The

BLACK BELT Memory Jogger™

A Pocket Guide for

Six Sigma Success


GOAL QPC
Improving the Way Organizations Run

The

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Six Sigma Success

Six Sigma Academy

First Edition
GOAL/QPC

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Six Sigma Academy

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Introduction

What is Six Sigma?

The Six Sigma methodologies are a business philosophy and initiative that enables world-class quality and continuous improvement to achieve the highest level of customer satisfaction. Metrics are established that align an organization's strategic goals and values to that of their customer's needs and expectations.

Sigma (σ) represents a unit of measurement that designates the distribution or spread about the mean (average) of a process. In business, a sigma value is a metric that represents how well a process is performing and how often a defect is likely to occur. The higher the sigma value, the less variation and fewer defects the process will have. Six Sigma is the new standard of excellence at only 3.4 defects per million opportunities (DPMO).

How does it work?

The Six Sigma philosophy uses data and statistical tools to systematically improve processes and sustain process improvements. Process metrics are evaluated based on a comparison of average and variation to performance specifications or targets.

The methodology is a project-focused approach consisting of five phases: Define, Measure, Analyze, Improve, and Control. Projects are selected and *Defined* from business, operational, and customer needs, based on their linkage to executive strategies. In the *Measure* phase, tools are applied to validate the measurement system and to characterize the process. In the *Analyze* and *Improve* phases, sources of variation are identified, a statistical relationship between the process input and

output variables is established, and the process performance is optimized. The *Control* phase applies traditional and statistical tools to sustain process improvements. Emphasis is placed on controlling the key process inputs to consistently achieve key process outputs.

The DMAIC Model

What is it?

The DMAIC model is a set of tools outlined in five phases that are used to characterize and optimize both business and industrial processes. Each project must complete the five phases in chronological order.

Define Phase

In the Define phase, the customer needs are stated and the processes and products to be improved are identified.

Steps	Activities/Tools	Output(s)
Create problem statement	• Define process to improve • Define project objectives • Identify project stakeholders • Identify customers	• Problem statement • Project scope • Project goals
Identify CTQs	• CT Trees	• Identified customer needs
Define performance standards	• Identify performance measures • Financial analysis • High-level process mapping	• Gap analysis • Business impact (project savings) • Project definition • Project charter • Project plan/ timeline • High-level process map • Definition of performance measures

Measure Phase

The Measure phase determines the baseline and target performance of the process, defines the input / output variables of the process, and validates the measurement systems.

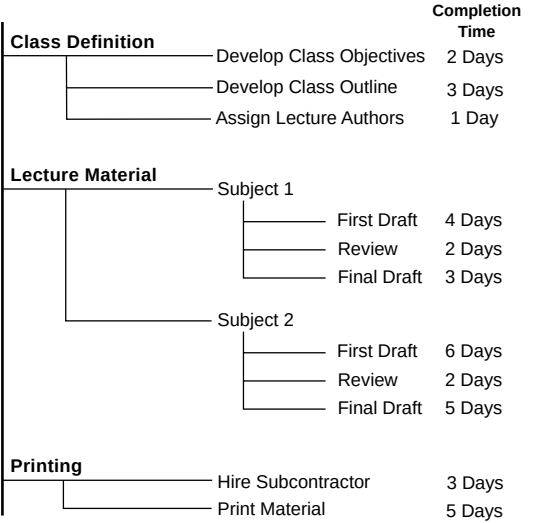
Steps	Activities/Tools	Output(s)
Understand process and validate measurement system	• Process-map the as-is process • Identify process inputs/outputs • Collect data • Evaluate measurement system of process y's	• Detailed process map • Identified process output variables (POV) – (y's) and their measurements • Identified process input variables (PIV) – (x's) • Validated performance data • Measurement system capability on y's • Data collection/ sampling plan
Determine process capability	• Control charts on process y's • Capability analysis • Graphical techniques	• Baseline control charts • Baseline capability • DPMO • Z value
Finalize performance objectives	• Cause and effect analysis • Create FMEA • Review of project goals and plan	• Revised project goals • Quantified project objectives • Validated financial goals • Revised project plan • Cause and effect relationships • Prioritized risk

Analyze Phase

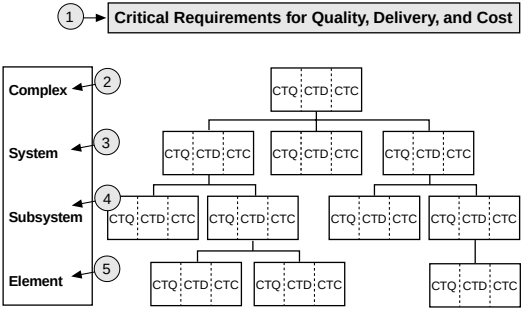
The Analyze phase uses data to establish the key process inputs that affect the process outputs.

Steps	Activities/Tools	Output(s)
Identify sources of variation	• Detailed process map • Brainstorming • Fishbone diagram • Cause & Effect Matrix • FMEA • SPC on x's and y's • MSA on x's	• Identified sources of variation • Identified potential leverage variables (KPIVs) • Updated process map • Updated FMEA
Screen potential causes	• Graphical analysis • Hypothesis testing • Multi-Vari analysis • Correlation and regression analysis	• Potential x's critical to process performance • Identified improvement opportunities • Data on KPIVs • Statistical analysis of data

A Work Breakdown Structure for the Development of an Educational Course



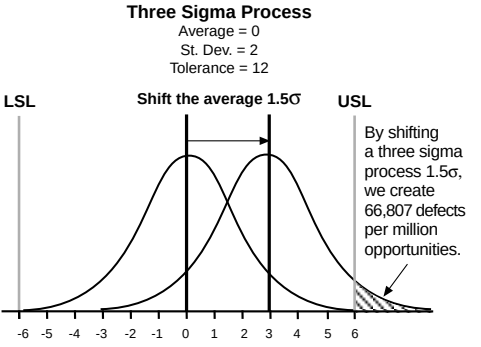
A CTX Product Tree or Flowdown



1. Critical requirements for quality, delivery, and cost are translated from the CTS characteristics.
2. The complex level is the first level of the product tree and describes the final product or service that is delivered to the customer. CTQs, CTDs, and CTCs can be found at this level and are usually expressed as a function of the immediate lower level characteristics: CTQ-complex = f (CTQ-system$_1$, ... CTQ-system$_n$).
3. The system level is a more detailed breakdown of the complex level. CTQs, CTDs, and CTCs can be found at this level and are usually expressed as a function of the immediate lower level characteristics: CTQ-system = f (CTQ-subsystem$_1$, ... CTQ-subsystem$_n$).
4. The subsystem level is a more detailed breakdown of the system level. CTQs, CTDs, and CTCs can be found at this level and are usually expressed as a function of the

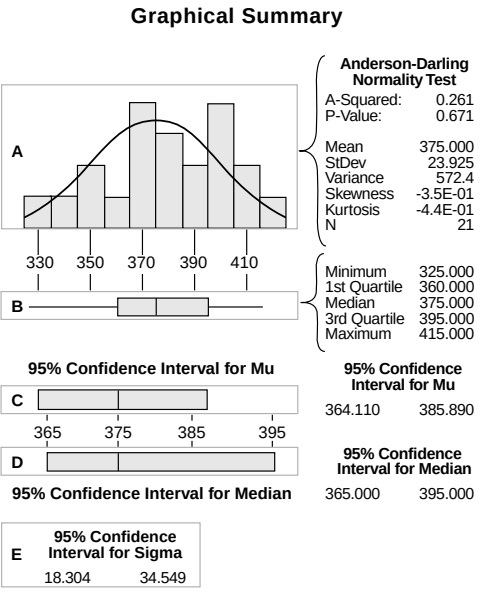
In a Six Sigma process, customer satisfaction and business objectives are robust to shifts caused by process or product variation.

Six Sigma as a Statistical Measure



Graphical Summary

Graphical summary is a tool that can be used to summarize a collection of individual observations for a continuous variable. Quantitative inferences about the data set can be made by analyzing the many statistics that a graphical summary provides. Most common statistical programs provide some version of a graphical summary; the following summary comes from MINITAB™ software.



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