

# Success With

# Six Sigma

# 6 $\sigma$

**A Mini-Tutorial for the Quality-Minded**

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# What Exactly is Six Sigma?

## History

Six Sigma is a term that comes from the field of Statistics. The history of the statistical term dates back to the 1800's (Carl Frederick Gauss), while Six Sigma as a measure of product variation dates back to the 1920's (Walter Shewhart). With a myriad of measurement standards available, the term "Six Sigma" was coined in the 1980's by a Motorola engineer named Bill Smith. Motorola was seeking a new way of measuring product variation and developed the methodology and associated culture change.

Six Sigma has developed into not only a quality measurement tool but also a whole new way of doing business. Six Sigma targets three main areas: improving customer satisfaction, reducing cycle time and reducing defects.

Six Sigma is different from Quality Programs of the past in three major ways:

1. Six Sigma is customer-focused. It's an obsession to keep the customer's needs in focus and in top priority.
2. Six Sigma projects produce major returns on investment. GE's CEO, Jack Welch, wrote in the annual report that in just three years, Six Sigma had saved the company more than \$2 billion.
3. Six Sigma changes how management operates. By implementing Six Sigma, leaders of the organization begin learning new tools and new approaches to thinking and executing to achieve results.

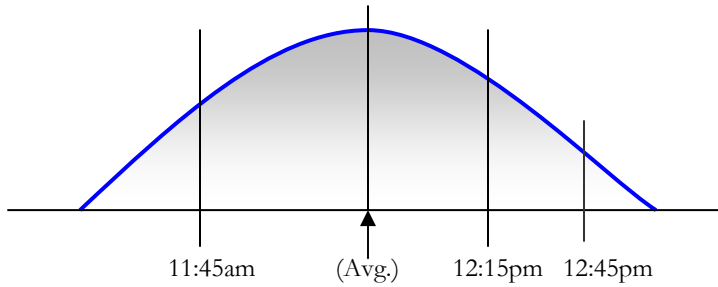
## The Statistics Behind Six Sigma

A brief discussion of the statistics behind Six Sigma will help us understand why it is such an effective measurement tool and what it means to the bottom line (i.e. profit).

Sigma ( $\sigma$ ) is a symbol meaning how much deviation exists in a set of data. If you look at Figure 1, you will recognize it as what is sometimes called a "bell curve." In statistics, this is called a standard normal distribution, but the idea is the same. In a bell curve, 50% of the values lie above the mean (average) and 50% of the values lie below the mean. In Statistics we take it a step further and delineate certain data points within that timeline.

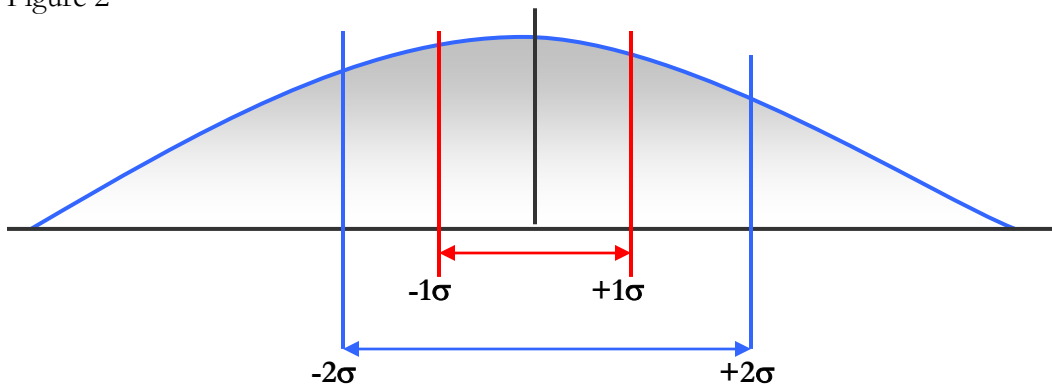
Let's use the example of a sandwich shop. You have a lunchtime special where you will deliver the sandwiches between 11:45am and 12:15pm, guaranteed. If you don't meet that window, you owe the customer a 50% discount on their next order, so you are motivated to deliver within that timeframe. Anything outside this 30-minute window we will consider a "defect" because it doesn't meet our delivery guarantee. In Figure 1, we have included all the deliveries for the past month and marked off our goal time period. The curve shows us how many deliveries are within that goal and how many fall outside the goal time.

Figure 1



From the field of statistics, we know that 68% of the data falls within the area of  $-1\sigma$  and  $+1\sigma$  on either side of the mean. The area between the red lines in figure 2 indicates  $\pm 1\sigma$ , or 68% of the data. So if you deliver your sandwiches on time 68% of the time, you could call yourself a  $1\sigma$  sandwich shop.

Figure 2



Continuing on, if you deliver your sandwiches on time 95% of the time you are at a 2 sigma level. Sounds pretty good? How about on-time deliveries of 99.73%? That's only operating at a 3 sigma level. Don't think you can get much better? In order to be at a six sigma level you would have to deliver on time 99.9997% of the time. So that means for every million deliveries made, you would only be late 2 or 3 times. What an operation!

Figure 3

Sigma Level	Percent	Defects per Million Opportunities
6	99.9999998	.002
5	99.999943	.57
4	99.9937	63
3	99.73	2700
2	95.45	45,500
1	68.27	317,300

So you can see at an operating level of one million opportunities, if you were only operating at a 2-sigma level (most companies do operate between 2 and 3 sigma!), you would still have approximately 45,500 defects! Imagine if you were a credit card company sending one million bills each month and 45,500 were late each month! You can see the impact that Six Sigma can have on the bottom line of your company!

