

In March 2015 I wanted to understand how six sigma is used in a manufacturing setting, where it originated. Do they manage quality with sigma? I hired a freelance writer, Ranjesh Kumar, with a greenbelt in six sigma to visit a factory and write this essay on **“Six Sigma in a Manufacturing Setting.”**

Compare this to what you were taught about sigma in the medical laboratory. Enjoy the conversation at the end. Are labs missing the best parts of six sigma?

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Statistical Quality Control – A bible for the quality?

The Statistical quality control was best defined by the one of well-known quality guru, Deming (1971), as the application of statistical principles and techniques in all stages of design, production, maintenance and service, directed toward the economic satisfaction of demand. Statistical control also deals with how the control plan for any object is to be made.

The control plan varies with the size and type production. For Example a company say X manufactures the Flywheel ring for some other organization then to make a control plan the company X has to look on both the data, What other organization is demanding and how well the machinery in Company x is Working.

Based on the past history of the machinery being used in that organization and the tolerance limit given by other organization. The company X employs quality team to measure all the dimensions coming out from the plant on every 4 hours. SQC helps companies to control the defect at a certain extent but this doesn't mean that the sampling and control plans used by the organization are totally defect free. **There can be defects in the process of making a control plan or there can be defects in the quality of the machinery used. So methods of sampling being used now a days can also not be taken as bible for the quality control methods.**

Six Sigma – A best possible process?

What is Six Sigma?

Six Sigma is basically a set of techniques and principles used for process improvement and a process is the repeatable tasks carried out in a specific manner. It was developed by Motorola in the year 1986, the chairman and CEO of General Electric made six sigma central to his business strategy in 1995. It is now used in numerous industries. Six Sigma improves the quality of the outputs from a certain process by identifying and eliminating the causes of errors that come up.

Various definition of Six Sigma

Six Sigma is a

- **Goal-** Goal to achieve 3.4 defect per million
- **Value-** It is value of six standard deviation on the Gaussian distribution Curve
- **Philosophy:** Philosophy of making fewer and fewer mistakes.
- **Metrics:** Measure Everything that results in Customer satisfaction
- **Business strategy:** According to Kaoru Ishikawa quality means staying in business. In order to stay in business we need to understand and optimize the whole system of value exchange and this can be done through six sigma
- **Tool:** Six sigma is tool to reduce defects from a Process.
- **Statistical Measurement:** Sigma stands for standard deviation. Sigma Measure implies how well customer requirement are being met.

Basic Principle of Six Sigma

The basic Principle of six sigma is that output Y is dependent upon the input x.

Let $Y = f(x)$ be a function .Here x is input and Y is output, Which means what come out of a process is result of what goes inside to the process. If writing more precisely then this equation could become

$$Y = f(X_1 + X_2 + X_3 + X_4 + \dots + X_n)$$

So one can actually control the output Y by controlling the input X.

How Six Sigma Works?

Six Sigma works on the DMAIC methodology where

D- Define the problem statement (In very specific terms)

M- Measure it

A- Analyze the process

I – Improve the Process

C- Control it

How Manufacturing Industries Uses Six Sigma?

Normally all the data tends to follow a normal distribution curve i.e. the Gaussian distribution curve. So the deviation in the process would also follow the same curve. DPMO of the process is found using the formula:

$$\text{DPMO} = (\text{No of defects} / \text{No of Unit} * \text{No of opportunities}) * 10$$

Using DMPO the Sigma level of the process is found. Once sigma level is known one can find out up to what extent they can improve their process and what is the benefit they are getting from this process in terms of Money and time. Based on the expected revenue from the project, the six sigma project is selected. Biggest problem that everyone faces in the industries that they don't know what they don't know. Therefore it takes too much of time in defining the problem. Once Problem is defined then Pareto analysis is done to find out major contributor for the problem using 80-20 rule. Once Major Contributor is found then further analysis is done to find out the root cause of the problem. After finding the root cause of the Problem all possible solution are generated using brain storming and Affinity diagram. All the proposed solution are kept at a place and made sure that the process being finalized is proactive and follows Poka Yoke. Solution is implemented and checked whether the new process is able to bring change or not. Once desired change is confirmed the control process begins. The Sigma level is checked on a regular basis on a particular interval in a week or month based on the Industry standard so that process doesn't go out of control.

