

What is Six Sigma ?

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Abstract: Over the past decades, several business improvement methods were launched, including the one known as Six Sigma. The Six Sigma implies the application of scientific principles to business processes and allows companies to obtain better, faster and cheaper products and services. Motorola was the first company that introduced and implemented Six Sigma in its business processes in the 1980s.

Keywords: Six Sigma, Motorola, company, process

Introduction

Improving business performance represents a critical responsibility for top and executive management in order to ensure the effectiveness and efficiency of their companies. Over the past decades, several business improvement methods were launched, including the one known as Six Sigma. Through the application of scientific principles to processes and products, the Six Sigma can help companies to do things better and improve their profitability. Famous companies around the world, such as General Electric, Motorola, Asea Brown Boveri, Polaroid and American

Express, have successfully implemented Six Sigma in their processes and activities.

Defining Six Sigma

In the late 1970s after the oil crisis, the American economy was in a slump. Several American companies understood that the time for a change in the way they did businesses came. Among them Motorola proved to be a valuable example. Trying to do things in a different way, the leadership of Motorola conducted benchmarking studies, analyzed customer feedback and discovered various problems.

All started when a Japanese company took over a Motorola factory that produced Quasar television sets in the United States of America (USA) in the 1970s. The Japanese were totally unsatisfied about how the factory operated. After drastic changes under Japanese management, the factory began soon producing TV sets with only 1/20th defects compared with the previous period. It took for Motorola about a decade, until the mid-1980s, to understand what happened and to figure out how to act in the future.

Motorola discovered that customers expected better products than it provided. B. Galvin, its Chief Executive Officer (CEO) at that time, directed the company on the quality path known as Six Sigma. At a time when most American companies considered that quality implies significant expenditures, Motorola appreciated that by improving quality costs would actually be reduced. In this respect, Motorola believed that the achievement of high-quality products should cost less. This is why, from the beginning, the Six Sigma designers at Motorola concentrated their efforts on obtaining enhancements in all operations within a process and did not focus on improvements in individual operations with unrelated processes.

Designing and implementing the Six Sigma way made Motorola both a quality leader and a profit leader in the USA. In 1988 Motorola won the Malcolm Baldrige National

Quality Award. As the secret of Motorola's success became public knowledge, the Six Sigma revolution began in the USA. During the time, experts and consultants have defined Six Sigma in different ways, as follows:

- Sigma is "a statistical concept that represents the amount of variation present in a process relative to customer requirements or specifications" [4, p. 1]. High sigma values (4.5-6) mean high performance process (Table 1).
- As a results-oriented, project-focused approach to quality, Six Sigma is "a way of measuring and setting targets for reductions in product or service defects that is directly connected to customer requirements" [1, p. 23].
- Six Sigma emphasizes "the improvement of processes for the purpose of reducing variability and making general improvements" [3, p. 1119].
- Six Sigma is "a business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimize waste and resources while increasing customer satisfaction" [6, p. VII].
- As a rigorous, focused and highly effective implementation of quality principles, Six Sigma aims for "virtually error free business performances" [8, p. 3].

Table 1- Customer requirements and sigma values

No.	Type of variation	Customer requirements	Sigma values
1.	Too much	Hard to produce output within customer requirements	Low (0-2)
2.	Moderate	Most output meets customer requirements	Middle (2-4.5)
3.	Very little	All output meets customer requirements (less than 4 defects per million)	High (4.5-6)

From the definitions above mentioned of Six Sigma two characteristics seem to be essential. Firstly, Six Sigma refers to a process viewpoint. Secondly, it clearly defines the customer requirements. It is also obvious that Six Sigma deals with quality, but not in the traditional sense as conformance to standards. Including economic value and utility both for the company and the customer, a new definition of quality might be "a state in which value entitlement is realized for the customer and provider in every aspect of the business relationship" [6, p. 6].

By identifying and eliminating waste costs, Six Sigma focuses on enhancing quality and on helping companies to make more money by improving customer value. Many companies have embraced Six Sigma because:

- It helps them to increase their market share, decrease their costs, and grow their profit margins (Box 1).
- It permits them to obtain significant savings.
- It ties quality directly to their bottom line.
- It provides them a measure of goodness and a methodology for improving performance.
- It helps them to focus on process management at all levels and to develop new processes, products, and services.
- It focuses on cycle time reduction.
- It guides them into making fewer mistakes.
- It allows them to increase customer satisfaction.
- It helps them to prevent, detect and correct their defects.
- It improves their bottom-line profitability.
- It allows them to achieve faster working capital turns.
- It directs them towards more productive research and development spending.

Box 1- Six Sigma at General Electric [6]

J. Welch, the former General Electric's CEO, was an enthusiastic promoter of Six Sigma within the company. He considered Six Sigma as the most important initiative ever undertaken by the company. In 1995, under Welch management, each General Electric operation worked toward achieving Six Sigma. As a result, company's operating income reached 300 million USD in 1997 and over 600 million USD in 1998.

Table 2- The number of parts per million (ppm) outside the specification limits, normal distribution centered [3, p. 14]

Specification limit	Percent	Defective ppm
+/- 1 sigma	68.27	317300
+/- 2 sigma	95.45	45500
+/- 3 sigma	99.73	2700
+/- 4 sigma	99.9937	63
+/- 5 sigma	99.999943	0.57
+/- 6 sigma	99.999998	.002

All companies need methods and tools of measuring what they claim to value. In order to measure companies' processes, Six Sigma uses metrics that lead to tangible, quantifiable results [2]. The higher the sigma level is, the better the process is performing. If a process operates at a six sigma value, the resulting products and services are almost defect free (Table 2).

The Six Sigma is applied within a simple performance improvement model known as Define-Measure-Analyze-Improve-Control (DMAIC) model. This model is used to incrementally improve existing processes and comprises the following elements in short [8, p. 4]:

- Define the objectives of the improvement activity.
- Measure the existing process.
- Analyze the process.
- Improve the process.
- Control the new process.

In sum, there is a close relationship between the sigma levels and the performance levels of a company. The Six Sigma implies

the application of scientific principles to businesses processes and allows companies to obtain better, faster and cheaper products and services.

Conclusions

The Six Sigma concept has redefined the world of work and the way companies operate. According to Six Sigma approach, the performance of companies is measured by the sigma level of their business processes. Higher sigma values mean better corporate performances.

By incorporating Six Sigma in their activities, training and education programs for current and future employees, companies recreate their processes so that defects never arise in the first place. In sum, through Six Sigma implementation companies make fewer mistakes in everything they perform while increasing their customer satisfaction. The Six Sigma has proved to be a powerful business method that drives improvement in any company's performance and profitability.

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