BREAKTHROUGH
Lean Implementation & Training Resource Publication
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6σ SIX SIGMA BASICS

By Harold Chapman

BUSINESS SYNERGY

Six-Sigma is a problem solving methodology that synergizes well with any Lean enterprise initiative. In some companies, the term "Lean Six Sigma" is used instead of separating the two methodologies, since they complement each other in their objectives. Lean is a system to eliminate waste, unevenness and overburden by identifying and solving problems utilizing people. Six-Sigma can be the methodology that is used to identify key problems, validate root cause, and solve the problem properly and permanently using statistical tools**.** It was developed by Motorola in the 1980's and has stood the test of time. As popular as it is, there are still many companies that have not benefited from the tried and true process that has shown its value time and time again at some of the world's largest organizations. GE, American Standard, Motorola and many other companies have attributed billions in savings to the Six Sigma business methodologies.

Six-Sigma is not just a problem solving tool. It is a business philosophy that enables world class results to be achieved in all areas of the business. The goal is to achieve customer satisfaction at the highest level. It aligns the company's actions with the needs and expectations of the customer. After all, the customer is the one that really pays the bills.

DEFINING SS

The term Six-Sigma is used to define the quantity of defects, and is generally presented as parts-per-million or defective parts per million produced, (ppm / dppm). Companies usually start with a level of improvement targeted toward Four or Five Sigma (6,210 or 230 *parts defective in every million produced, respectively*), and progressively work their way up to a Six Sigma level, (*3.4 parts defective in every million produced).* (There are some companies even attempting a Seven-Sigma figure).

Six-Sigma utilizes data and statistical tools to systematically improve processes and sustain process improvements. Process metrics are developed and monitored against expected targets. The Lean philosophy mandates that variation is seen as evil and therefore must be eliminated, especially when it negatively impacts customer satisfaction.

FIVE PHASES

The systematic approach within the Six-Sigma process consists of five phases. We will touch on each of the phases briefly in the introduction with more detail to come in future newsletters. The five phases are: Define, Measure, Analyze, Improve and Control. This is also known as the DMAIC process.

In the **Define Phase**, a team will set project goals and boundaries based on one's knowledge of the organization's business goals, customer needs and the processes that need to be improved to gain more profit, customer satisfaction, market share, etc. Some common tools used in the Define Phase are: Project Charter, Stake Holder Analysis, SIPOC, Rolled Throughput Yield, Voice of the Customer, Affinity Diagram, Kano Model, Decision Trees and Critical to Quality Tree. The output of the Define Phase is a clearly defined project that is strongly linked to business success.

Jason Manarchuck Director of New Business Development
11212 Nautical Drive. Knoxville, TN 37934 PHONE: 865.776.9159 FAX: 865.588.1814
www.LMSPI.com Jason@lmspi.com

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FIVE PHASES, cont'd

In the **Measure Phase**, the team's goal is to pinpoint the location or source of problems as detailed as possible by building a factual understanding of existing process conditions and problems. The knowledge gained here will help the team narrow the range of potential causes that need to be investigated in the Analyze Phase. A baseline for capability is a general output of the Measure Phase. Some common tools used in the Measure Phase are: Data Collection Plan, Data Collection Forms, Control Charts, Frequency Plots, Gage R&R, Isoplots, Pareto Charts, Prioritization Matrix, FMEA, Process Capability, Process Sigma, Sampling, Stratification and Time Series Plots. The output of the Measure Phase is a measurable cause whether it is a variable or an attribute.

In the **Analyze Phase**, one develops theories of root causes, confirms the theories with data, and identifies the root cause(s) of the problem. The verified cause(s) will form the basis for solutions in the next phase of the problem solving cycle, which is the Improve Phase. Some tools that are used in the Analyze Phase are: Affinity Diagrams, Brain Storming, Cause and Effect Diagrams, Control Charts, Data Collection Forms, Data Collection Plan, Design of Experiments, Flow Diagrams, Frequency Plots, Hypothesis Testing, Pareto Charts, Regression Analysis, Response Surface Methodology, Sampling, Scatter Plots and Stratified Frequency Plots. The output of the Analyze Phase is the link between the problem described in the Define Phase and the cause described in the Analyze Phase.

In the **Improve Phase**, one should be ready to develop, implement and evaluate solutions targeted at the verified cause. The goal in this step is to demonstrate, with data, that the solutions solve the problem and lead to an improvement. It is extremely important to VERIFY the solution before proceeding to the next Phase of the DMAIC process. A poorly selected root cause will cause the team to struggle in the future. The tools most commonly used in the Improve Phase are: Brain Storming, Consensus Building, Affinity Diagrams, Creativity Techniques, Data Collection, Design of Experiments, Flow Diagrams, FMEA, Hypothesis Testing, Planning Tools, Better vs. Current and Stakeholder Analysis. The output of the Improve Phase is confirmation that the problem is being driven by the cause stated in the Analyze Phase.

The **Control Phase** is the final phase of the problem solving cycle. The Control Phase is designed to help one ensure the problem remains fixed and that the new methods can be further improved over time. In some cases the solution can be in the form of an irreversible corrective action. In other cases, there may have to be some type of control or monitor in place to avoid problem recurrence. The tools most commonly used in the Control Step are: Control Charts, Data Collection, Flow Diagrams, Before and After Charts, Quality Control Process Charts, Tolerance Parallelograms and Standardization.

The DMAIC process has shown its power with many projects across many industries. It is a proven method that anyone can deploy to solve an organization's most difficult problems. The satisfaction of a team solving problems that have never been solvable in the past is very rewarding and builds momentum for future problem solving efforts in the plant, ultimately leading to a problem solving organization. Join us next month when we deep-dive into the DEFINE phase of the DMAIC process.

Stay tuned! This series will continue highlighting each phase in the DMAIC process. To read more, just click here or visit www.LMSPI.com to review the FREE Online Insider Archive now!

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