

6.1 INTRODUCTION

INSIDE

◆ Introduction

Six sigma is a measure of quality that strives for near perfection. **It is a disciplined and statistical methodology for eliminating defects (driving towards six standard deviations between the mean and the nearest specification limit) in any process, from manufacturing to transactional and from product to service.**

Introduced by Motorola, It is a high performance, data driven approach for analyzing the root causes of business processes/problems and solving them by linking Customers, Process improvements and financial results.

Sigma is used in statistics as a measure to denote the standard variation in a process. More specifically sigma measures the capability of the process to perform defect free work. A defect is anything that results in customer dissatisfaction like defective component, High maintenance, wrong shipment, High cost of spares, delayed deliveries, high cycle time etc.

The sigma level indicates how often defects are likely to occur. As sigma level increases, cost of poor quality goes down, while profitably, productivity and customer satisfaction go up.

Six sigma is not about establishing a separate quality ivory tower within a company or organization and is not about cost avoidance.

It is an enterprise-wide strategy that effectively develops employees within a company to have the knowledge and capability to solve problems, to improve decision-making and subsequently improve the overall performance of the enterprise from a financial and customer perspective.

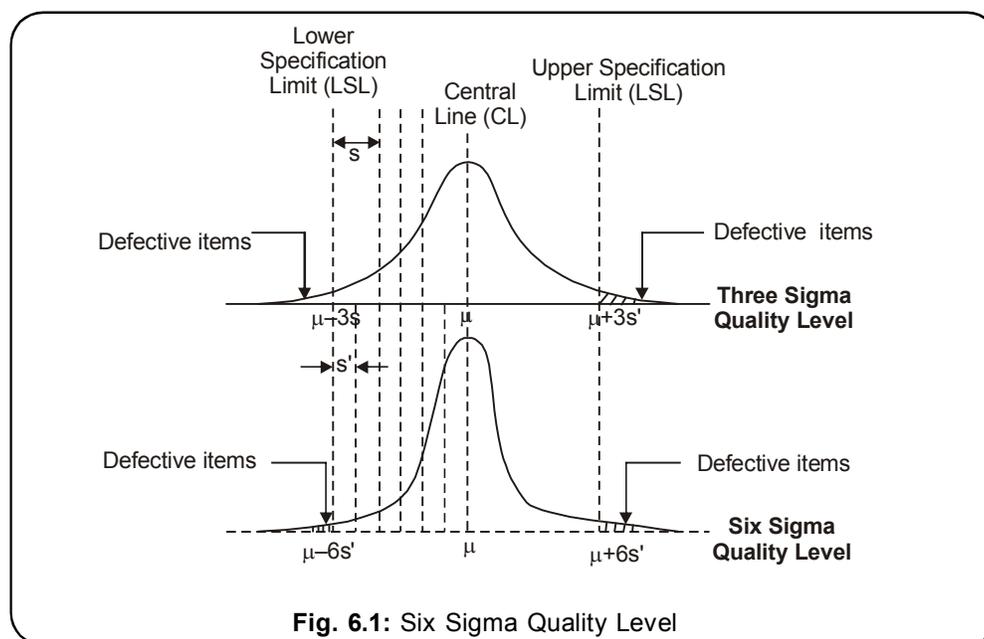
It combines the best problem solving tools and methods with capable employees under the umbrella of a comprehensive leadership framework, to rapidly achieve reduced costs, high quality, lower cycle times, improved overall customer satisfaction and a lower investment in equipment and inventory; all leading to increased market share, revenue, profits, and ultimately shareholder value.

The real challenge with six sigma is not the statistics. It is getting to the point where one can meaningfully measure a business' current performance against dynamic customer requirements while developing the internal abilities to respond to changing market place conditions.

Meaning of Six Sigma

In order to understand the meaning of Six Sigma, let us take up our example of the diameter of pencils in Chapter 3 once again. We have so far used 3 sigma limits about the natural tolerance limits of the process of manufacturing pencils. For the sake of better understanding, let us assume that for this process the specification limits are same as the natural tolerance limits, that is, $(\mu \pm 3s)$, as shown in Fig. 6.1 Thus, 99.73% of the pencils will have their diameters within the specification limits, while the remaining 0.27% or 27 per 100 or 270,000 per million pencils will be

defective. The standard deviation of the population is s . The company wants to take every measure to reduce this variation. Therefore, it gives training to every employee regarding statistical techniques to measure every critical factor responsible for variation. Then, steps are taken to improve the process and reduce the variation in the process. For example, workers are trained to reduce the mistakes on their part, processes are redesigned for better performance, and maintenance of machines are improved, thus, the standard deviation of the process gets reduced to such that now there is 12 sigma spread between the USL and LSL. Note that in Fig. 6.1 now there are 6 standard deviations between the CL and the USL or LSL. The values $(\mu \pm 6s')$ are now at the specification limits. Now, out of every 1 million pencils produced, only 0.002 pencils, that is, practically no pencil will be defective. This is Six Sigma quality level, meaning zero 3.4 defectives per million opportunities (DPMO).



6.1.1 Defects per Million Opportunities (DPMO)

- Defect is defined as any part of a product or service that does not meet customer specifications or requirements, or causes customer dissatisfaction, or does not fulfil the functional or physical requirements.
- To maintain Six Sigma Quality, a process must not be produce more than 3.4 defects per million opportunities. Opportunities can be defined as

the total number of chances per unit to have a defect. Each opportunity must be independent of other opportunities and, like a unit, must be measurable and observable.

- The DPMO can also be thought of as the capability of the process. The more capable the process the less is DPMO.
- Defects per million opportunities (DPMO) are calculated as: