Six Sigma

Current Quality Mini-Paper
September 28, 2001

Tiffany Raisch
Josh Anderson
Kelli Krogman
Becky Krueger

Iowa State University
Ames, IA

IE 361
Dr. Vardeman
“If they don’t get the quality they need from us, they will get it from someone else.”

-Stephen Schwartz, Senior VP, IBM

The Greek letter sigma (σ) is used to represent the standard deviation, a measure of variability. The concept of Six Sigma is to accept variation of plus or minus six sigma from the mean, or 3.4 defects per million parts. To achieve Six Sigma in terms of quality, defects have to virtually be eliminated. According to Six Sigma Qualtec, most US companies are achieving three or four sigma which translates into a 10-15 percent loss of their total revenue just from defects. Six Sigma can lead to success for more than just the manufacturing world; it is relevant in service industries as well (www.sixsigmaqualtec.com).

According to Les Shroyer, Motorola’s Chief Information Officer, Six Sigma can be broken into a six-step process. First, identify your product. What are you making or providing as a service? Second, identify customer requirements. Find out what your customer is dissatisfied with or the potential reason they may not purchase from you again. Third, diagnose the frequency and source of errors. Find out where the problem is initially starting. Fourth, define a process for doing the task. This is referred to as “mapping” at Motorola. Ask yourself what steps of the process are absolutely necessary and how the process can be simplified. Fifth, mistake-proof the process. Remove all unnecessary cycle time or steps that are only leaving room for error in the process. Sixth, put permanent control measures in place. Determine how you are going to measure your progress and remain at Six Sigma. According to Shroyer, “We’re at the mentality that if you can’t measure it, you can’t control it” (Rifkin).

There is no one procedure defined to achieve Six Sigma, nor will it happen overnight. To successfully achieve this, it must be a company-wide effort that takes place over a period of up to five years. As companies saw how Motorola went about the process of achieving Six Sigma, many followed in a similar manner. Teams were compiled of people coming from different levels of the company, including managers, engineers, and operators. Everyone was trained in statistical process control, including how to use statistical tools. Every team was assigned to a different problem, with each team member having different responsibilities. The operators were taught how to interpret and respond to different charts. Their role of filling in the chart correctly was the backbone of the entire project (Kumar, Gupta 88). Engineers were trained in advanced statistics and were responsible for using these charts to foresee the future. Management’s primary training was in presenting and interpreting the statistical process control data. These teams would meet often, discussing problems they were each facing and creating ways to permanently solve them using the design-of-experiments approach (Kumar, Gupta 90). As an incentive to
all employees, Motorola decided to recognize employees for their dedication to quality by rewarding them, either by a certificate and recognition or even extra vacation.

The benefits from achieving Six Sigma are well worth the time and investment made. According to Six Sigma Systems:

- Six Sigma reduces cost by 50% or more through a self-funded approach to improvement.
- Six Sigma reduces the waste chain.
- Six Sigma affords a better understanding of customer requirements.
- Six Sigma improves delivery and quality performance.
- Six Sigma provides critical process inputs needed to respond to changing customer requirements.
- Six Sigma develops robust products and processes.
- Six Sigma drives improvements rapidly with internal resources (Six Sigma Systems 1).

**History of Six Sigma**

Six Sigma has breathed new life into the quality and profitability of many goods and services produced by American companies. For years, the focus of quality programs in America consisted of finding the defects of a finished good and reacting to that information. Six Sigma allows companies to take a more proactive approach to quality (Harry and Schroeder). This new paradigm has greatly increased the financial results of companies and allowed them to produce goods and services of much higher quality.

Six Sigma and the implementation procedures that have made it so successful were developed by Motorola in the mid 1980’s. Motorola set out to significantly improve the quality of the products it manufactured. They found that by using statistical methods to improve all aspects of their operations, they could produce higher quality products at a lower cost. This disproved the previous notion that quality costs more money. By fixing problems at the root and designing out problems, Motorola was able to produce products virtually free of defects. They changed the language of quality in America by beginning to measure defects out of opportunities or parts per million (and even billion), instead of parts per hundred (www.qualitydigest.com).

One important aspect of Six Sigma developed by Motorola is the implementation procedure. By developing different levels of training in Six Sigma procedures, they were able to ensure that only those with the proper training were given leadership roles. They equipped people with titles such as Champion, Master Black Belts, Black Belts, and Green Belts, based on their training and responsibilities (http://mu.motorola.com). This organized approach of using people effectively allowed Six Sigma to be
successful at Motorola. As the success of Six Sigma at Motorola became known, other large corporations developed Six Sigma programs. Results continued to bring value to the new way of doing business, and soon companies like General Electric and IBM embraced Six Sigma programs to help their companies improve market share and profits.

**General Electric Capital Commercial Finance and Six Sigma**

General Electric did not begin focusing on quality until the late '80's. Jack Welch, CEO of GE, was "open to change, hungry to learn, and anxious to move quickly on a good idea." He later announced he would invest more than $200 million in attaining Six Sigma quality levels. In 1996, implementation of Six Sigma began. That year, GE earned a return of $880 million on their initial investment of $580 million (www.sixsigmaqualtec.com). Today, Six Sigma is defining how GE works and has set the standard for helping customers reap the benefits of Six Sigma.

In late 1996, GE Capital Commercial Finance considered joining their parent company's initiative. They realized to that point, "We had made almost no progress whatsoever," says Managing Director of Quality Steve Sargent. "We had no customer, process or employee measurements. Our people had not bought into the quality initiative. We had no way of knowing how well or how poorly we were doing." He later compared the Commercial Finance organization to a car that didn't have a steering wheel, a dash-board, an air conditioner or a radio. "All we had was an accelerator and a rear view mirror, and we got from point A to point B by putting our foot on the accelerator and getting to wherever we were going through brute force. We needed the works so we could figure out where to go, how to get there and how fast," Sargent states (www.sixsigmaqualtec.com).

The Commercial Finance organization worked quickly to install a robust business performance measurement system, which could monitor their business processes, their customers and employees, and measure the results of their efforts. Within three months, Sargent and his cross-functional quality team collected and analyzed the market, customer and employee data, mapped nearly fifty core business processes, established key indicators and began to implement targeted actions to improve the business.

Today GE's Commercial Finance is a different kind of organization. It has built a comprehensive balanced scorecard system that gathers, analyzes and reports information on customers, processes, employees, markets and financial performance. It has clear and defined processes. In addition, each month it conducts management reviews, during which performance data is presented and used to initiate improvement projects.
Their system is a success. The Commercial Finance organization closed 166 percent more deals in 1997 than it did in 1996, without an increase in head count (www.sixsigmaqualtec.com). This, plus other Six Sigma successes at GE account for an estimated gross annual benefit of five percent sales, which could increase by between 10 and 15 percent. Jack Welch later praised “Six Sigma has galvanized our company with an intensity the likes of which I have never seen in my 40 years at GE” (Basu, Ron 27).

**Six Sigma at IBM**

Another company that has used Six Sigma to increase the quality of their products is International Business Machines (IBM). In the early 1980’s, IBM was one of the world’s leaders in the production of mainframes and personal computers (PCs). In 1986, however, the company began losing market share among its major customers in both mainframes and PCs. To combat this problem, IBM hired a new chairman by the name of John Akers to reestablish the company as a technology and product leader. In his first four years as chairman, Akers restructured the entire company, removing almost 37,000 management and workforce jobs while increasing the number of sales and service personnel by 20%. Despite these changes, there were still quality problems along with low morale of the remaining workers (Rayner).

To combat these problems, Akers changed the focus from restructuring to dealing with the larger problem of poor quality products. After a session at Motorola Inc., IBM was determined to use the Six Sigma approach to eliminate defects in their products. The goal of the company was to reduce the number of defects by a factor of 20,000 and cut the product cycle time in half. A program entitled Market-Driven Quality (MDQ) was initiated to achieve Six Sigma. MDQ has three components: a set of quality initiatives, a system of process review, and a system of quality measurement. By 1991, all the managers at IBM had attended a MDQ training session in which they learned quality basics such as defining initiatives, deploying a quality-based process-management system, applying the Baldridge criteria, implementing Six Sigma, benchmarking and measuring quality. These managers then took the training material back to their employees and trained them in the same quality basics. All parts of the company, including non-manufacturing segments, were required to adapt the MDQ program (Rayner).

The changes that the company made towards improving quality by using MDQ to achieve Six Sigma were very successful in the early 1990’s. According to PC magazine, IBM received “A’s” for quality and customer service on their PC’s from 1992-99. However, in the late 1990’s, IBM changed their focus. The company objective is now to strive to lead in the creation, development and manufacture of the industry's
most advanced information technologies, including computer systems, software, networking systems, storage devices and microelectronics. Because of these changes, IBM has recently received ratings as low as “C’s” on quality and customer service (www.ibm.com).

**Is Six-Sigma always the answer?**

Many organizations, including the venerable GE, have benefited from the development of Six Sigma. Nevertheless, like other processes, if it is not implemented and carried-out correctly, it will never reach its full potential. As IBM and other companies are learning, altering a current process is not always the right decision. The logical and statistical methods that form the backbone of Six Sigma are reinventing the way companies do business.
Works Cited


General Electric: http://www.ge.com/sixsigma/


International Business Machines: www.ibm.com


Motorola University: http://mu.motorola.com/sigma.shtml

PC Magazine, August 1. 2001


Six Sigma Qualtec: “What is Six Sigma?”
http://www.sixsigmaqualtec.com/Products/sixsigma/what.htm

“GE Capital Commercial Finance Leverages Process and People for Sustainable Business Results.”
http://www.sixsigmaqualtec.com/News/ge_finance.html

“Six Sigma Is More Than A Lofty Notion.”
http://www.sixsigmaqualtec.com/News/notion.html

Six Sigma Systems: “What is Six Sigma and Lean Manufacturing?”
http://www.sixsigmasystems.com/what_is_six_sigma.htm