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Handling Statistical Variation In Six Sigma

By Peter Peterka

Six-Sigma provides a methodical, disciplined, quantitative approach to continuous process

improvement. Through applying statistical thinking, Six Sigma uncovers the nature of business variation and its affect on waste, operating cost, cycle time, profitability, and customer satisfaction.

The term "six sigma" is defined as a statistical measure of quality, specifically, a level of 3.4 defects per million or 99.99966% high-quality. To put into practice the Six Sigma management philosophy and achieve this high level of quality, an organization implements the Six Sigma methodology. The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of Six Sigma improvement projects. Projects are selected that support the company's overall quality improvement goals.

A Six Sigma project begins with the proper metrics. Six Sigma produces a flood of data about your process. These measurements are critical to your success. If you don't measure it, you can't manage it. Through those measurements and all of that data, you begin to understand your process and develop methodologies to identify and implement the right solutions to improve your process. Six Sigma's clear strength is a data-driven analysis and decision-making process—not someone's opinion or gut feeling.

Metrics lie at the heart of Six Sigma. Critical measures that are necessary to evaluate the success of the project are identified and determined. The initial capability and stability of the project is determined in order to establish a statistical baseline. Valid and reliable metrics monitor the progress of the project. Six Sigma discipline begins by clarifying what measures are key to gauging business performance, then it applies data and analysis to build an understanding of key variables and optimize results. Fact driven decisions and solutions are driven by two essential questions: What data/information do I really need? How do we use that data/information to maximize benefit?

Six Sigma metrics are more than a collection of statistics. The intent is to make targeted measurements of performance in an existing process, compare it with statistically valid ideals, and learn how to eliminate any variation. Improving and maintaining product quality requires an

understanding of the relationships between critical variables. Better understanding of the underlying relationships in a process often leads to improved performance.

To achieve a consistent understanding of the process, potential key characteristics are identified; the use of control charts may be incorporated to monitor these input variables. Statistical evaluation of the data identifies key areas to focus process improvement efforts on, which can have an adverse effect on product quality if not controlled. Advanced statistical software such as Minitab or Statgraphics, are very useful if not essential for gathering, categorizing, evaluating, and analyzing the data collected throughout a Six Sigma project. Special cause variation can also be documented and analyzed. When examining quality problems, it is useful to determine which of the many types of defects occur most frequently in order to concentrate one's efforts where potential for improvement is the greatest. A classic method for determining the "vital few" is through a Pareto chart.

Many statistical procedures assume that the data being analyzed come from a bell-shaped normal

distribution. When the data to be analyzed does not fit into a normal bell-shaped distribution, the results can be misleading and difficult to discern. When such data distribution is encountered, other statistical techniques can be used to assess whether an observed process can reasonably be modeled by a normal data distribution. In such cases, either a different type of distribution must be selected or the data must be transformed to a metric in which it is normally distributed. In many cases, the data sample can be transformed so that it is approximately normal. For example, square roots, logarithms, and reciprocals often take a positively skewed distribution and convert it to something close to a bell-shaped curve. This process will uncover significant statistical variation, separating the important data from meaningless data "noise."

Once the data is crunched and a problem's root causes are determined, the project team works together to find creative new improvement solutions. The data is used and relied upon—it is the measurements of the realities you face! Yet it is smart measurement and smart analysis of the data—and above all the smart creation of new improvement solutions and their implementation—that create real change. The Six Sigma statistical tools are only the means to an end and should not be construed as the end itself. Using tools properly is critical to getting the desired result. Through a successful use of statistics in uncovering significant data, Six Sigma will drive an organization toward achieving higher levels of customer satisfaction and reducing operational costs.

<http://www.6sigma.us/>

– Peter Peterka is the Principal Consultant in practice areas of DMAIC and

DFSS. Peter has eleven years of experience performing as a Master Black Belt, and has over 15 years experience in industry as an improvement specialist and engineer working with numerous companies.

Why Six Sigma Will Outlast Total Quality Management

By Peter Peterka

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Six Sigma is not just a new term for Total Quality Management (TQM) . They have many similarities and are compatible in many business environments. TQM has brought great improvements and value to many companies. Six Sigma can do more.

TQM is the development, deployment, and maintenance of systems related to quality—producing business processes. TQM is a strategic approach that focuses on encouraging a continuous flow of incremental quality improvements. It encourages the establishing of a culture of collaboration among different departments within organization. TQM is mainly a cultural initiative and a style of management toward increased quality.

Six Sigma is not just another quality initiative or process improvement program. It is more than that because it is a robust continuous improvement strategy and process that includes cultural methodologies such as the various TQM approaches. Six Sigma is complementary to TQM initiatives such as ISO 9000 registration, which is mainly procedural; Total Quality Management (TQM), which is mainly cultural, and Statistical Process Control (SPC), which is primarily statistical process control monitoring. All of these initiatives attempt to improve quality levels but typically reach a plateau. The Six Sigma approach goes to the next level.

Six Sigma is not about quality in the strict traditional sense. Quality, defined traditionally as conformance to internal requirements, is not the focus of Six Sigma. True, Six Sigma focuses on improving quality by helping organizations produce products and services better, faster and cheaper. However, it accomplishes that by reducing waste. In traditional terms, Six Sigma focuses on defect prevention, cycle time reduction, and cost savings. Six Sigma is about helping the organization make more money. Unlike cost-cutting programs that reduce value and quality, Six Sigma identifies and eliminates costs that provide no value to customers: the costs incurred due to waste.

The focus of TQM initiatives differs from the focus of Six Sigma programs. One, TQM programs focus on improvement in individual operations with unrelated processes. Six Sigma focuses on making improvements in all operations within a process. Two, Six Sigma involves dedicated, full-time resources—the "black belts"—versus TQM, which is usually a part-time activity of non-dedicated managers.

The breadth and depth and the precision of Six Sigma and TQM also differ. Six Sigma has a well-defined project charter that outlines the scope of a project, financial targets, anticipated benefits, milestones, etc. It's based on hard financial data and savings. In TQM, organizations go into a project without fully knowing what the financial gains might be. Six Sigma has a solid control phase (DMAIC - Define-Measure-Analyze-Improve-Control) that makes specific measurements, identifies specific problems, and provides specific solutions that can be measured.

How else is Six Sigma different? Six Sigma is:

- * Fact based and data driven

- * Results-oriented, providing quantifiable and measurable bottom-line results

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- * A leader-sponsored top-down approach
- * Linked to strategy
- * Thinking about customer requirements
- * Applicable to all business processes – administrative, sales, marketing, R&D, etc.

Six Sigma is a robust continuous improvement strategy and process that includes cultural methodologies such as Total Quality Management (TQM), process control strategies such as Statistical Process Control (SPC) and other important statistical tools. Six Sigma tools and techniques all are found in total quality management. Six Sigma is the application of the tools on selected important projects at the appropriate time. Six Sigma tools and techniques all are found in TQM. When done correctly, Six Sigma becomes a way toward organization and cultural development. Yet, it is more than a set of tools! Six Sigma is the strategic and systematic application of the tools on targeted important projects at the appropriate time. Because Six Sigma incorporates TQM but goes beyond it, it will outlast TQM.

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