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Six Sigma : A Continuous Improvement Methodology for Manufacturing Organizations

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ABSTRACT

Six Sigma is a technique used to improve the quality by reducing process variations, reducing defects, making continuous improvements in the processes. Six Sigma is statistical based methodology which is focused on improving process capability by reducing the number of defects and increase competitiveness by minimizing the cost involved in its production. This paper provides a general overview of the Six Sigma methodology.

Keywords: Six Sigma, Quality, Defect Reduction, Barriers, Enablers.

I. INTRODUCTION

In the world of globalisation and liberalised policies all over the world the market environment is having cut-throat competition and the presence of high quality, proper knowledge and particular skills gives an edge to an organisation over other competitors. Six Sigma is business improvement approach which is adopted by companies all over the world that reduces process variations and enhances the business effectiveness. Six Sigma is well established approach which helps in identification and elimination of defects by focussing on those performance features which are very important to customers. This approach to reducing defects has made an extensive effect on many organisations by improving organisational profits, customer satisfaction and loyalty of customers (Antony, 2007).

Six Sigma was initially developed by Motorola in 1985 and then was further adopted by many companies such as IBM, Johnson & Johnson and General Electric to improve the processes involved and also the skills of the workers thereby improving the strategic results. Motorola won the Malcom Baldrige National Award in 1988 which set the standard for other companies to imitate. The case of General Electric capital clearly demonstrates that Six Sigma can be used by service companies to achieve high level competitive quality performance as analogous to that of manufacturing industries. Nowadays, Six Sigma methodology is very well established and is widely used in almost all the industries worldwide. Six Sigma process capability implies 3.4 defects per million opportunities or 3.4 defects in every million possible defects be it manufacturing or service processes.

Desale et al. (2013) stated that Park et al. (2000) in his research presented that Six Sigma is a new strategic model for survival of an organisation in the 21st century, which implies three things: statistical measurement, management strategy and quality culture. It enlightens the standard of quality that can be achieved through statistical measurement of quality level. Statistical thinking is a philosophy of learning and action based on certain principles such as: in a system all work occurs through interconnected processes, variations exists in all processes, and understanding and reducing wastes are key factors to success.

II. ELEMENTS OF SIX-SIGMA

There are two major improvement methodologies /elements is Six Sigma namely - DMAIC and DMADV.

- The first methodology DMAIC is used to improve already existing processes and can be divided into five phases;

Elements	Meaning	Definitions
	D- define	Define the customer requirements and goals of the

DMAIC		project;
	M- measure	Measure aspects of the current process and collect relevant data so to get a view of the capability of the process;
	A- analyse	Analyse to investigate and verify the causes of defects arising, so that they can be eliminated by with the help of cause and effects relationships;
	I- improve	Improve the current processes based upon data analysis to eliminate defects as far as possible;
	C- control	Control the future state of processes to ensure that variability can be reduced to minimum before it results in defects.

- The second methodology DMADV is used to create new product or process designs and it is also known as DFSS that is 'Design For Six Sigma'. DMADV is also divided into five phases namely;

Elements	Meaning	Definitions
DMADV	D- define	Define design goals that are consistent with customer demands and the enterprise strategy;
	M- measure	Measure the factors that are critical to quality and to translate the customer requirements into clear project goals;
	A- analyse	Analyse to design and develop alternatives wherever required;
	D- design	Design an improved alternative best suited as per determined in the previous step;
	V- verify/ validate	Verification and validation of the design, setting up pilot runs, implementing the production process and handing it to the customers.

III. ENABLERS IN SIX SIGMA IMPLEMENTATION

Coronado and Antony (2002) stated that Six Sigma implementation is a complex and central process, where critical success factors in its implementation must be recognised. Some of the factors identified by them are management involvement and commitment, cultural change, communication, organisation infrastructure, training, linking Six Sigma to business strategy, linking Six Sigma to customer, etc. Pande et al. (2000), and Antony (2008) stated that strategic selection of the project is a very important success factor in Six Sigma implementation.

Kumar et al. (2009) suggested that linking of the project to the customer that is making it customer focussed acts as an important success factor in Six Sigma implementation. The role of six sigma approach as a managerial tool for improving quality and productivity can be extended to a general tool for quality and process control (Han et al. 2008). Empowerment of people, involvement, motivation, effective communication, reward and recognition system play a critical role in the implementation of six sigma strategy, irrespective of the size of the company (McAdam & Laffert, 2004).

IV.BARRIERS IN SIX SIGMA IMPLEMENTATION

Martins et al. (2006) stated that measurement barriers such as ineffectual measurement skills, insufficient planning and alignment, and improper estimation of financial gains act as key inhibitors in Six Sigma implementation. Chakrabarty and Tan (2007) documented that lack of knowledge regarding Six Sigma, insufficient time to work on Six Sigma project and improper data collection are some of the problems faced by service organisations in Six Sigma implementation. They also recognised that poor understanding of process and sub-processes and difficulty to sustain Six Sigma improvements due to insufficient resources acts as barriers to its implementation. Antony and Desai (2009) recognised that lack of training and physical resources, internal resistance from within the organisation, poor project selection methodology and intangibility of Six Sigma results acts as main barriers in Six Sigma implementation. Antony et al. (2016) said that the main barrier in the implementation of Six Sigma lies in the lack of statistical competence in the organisation. Tyagi et al. (2016) stated that lack of employee involvement always leads to failure in the implementation of Six Sigma strategy.

V. CONCLUSION

Through this paper an attempt has been made by the authors to present the basic overview of Six Sigma methodology. The two basic methodologies used in Six Sigma are DMAIC and DMADV. The enablers and barriers are also given in this paper which includes major barriers such as measurement and financial barriers.

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