## **Six Sigma Affects Management**

Six Sigma makes a difference in your organization because it involves a commitment from all levels of the organization. It's not just management's buzzword/improvement project du jour; it is a process that requires everyone to do their part to achieve Six Sigma quality. Often the ideas, solutions, process discoveries, and improvements that arise from Six Sigma happen on the front lines of the organization. It is this commitment to the customer that makes Six Sigma a success. It ensures that everyone from the CEO, to Mr. Smith, the assembly line worker, has a vested interest in the company's success.

Staying focused on the customer is not only a good thing to do, but keeping customers happy is also profitable for the business. Just a simple 5% increase in customer retention can increase profits more than 25%. It's estimated that companies lose 15% to 20% of revenues each year due to inefficient or ineffective processes. Six Sigma allows management to set attainable short-term goals while maintaining the ability to achieve long-term goals.

Implementing Six Sigma is done through a very extensive training program. People trained in Six Sigma are called "Black Belts." Those who have demonstrated a high commitment to the program and begin to mentor others are called "Master Black Belts." The training is delivered to every employee and impacts the entire organization.

There are six themes of Six Sigma:

1. **Genuine Focus on the Customer.** Monumental improvements can be made by simply understanding your customer. Six Sigma improvements are measured by customer satisfaction and value.
2. **Data- and Fact-Driven Management.** Six Sigma clarifies key metrics that gauge business performance success. Then problems can be effectively defined, analyzed and resolved, permanently.
3. **Processes Are Where the Action Is.** Six Sigma focuses on the process rather than the end result. By analyzing and fixing the process itself, it enables a much higher quality rate. The most powerful part of Six Sigma is: by mastering the process, companies are able to build competitive advantage in delivering value to customers.
4. **Proactive Management.** Being proactive is the opposite of being reactive. Instead of reacting to change, management shifts to being proactive by defining ambitious goals and reviewing them frequently, setting clear priorities, focusing on problem prevention rather than "putting out fires," and questioning why we do things instead of doing them because "that's the way we've always done it."
5. **Boundaryless Collaboration.** A term coined by GE's CEO Jack Welch. All parts of the organization including vendors and partners need to keep their focus on the customer in mind. If everyone works towards the same goal, the boundaries will

- disappear. Organizational leaders need to work to break down the barriers and improve teamwork between all parts of the organization (up, down and across).
6. **Strive for Perfection, Tolerate Failure:** Nothing new ever comes without risk. If people are afraid of the consequences of mistakes, then they'll never try. Tolerate failure by learning from those mistakes and continue your goal towards perfection.

## How is Six Sigma Being Used?

### Success Stories

There are a number of success stories in the business. We'll look at three large companies who undertook Six Sigma quality: General Electric, Motorola, and Eastman Kodak.

Any time you hear about Six Sigma, you're likely to hear about General Electric. GE's CEO Jack Welch describes Six Sigma as "the most challenging and potentially rewarding initiative we have ever undertaken at General Electric." An example of Six Sigma benefits was given in their 1997 Annual Report. It stated that the Medical Systems Division reported a ten-fold increase in the life of CT scanner X-Ray tubes, increasing the "uptime" for these machines. At GE, Six Sigma training has infected all parts of the organization and has become a prerequisite for promotion in all managerial and executive positions. A quote from Jack Welch, CEO says it all: "Six Sigma has changed the DNA of GE- it is now the way we work- in everything we do, and in every product we design."

You're also likely to hear about success with Six Sigma at Motorola. After all, it was Bill Smith, a Motorola engineer, who crafted the statistics and formulas that were the beginning of nothing short of a revolution. In fact, the movement towards Six Sigma in all industries has been loosely dubbed "The Second Industrial Revolution." Motorola launched its Six Sigma Quality Program on January 15, 1987. The company set a five-year goal to reach Six Sigma and by March, 1988, Six Sigma Training was taking place and teams were starting improvement projects. A quote from Bill Wiggenhorn, Sr. Vice President of Motorola Training and Education: "The language of quality became the common Motorola language. Whether it was French, Arabic or Texan, everyone understood the six steps, defect measurement and elimination and parts per million."

Eastman Kodak began their Six Sigma quality initiative in the 1990s, along with Texas Instruments, Digital Equipment Corporation, and IBM. Kodak reported that they saved over \$100 million with the implementation of Six Sigma and other quality improvement programs. Kodak lists five factors that have been critical to the success of their Six Sigma training initiative:

- Management support
- Quality of the work environment
- Quality of the Six Sigma candidates (employees trained in Six Sigma)
- Consistency across all quality programs
- Effectiveness of the program instructors.

## Where Can I Find Out More About Six Sigma?

There are a number of resources available that have excellent information on the process and training involved with Six Sigma. Listed below are just a few:

- [www.isixsigma.com](http://www.isixsigma.com) is a resource for companies interested in the implementation of Six Sigma. It contains all of the information you need to know.
- [www.ge.com/sixsigma/](http://www.ge.com/sixsigma/) details GE's views on Six Sigma.
- [www.issp.com](http://www.issp.com) is a national organization dedicated to Six Sigma Leadership.
- Managing Six Sigma: A Practical Guide to Understanding, Assessing and Implementing the Strategy That Yields Bottom Line Success by Forrest W. Breyfogle III, James M. Cupello, and Becki Meadows (John Wiley and Sons, 2001)
- What is Six Sigma? By Pete Pande and Larry Holpp (McGraw Hill, 2002). A great beginners (layman's terms) guide to Six Sigma.
- Achieve Lasting Process Improvement: Reach Six Sigma Goals Without the Pain, by Bennet P. Lientz and Kathryn P. Rea (Academic Press, 2002)

Good luck in your implementation of Six Sigma!

***"You'll miss 100% of the shots you never take."  
-Wayne Gretzky (The Great One)***