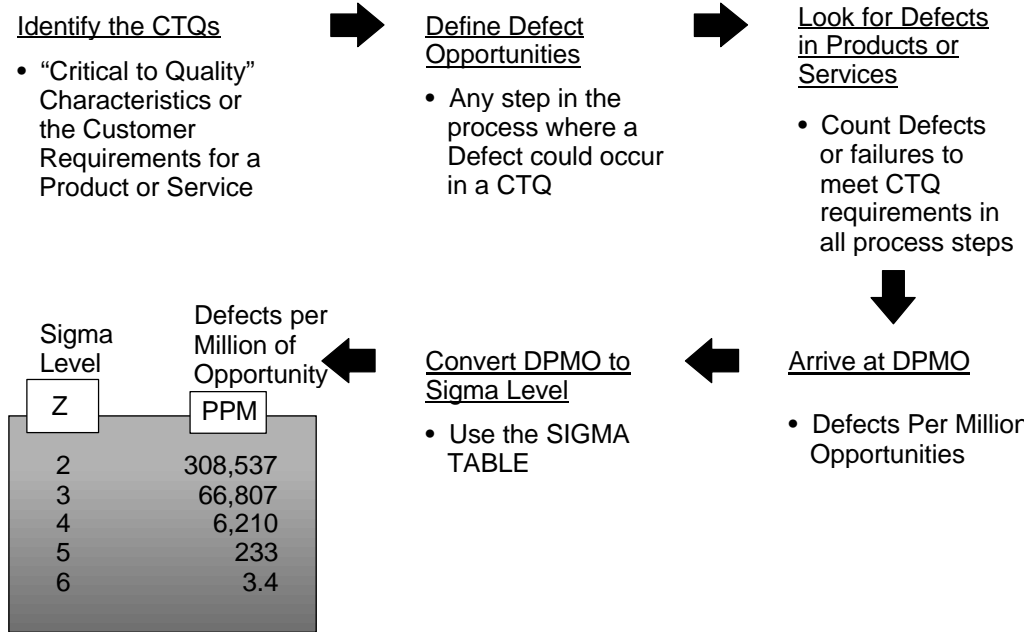


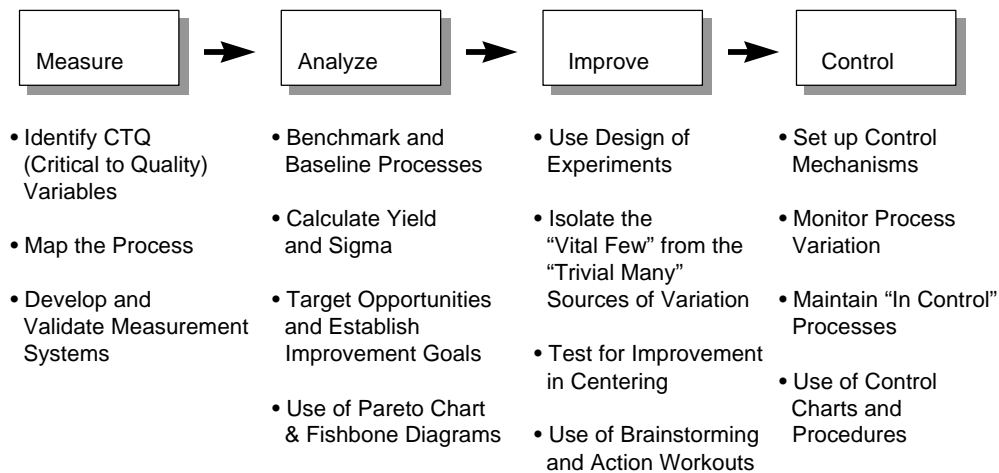
INTRODUCTION TO SIX SIGMA

MEASUREMENT SYSTEM: HOW DO WE ARRIVE AT SIGMA LEVEL?