Why Six Sigma is not the best Process?

Six Sigma was a boom in the quality industry after 1995. Most of the companies got benefitted because of the six sigma process, many of them saved millions of dollars using six sigma but they are many industries which also failed to experience any change in their process or revenue. This happened because not knowing the exact process. Everyone cannot develop a six sigma level process because this needs expertise of this field. One must be Master black certified before he /she designs a six sigma level process. Six Sigma level process designing is complex therefore there is a need of having an easier yet effective process in the market.

Originally Six Sigma level process means 2 defect per billion but due to long term shift in six sigma process it is aimed to achieve 3.4 defects per million. 3.4 defect per million is at the 4.5 Sigma. 1.5 sigma shift is taken because of need of having too much of data at least the data of 15-20 years to achieve the aim of having 2 defects per billion. It is very difficult to handle the data of 15-20 years therefore the goal of achieving 2 defect per billion was dropped and 3.4 defect per million is taken as 6 Sigma level for all the short term goal. Although there is 1.5 sigma shift but no organization has been able to achieve this level. Most of the world class organization works at 4 or 5 Sigma level. Only reason why no organization has been able to achieve six sigma level (with 1.5 Sigma shift) is due to too much idealization of the process and complexity of the process. The short term for this six sigma project is actually becomes long term project. Today with the change in the market every one want's to gain quickly therefore six sigma cannot help them. The market needs a process which can control their process at very short term without using much of the data and time. Therefore I would say Six Sigma is not the best process, best process is yet to come.

Q&A with Zoe Brooks

[2015-03-06 12:57:28 PM] zoe_brooks:

What I am asking about - and this is another article that you may need to research - what QC process do they use to alert them if the 6 sigma process fails unexpectedly and becomes 2 sigma

Ranjesh kumar: Okay . will think on it and let you know Hey but why would the process fail ?

zoe_brooks: That's the whole point of QC. Things fail :) Parts wear out, someone sets a gauge wrong The ingredients from the supplier are wrong

Ranjesh kumar: but there are proactive systems made for that

zoe_brooks: Aha! How do they work?

Ranjesh kumar: They also use POKA YOKE

zoe_brooks: Huh?

Ranjesh kumar: So there is no chance of having a mistake even by mistake

zoe_brooks: What is POKA YOKE?

[2015-03-06 1:08:34 PM] Ranjesh kumar: is your laptop having projector port?

[2015-03-06 1:08:58 PM] zoe_brooks: Huh?

[2015-03-06 1:09:26 PM] Ranjesh kumar: Try to see that once

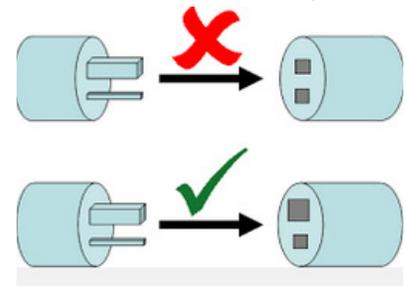
can you insert anything other than projector in that port ?

zoe_brooks: I googled it. That does not prevent all errors

zoe_brooks: Why measure sigma, but not be sure you can detect if it changes? How often would you measure sigma?

Ranjesh kumar: I think I need to do some research on this

Figure 1 Poka Yoke
"Don't make a mistake, even by mistake"



zoe_brooks: Interesting, eh?

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Please send comments to zoe@awesome-numbers.org

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Contact me if you would like to be an early customer to prove the clinical savings available with M.O.R.E. Quality©. Mathematically Optimized Risk Evaluation© has all the good stuff from six sigma and fixes for all the errors and complexity. **Finally - a better quality management process!**