when, where and why the imperfections happen in the venture, which incorporates real and potential issues by utilizing Six Sigma apparatuses.

D. Improve Phase

In this step, Six Sigma project aims to eliminate the identified defects through the knowledge derived from analyze phase. Motivating the team and effective coordination of the different processes and activities and their interface are required to improve the entire construction project.

E. Control Phase

In this progression, in the wake of discovering main drivers, options for development are thought of and enhancements made. At that point, further information is gathered to guarantee that enhancements have happened and control plan is set up to guarantee the progressions are changeless. More or less, this progression guarantees that the procedure improvement isn't lost after some time.

IV. CONCLUSION

Any association that needs to improve their nature of solid blend can utilize DMAIC cycle and the proposed improvement framework; at that point, start by giving faculty a concise presentation on current the board methods of value control since they are the base of Six Sigma.

Despite the fact that there is a lot of distribution around Six Sigma and hence a variety of perspectives, it is conceivable to distinguish four understandings of Six Sigma: a lot of factual instruments, an operational way of thinking of the board, a business culture what's more, an investigation procedure that utilizes the logical strategies, in spite of the fact that the streams are not fundamentally unrelated but rather, covering.

The fundamental objectives of Six Sigma, be that as it may, stay unaltered, for example improving effectiveness, benefit and ability in the process.

The underlying approach of Six Sigma was centered around process improvement and as needs be DMAIC approach was all around embraced, yet as time advanced, the need of executing Six Sigma at configuration phase of item (or procedure) was felt critical what's more, thus the idea of Design for Six Sigma (DFSS) was created. A few marginally various varieties of the previously mentioned approaches are accessible in the writing.

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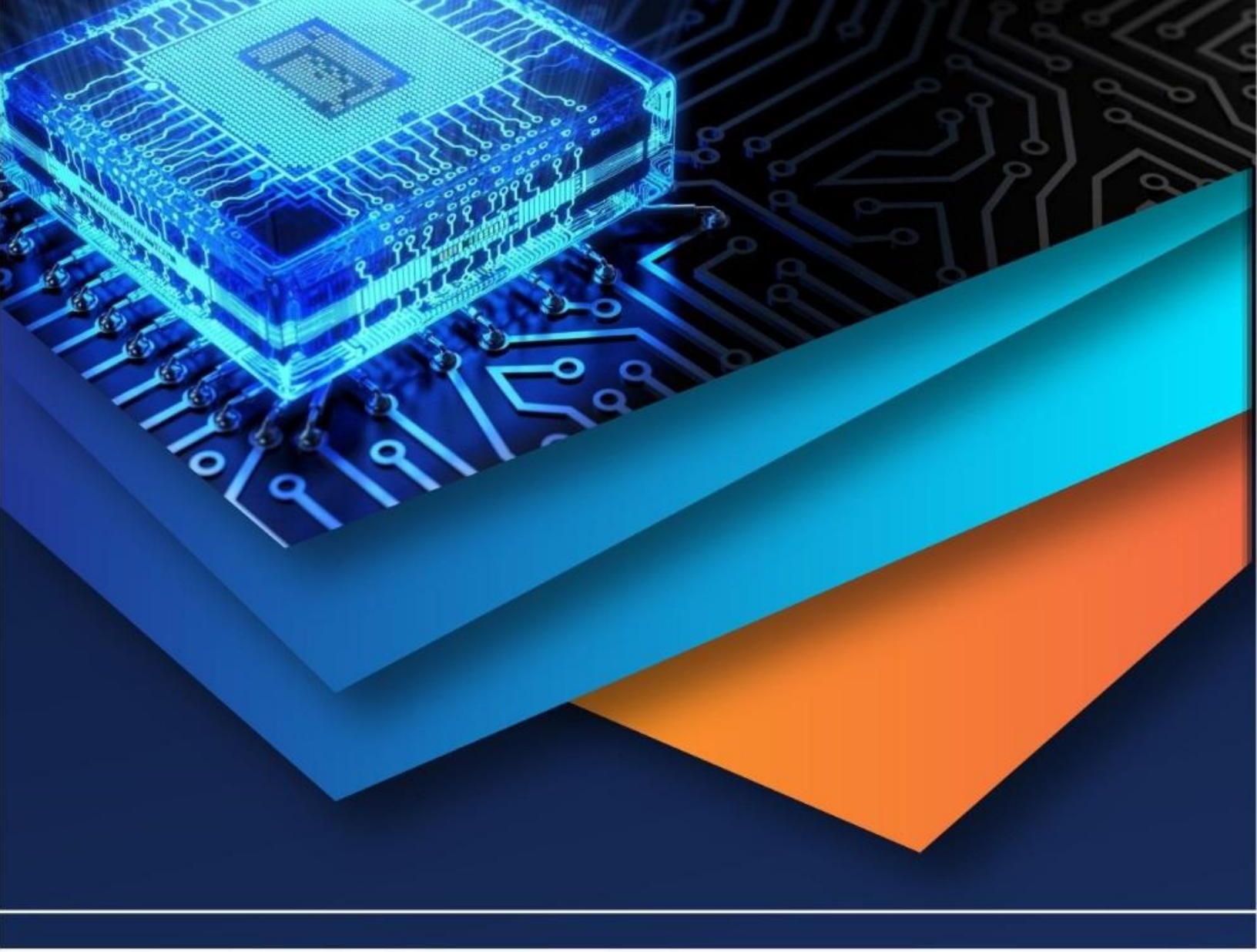

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