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OperMgmt380

Mini Tutorial

« Six Sigma »

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*"[Six Sigma -  
The Breakthrough  
Strategy] is the  
most important  
initiative GE has  
ever taken...  
it is part of the  
genetic code of  
our future leadership."*

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*- Jack Welch, CEO, GE*

## ***Introduction:***

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Six Sigma was the expression given as a synonym by Motorola in 1986 for their quality program. Since then, a general definition has developed, and it has become a useful technique for measuring quality. It has become a tool used particularly among technology driven companies such as Allied Signal, General Electric, Kodak, and Texas Instruments. What does it mean to be “Six Sigma” anyway? Its goal is to reduce output variability through process improvement. Six Sigma refers to an organization's measure of quality that strives for near perfection. What can it do for your organization? If your organization is focused on customer satisfaction, then Six Sigma will offer you a method and some tools for identification and improvement of both internal and external process problems to better meet customers' needs by identifying the variations in your organization's processes that might influence the customer's point of view negatively.

## ***How Does Six Sigma Work, and How To:***

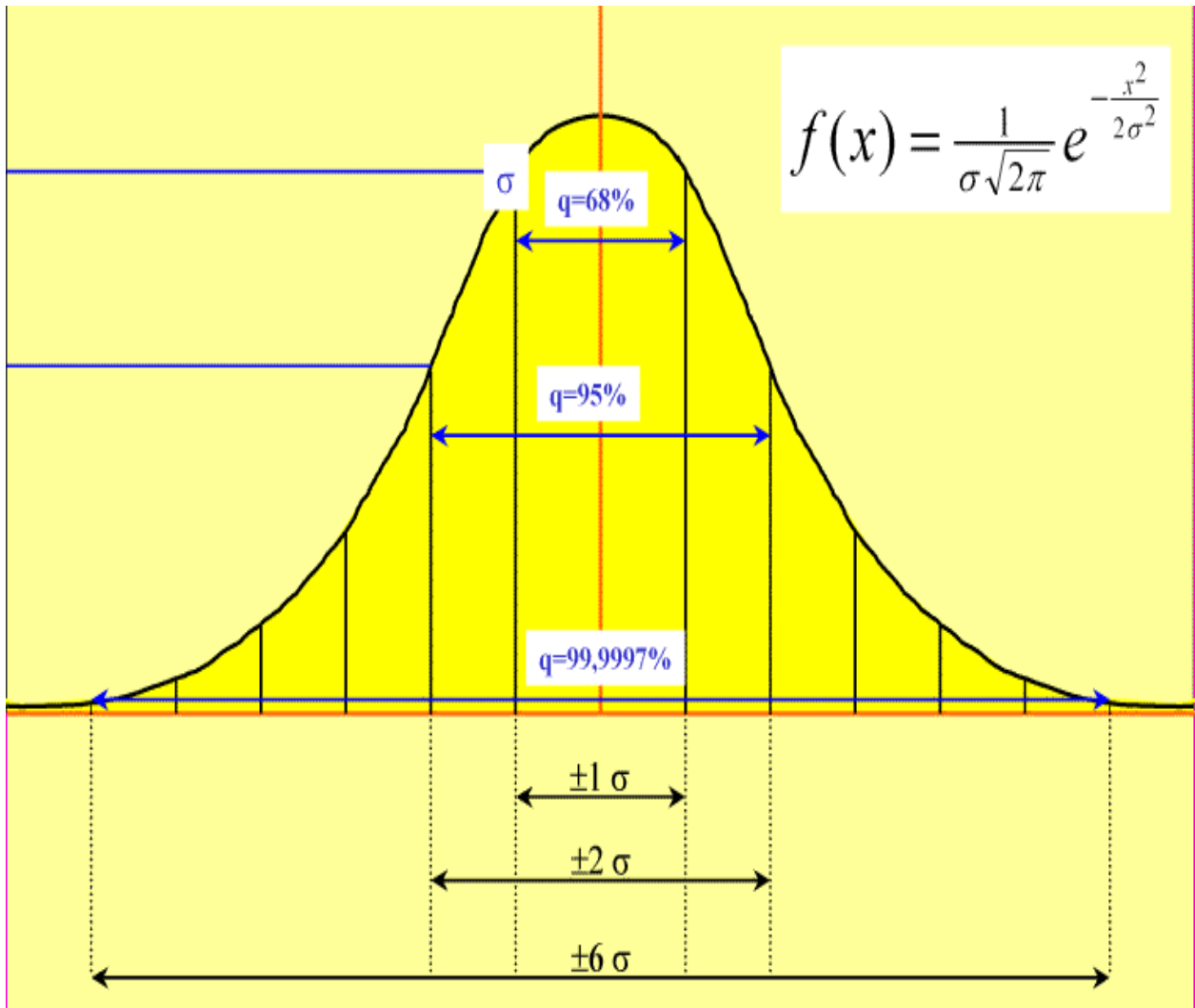
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How to:

