**FOCUSING ON THE CUSTOMER WITH SIX SIGMA**

There’s an old joke about two men who get into a fight in a bar. The first man tells the second man, “I have to warn you: I’m a black belt.” He then promptly loses the fight... probably because his “black belt” was in Six Sigma, not Karate.

You’ve probably heard the term “Six Sigma Black Belt” before in the business world. Having a black belt certification in Six Sigma means that you can effectively apply the concepts, tools and techniques of Six Sigma. But what is Six Sigma itself? Simply put, it’s a method of eliminating waste and improving quality that focuses on the customer. The goal is to produce near-perfect processes, improving financial performance and organizational efficiency to “breakthrough” levels.

Sigma, written in Greek as “σ,” is a statistical term that denotes the *standard deviation*, or measure of variation, in a process. In other words, sigma is a measure of how variable a process is. As a metric, sigma indicates the level of performance, with six sigma as near perfection at no more than 3.4 defects per million opportunities (or dpmo).

These defects or errors could have to do with anything from the design and production of a product to a customer-oriented service process. As variation reduces, the standard deviation decreases. With a more consistent process, the sigma level of performance increases.

To quote Jack Welch, “Variation is Evil”. Variation, here, refers to *variation in your processes*. We consider this evil from an Operations Management standpoint because variation within your processes produces inconsistencies. This makes the processes unpredictable, which in turn makes it difficult to plan, budget, schedule, and deliver to meet customer requirements and expectations. This unpredictability leads to errors and quality defects —and therefore customer dissatisfaction.

**SIX SIGMA TARGETS VARIATION**

The underlying premise of Six Sigma is the equation...

**Y = f(x)**

In this equation, Y is a function of X. Y is the response or output of interest, while X represents factors or determinants that impact Y. By analyzing, identifying and controlling the key X factors, we can reduce variation and improve the level of performance of Y.

**HOW SIX SIGMA WORKS**

Six Sigma translates customers’ needs into operational terms or *critical-to-quality* (CTQ) requirements. In other words, this methodology determines what matters to customers most, defines processes critical to those aspects of the customer’s wants and needs, and establishes on that basis what tasks must be done (and done well). Six Sigma projects improve the performance of processes, services, or products to breakthrough levels of effectiveness and efficiency. Breakthrough performance is generally defined as a new and unprecedented level of performance compared to what the business entity was previously achieving.

There are two project methodologies used in Six Sigma. One of them, used for improvement projects, is called DMAIC. The other, used for design projects, is called DMADV or DFSS (Design for Six Sigma).

**DMAIC**

**Improvement projects** in Six Sigmafollow a five-phased methodology called **DMAIC**. The letters represent the project phases: Define, Measure, Analyze, Improve, and Control:

* **Define** — The problem or improvement opportunity, Y, is defined.

Tools used to define the opportunity include the project charter (detailing the problem statement, goal statement, project scope, metrics/CTQs, operational and financial impact, project team, stakeholders, milestones, and approvals) and SIPOC (a high-level process map).

* **Measure** — Measure the size of the problem, document the  process, identify key customer requirements, and identify and theorize on potential Xs that are key Xs in Y= f(x).

Tools used to measure the problem include process maps, a data collection plan, measurement system analysis, graphs and charts (such as Pareto, histograms, and boxplots), descriptive statistics, baseline process capability and sigma level, brainstorming of theories, and cause-effect diagrams.

* **Analyze** — Plan for data collection, analyze the data, and diagnose the key Xs that drive performance. Tools used for analysis include a data collection plan to test likely theories, hypothesis testing, and inferential statistics (such as correlation, regression, and analysis of variance (ANOVA)).
* **Improve** — Develop solutions to address the proven Xs. Tools used for improvement include creative idea generation, evaluation and selection matrices (such as criteria-based matrix and Pugh matrix), design of experiments (DOE), detailed process maps, failure modes effects analysis (FMEA), and pilots and statistical tests to confirm significance of results.
* **Control** — Solutions are implemented and controls put in place on proven key Xs to ensure project gains on Y are sustainable. Tools used for control include mistake-proofing, control plans, SPC control charts, process capability, training, change management, standard operating procedures (SOPs), and sign-off on results.

**DMADV**

**Design projects** follow a methodology called Design for Six Sigma (DFSS) or DMADV. The letters in DMADV again stand for the project phases: Define, Measure, Analyze, Design, and Verify: DMADV is customer focused; the voice of the customer and customer requirements drive the design effort. This results in an effective product, process or service.

* **Define** — Identify what product, service, or process is to be designed. Tools used to define this include the project charter (including a business case).
* **Measure** — Translate customer needs into CTQs, or what’s critical to quality in the eyes of the customer.Tools used for measuring include Voice of the Customer (VOC) analysis, focus groups, interviews, observations, VOC translation to CTQs, design scorecards, and Quality Function Deployment (QFD) matrices.
* **Analyze** — Identify alternative design concepts and develop one or more into a high-level design(s). Tools used for analysis include transfer functions, QFD matrices, creative idea generation, function diagrams, high-level designs, the Pugh matrix, and design scorecards.
* **Design** — Develop the design in detail. Tools used for design include transfer functions, QFD matrices, design of experiments

(DOE), simulation, inferential statistics, pilots, design FMEA (DFMEA), and design scorecards.

* **Verify** — Verify performance of the new design and roll out to production. Tools used in this phase include process capability, SPC control charts, inferential statistics, control plans, and training, documentation, and implementation plans.

**EXAMPLE: REDUCING BLOOD WASTAGE**

Most people understand that Six Sigma reduces waste. Never forget that this reduction is not merely academic. It isn’t always a matter of improving the bottom line. Reducing waste can affect all aspects of a business or other entity, and sometimes, the difference saves lives.

Take, for example, John Hopkins Hospital. At John Hopkins, more than 4.4 percent of packed red blood cells had to be discarded before they could be delivered to patients. Most of the time, this was because units left the blood bank for more than the 30 minutes allowed to administer them. Blood that reaches temperatures beyond the maximum allowed limits, or which has been out of the blood bank for too long, cannot be given to patients.

Using Lean Six Sigma, a team with backgrounds in anesthesiology, transfusion medicine, and nursing identified major factors affecting blood product wastage. These included units being improperly packed in coolers, which allowed them to become too warm before they could be administered. Implementing the team’s Six Sigma changes reduced blood wastage at John Hopkins by more than 50 percent. Over its first four years, this effort saved the hospital $800,000 — and, even more importantly, ensured that more of this life-saving resource was available to patients who needed it.

**MANAGEMENT IMPLICATIONS**

Six Sigma is not just a theory and not merely a methodology. Applied properly, it can improve a business entity’s operations, better position that company for competitive advantage, and significantly increase effectiveness and efficiency while reducing or eliminating waste. Business leaders must be prepared to implement Six Sigma from the top down, selecting and launching projects that help their companies to achieve both short- and long-term financial and strategic goals. By driving improvements In effectiveness and efficiency, Six Sigma is one way that business leaders use operations management to *win*.