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Review To Six Sigma: A Metric And A Methodology

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Abstract:- Recent advancement in the manufacturing techniques and increased demand of quality products necessitate the use of error reduction techniques. Six sigma developed as such error reduction technique that broaden the limits of quality in order to reduce defects up to 3.4 million per opportunities. Origin of six sigma by Motorola industry proven as the quality assurance technique and validated over many years. Present exertion is made to lime light the importance and need of the philosophy of six sigma so as to reduce the defects in the manufacturing industries. Work represents the importance of six sigma as well methodology used for implementation and the potential benefits by using six sigma.

Keywords:- Six Sigma,metric,methodology, quality assurance.

I. INTRODUCTION

Six Sigma is a statistical process in which the range between the mean of a processquality measurement and the nearest specification limit is at least six times the standard deviation. "*Six Sigma is a set of strategies, techniques, and tools for process improvement. It was developed by Motorola in 1981*" [1-2]. The origin of the quality management approaches, including Statistical Quality Control (SQC), Zero Defects professed by Philips Crosby and Total Quality Management (TQM), have been key elements for manufacturing in past years. While Six Sigma is the latest quality improvement initiateand gain the popularity and well accepted in many industries across the globe. Six Sigma is a rigorous methodology that provides the demands detailed analysis, fact-based decisions, and a control plan to ensure quality control of a process. "*Since its initiation at Motorola, many companies including GE, Honeywell, Sony, Caterpillar, and Johnson Controls have adopted Six Sigma and obtained substantial benefits. Six Sigma is a long-term commitment. It won't work well without full commitment from upper management. Six Sigma changes the way a company thinks by teaching fact-based decision making to all levels. In recent years, interest from the academic community has increased dramatically. However, to date only few papers can be identified as a literature review regarding Six Sigma focusing on the basic concept, implementation and future of Six Sigma"* [3-5]. Today, it is widely used in many industrial sectors. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes [6].

II. METHODOLOGY VERSUS METRIC (SIX SIGMA)

It is the topic of discussion for many of the research, whether six sigma is a methodology or a metric system. A methodology is defined as the system which provide methods in order to perform the work. And six sigma also provides the set of tools and methods to enhance the organizational system in order to claim defect reduction through process approach. And a metric system is that system which provide the set of measurement tools to evaluate the present and the previous performance. Six sigma also provides the set of measurement tools which can evaluate and distinguish between past and present state of the system and provide the roadmap to reach the future state of 3.4 DPMO (Defects per million opportunities). Therefore, six sigma works on the coordinates of metric as well as methodology.

III. METHODOLOGY OF SIX SIGMA

The term "Six Sigma" comes from a field of statistics known as process capability studies. Six Sigma has been defined as the statistical unit of measurement, a Sigma that measures the process capability to achieve a defect free output. Originally, it referred to the ability of manufacturing processes to produce a very high proportion of output within specification. Processes that operate with "six sigma quality" over the short term are assumed to produce long-term defect levels below 3.4 defects per million opportunities (DPMO) [7-8]. Six Sigma has the ability to produce products and services with only 3.4 defects per million, and can be claimed as world-class manufacturing system. "The philosophy of Six Sigma presents a statistically based reason for adding a 1.5 Sigma shift before estimating process capability, proposing a new capability index, called dynamic Cpk" [9]. "Antony studies the strengths and the weaknesses of Six Sigma in detail and links Six Sigma to statistical thinking" [10]. He suggests that Six Sigma has a strong statistical foundation and consequently is likely to continue to be of importance in the future.

As of 2006 Motorola reported over US$17 billion in savings from Six Sigma [11]. Other early adopters of Six Sigma who achieved well-publicized success include Honeywell and General Electric, where Jack Welch introduced the method [12]. In recent years, some practitioners have combined Six Sigma ideas with lean manufacturing to create a methodology named Lean Six Sigma [13]. The Lean Six Sigma methodology views lean manufacturing, which addresses process flow and waste issues, and Six Sigma, with its focus on variation and design, as complementary disciplines aimed at promoting "business and operational excellence"[13].

IV. DMAIC AND DFSS PHASE

"DMAIC is a closed-loop process that eliminates unproductive steps, often focuses on new measurements, and applies technology for continuous improvement" [14]. Snee emphasizes the importance of the project selection process in the Define phase for the successful implementation while Mason suggests using multivariate statistical process control in the Control phase [15-16].

On the other hand, Design for Six Sigma (DFSS) is a systematic methodology utilizing tools, training and measurements to enable the organization to design products and processes that meet customer expectations and can be produced at Six Sigma quality levels [17].DFSS is potentially far more effective than DMAIC as its application is in the early stage of new product/process development, thus the papers under this category aim to provide an explanation of DFSS and why it is different from DMAIC [18-19].

V. DEPLOYMENT OF SIX SIGMA

Six Sigma deployment focus on people issues, with particular emphasis on the professional role of Belts and training issues. For example, some authors describe the role of Black Belts and the required qualifications including the suggestion of a Black Belt training curriculum. Hoerl et al. suggest that it is a positive career move for a statistician to take up a leadership role in Six Sigma, implying that it is important for BB to have statistical skills [20]. However, care is needed in selecting the right qualities for Belts, as it is important for Six Sigma to retain an inclusive stance rather than becoming too closely aligned with specialist skills. Caulcutt suggests the use of Myers-Briggs Type Indicator (MBTI) tool to assist BBs to work effectively with others [21]. It is claimed that this tool helps Black Belts to understand the personality types of team members and communicate more effectively, gain cooperation and overcome resistance. Role of management is important as Management involvement and support are essential to Six Sigma deployment, as is the case for many other initiatives. Haikonen et al. present a preliminary case study on the role of management in the improvement of the deployment process in Six Sigma and highlights its key finding that the level of management support is positively related to how well they understand the Six Sigma methodology [22].Successful implementation of six sigma require some key ingredients for the effective introduction in manufacturing and services organizations as the following [23-24].

1) Management commitment and involvement.
2) Understanding of Six Sigma methodology, tools, and techniques.
3) Linking Six Sigma to business strategy.
4) Linking Six Sigma to customers.
5) Project selection, reviews and tracking.
6) Organizational infrastructure.
7) Cultural change.
8) Project management skills.
9) Liking Six Sigma to suppliers.
10) Training.

The above key factors are necessary elements for the implementation of the six sigma irrespective of type of the organization.

VI. CONCLUSION

Fierce competition with the boom in manufacturing industry the need to develop some salient but constructive approaches arises which can yield @ customers' demands. This urgent need to assure quality in order to satisfy the customers with quality the methodology of six sigma was originated by efforts of Motorola.The knowledge and implementation of six sigma in organization ensures the output with maximum 3.4 DPMO (Defects per million opportunities).In present situation it is hard to find the state of monopoly, but the continuous improvement in defect reduction can help to facilitate the production system in order to achieve defect free production.

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