Okay, okay, how do you use Six Sigma then? Six Sigma is based on the normal distribution theorem by Carl-Friedrich Gauss with this formula:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}}$$

This formula describes a curve whose form is defined by two parameters, the mean average value, and the standard deviation “sigma.” Six Sigma is the tool used to help design highly capable parts that meet set specifications, namely customer specifications. These specifications are +/- six standard deviations from the process mean, which is the center line.



As you can see from the picture,  $\pm 6$  deviations (6 sigma) contains 99.9999% of all values. It can never reach 100% though. This means that there will always be room for improvement. Requirements and environmental boundaries must be considered when calculating a six sigma value as well.

The idea is to identify all of the opportunities for defects and then count the actual number of them that occur, and then normalize this value to one million opportunities to find the Defects per Million Opportunities. Now you can determine the corresponding sigma value. You must locate a table of values for the one-sided normal distribution.

[http://www.sixsigma.de/english/sixsigma/6s\\_e\\_values.htm](http://www.sixsigma.de/english/sixsigma/6s_e_values.htm) is a fairly simple one to follow. Ideally, defects should be below 3.4 defects (standard deviations) per million opportunities for a defect. This means that ideally, the implementation of six sigma will result in an average of only about 3.4 defects per million units produced.

***Other Helpful Sources for Six Sigma Information:***

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1.) General Electric created a Six Sigma Academy in 1994. This is the Web Site address. It may be helpful for more information and training.

<http://www.6-sigma.com/>

2.) iSixSigma, Six Sigma Quality Resources for Achieving Six Sigma Results. This web site has plenty of information, discussion forums, and updated news on the subject, and job shops as well.

<http://www.isixsigma.com/>

3.) This site is also a good source of information and offers definitions and step by step instruction on the how to's of Six Sigma.

<http://www.sixsigma.de/>

4.) General Electric is considered one of the Benchmarks in this area. This web site is very helpful, not only for information, but for some real life uses.

<http://www.ge.com/sixsigma/>

5.) Motorola is the company who introduced this method. It is also considered a major benchmark for Six Sigma Method.

[http://www.qa-inc.com/knowledgecente/articles/SixSig\\_pg1-3.html](http://www.qa-inc.com/knowledgecente/articles/SixSig_pg1-3.html)

*Conclusion:*

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Six Sigma is far more in depth than this document has illustrated. It is a tool that if used correctly, can identify key areas of business processes that need attention to lower defect rates. One of the greatest advantages is that all the measured improvements achieved through this technique can be directly converted into financial results. In fact, more and more shareholders even require that Six Sigma method be implemented.

## **References:**

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### **Web Sites:**

- 1.) <http://www.sixsigma.de/english/index.htm>  
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Release date: Oktober 06, 2000  
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- 2.) [http://www.sixsigma.de/english/sixsigma/6s\\_e\\_theory.htm](http://www.sixsigma.de/english/sixsigma/6s_e_theory.htm)  
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### **Books:**

- 7.) Managing Quality: An Integrative Approach. Foster, Thomas S. Copyright 2001. Prentice-Hall, Inc. New Jersey.