SIX SIGMA STEPS

Six Sigma methodology has four phases (MAIC): Measure, Analyze, Improve, Control. A specially trained Black Belt or Green Belt leads the team to help identify root causes of defects and/or variation in an existing process (or product) and then improve and control that process.



Measuring & Eliminating Defects is the “Core” of Six Sigma

SIX SIGMA ROLES

Champion: A business leader who provides overall strategic direction for a Six Sigma project team. This individual serves as a liaison between management and the project team; facilitates the acquisition of resources and support for the project.

Master Black Belts: Quality leaders responsible for strategy, training, mentoring and deployment of Six Sigma.

Black Belts: Six Sigma experts who work projects across the business.

Green Belts: Fully-trained individuals who work projects in their job.

SIX SIGMA GLOSSARY

Capability Flowup

Trading off or optimizing defect levels by statistical propagation of defects from lower level variables to higher level variables in a system (design and/or product) CTQ flowdown.

Critical To Quality (CTQ)

An element of a design or a characteristic of a part that is essential to quality in the eyes of the customer.

CTQ Flowdown

A system (process and/or design) block diagramming technique to identify the transfer functions (dependencies) between Ys and Xs at various levels of the system. The Xs at one level are the Ys at a lower level.

Defect

A failure to meet an imposed requirement on a single quality characteristic or a single instance of nonconformance to the specification.

Defective

A unit of product containing one or more defects.

Defects Per Million Opportunities (DPMO)

The number of defects counted, divided by the actual number of opportunities to make a defect, then multiplied by one million. A direct measure of sigma level.

Defects Per Unit (DPU)

The number of defects counted, divided by the number of products or characteristics produced. A process of counting and reducing defects as an initial step toward Six Sigma quality.

Design for Six Sigma (DFSS)

Creating a component, system, or process such that its capability approaches entitlement upon initiation.

Design of Experiments (DOE)

Statistical experimental designs to economically improve product and process quality. A major tool used during the "Improve Phase" of Six Sigma methodology.

Entitlement

The expected performance level of a process when the major sources of variation are identified and controlled.

Failure Mode Effects Analysis (FMEA)

A process in which each potential failure mode in every sub-item of an item is analyzed to determine its effect on other sub-items and on the required function of the item.

Gage Repeatability & Reproducibility (Gage R&R)

A measurement system evaluation to quantify measurement error, and its ingredient components, e.g., equipment variability, appraiser variability, etc. This study is critical to ensure that the collected data is accurate and to assess how much of the total process variation is due to measurement.

Process

A particular method of doing something, generally involving a number of steps or operations.

Process Capability

The relative ability of any process to produce consistent results centered on a desired target value when measured over time.

Quality Functional Deployment (QFD)

Structured methodology to identify and translate customer needs and wants into technical requirements and measurable features and characteristics. This tool is used to identify Critical to Quality Characteristics (CTQs).

Sigma (s)

A measure of the consistency of a process.

Sigma Level

A statistical measure (Z value) of process variation; the distribution or spread about the mean (average) of any process or procedure. The higher the sigma, the better the process. Z_{lt} (long term Z) is the sigma level of a CTQ (or a process) in the presence of long term sources of variation. Z_{st} (short term Z) is the sigma level in the presence of short term sources of variation only. This typically represents the basic entitlement of the process.

Six Sigma Quality

A combination of verified customer requirements reflected in robust designs and matched to the capability of production processes that creates products with fewer than 3.4 defects per million opportunities to make a defect. World-class quality. A collection of tools and techniques for raising quality to worked-class levels.

Transfer Function

Model for relationship (e.g., regression equation, response surface fit, simulation model, finite element model, etc) between the Xs and Ys.

"Xs"

Designation in Six Sigma terminology for those variables which are the root causes ("explanatory variables" in regression analysis); as opposed to "Ys" which are dependent outputs of a process. Six Sigma focuses on measuring and improving Xs, to see subsequent improvement in Ys.

"Ys"

Designation in Six Sigma terminology for those variables which are dependent outputs of a process, as opposed to "Xs" which are independent root causes that impact the Y's.