

Black Belt Curriculum

Black Belt Training: Define Phase

1.1 Six Sigma Overview

- 1.1.1 What is Six Sigma
- 1.1.2 Six Sigma History
- 1.1.3 Six Sigma Approach $Y = f(x)$
- 1.1.4 Six Sigma Methodology
- 1.1.5 Roles & Responsibilities

1.2 The Fundamentals of Six Sigma

- 1.2.1 Defining a Process
- 1.2.2 VOC & CTQ's
- 1.2.3 Cost of Poor Quality (COPQ)
- 1.2.4 Pareto Analysis (80:20 rule)

1.3 Lean Six Sigma Projects

- 1.3.1 Six Sigma Metrics
- 1.3.2 Business Case & Charter
- 1.3.3 Project Team Selection

1.4 Lean Fundamentals

- 1.4.1 Lean & Six Sigma
- 1.4.2 History of Lean
- 1.4.3 The Seven Deadly Muda
- 1.4.4 Five-S (5S)

Black Belt Training: Measure Phase

2.1 Process Definition

- 2.1.1 Cause & Effect Diagrams
- 2.1.2 Process Mapping
- 2.1.3 X-Y Diagram
- 2.1.4 FMEA: Failure Modes & Effects Analysis

2.2 Six Sigma Statistics

- 2.2.1 Basic Statistics
- 2.2.2 Descriptive Statistics
- 2.2.3 Distributions & Normality
- 2.2.4 Graphical Analysis

2.3 Measurement System Analysis

- 2.3.1 Precision & Accuracy
- 2.3.2 Bias, Linearity & Stability
- 2.3.3 Gage R&R
- 2.3.4 Variable & Attribute MSA

2.4 Process Capability

- 2.4.1 Capability Analysis
- 2.4.2 Concept of Stability
- 2.4.3 Attribute & Discrete Capability
- 2.4.4 Monitoring Techniques

Black Belt Training: Analyze Phase

3.1 Patterns of Variation

- 3.1.1 Multi-Vari Analysis
- 3.1.2 Classes of Distributions

3.2 Inferential Statistics

- 3.2.1 Understanding Inference
- 3.2.2 Sampling Techniques & Uses
- 3.2.3 Sample Size
- 3.2.4 Central Limit Theorem

3.3 Hypothesis Testing

- 3.3.1 Goals of Hypothesis Testing
- 3.3.2 Statistical Significance
- 3.3.3 Risk; Alpha & Beta
- 3.3.4 Types of Hypothesis Test

3.4 Hypothesis Testing: Normal Data

- 3.4.1 1 & 2 sample t-tests
- 3.4.2 1 sample variance
- 3.4.3 One Way ANOVA

3.5 Hyp Testing: Non-Normal Data

- 3.5.1 Mann-Whitney & Mood's Median
- 3.5.2 Kruskal-Wallis
- 3.5.3 Moods Median
- 3.5.4 Friedman
- 3.5.5 1 Sample Sign
- 3.5.6 1 Sample Wilcoxon
- 3.5.7 1 and 2 Sample Proportion
- 3.5.8 Chi-Squared (Contingency Tables)
- 3.5.9 Test of Equal Variances

Black Belt Training: Improve Phase

4.1 Simple Linear Regression

- 4.1.1 Correlation
- 4.1.2 Regression Equations
- 4.1.3 Residuals Analysis

4.2 Multiple Regression Analysis

- 4.2.1 Non-Linear Regression
- 4.2.2 Multiple Linear Regression
- 4.2.3 Confidence Intervals
- 4.2.4 Residuals Analysis
- 4.2.5 Data Transformation, Box Cox
- 4.2.6 Stepwise Regression
- 4.2.7 Logistic Regression

4.3 Designed Experiments

- 4.3.1 Experiment Objectives
- 4.3.2 Experimental Methods
- 4.3.3 DOE Design Considerations

4.4 Full Factorial Experiments

- 4.4.1 2k Full Factorial Designs
- 4.4.2 Linear & Quadratic Models
- 4.4.3 Balanced & Orthogonal Designs
- 4.4.4 Fit, Model & Center Points

4.5 Fractional Factorial Experiments

- 4.5.1 Designs
- 4.5.2 Confounding Effects
- 4.5.3 Experimental Resolution

Black Belt Training: Control Phase

5.1 Lean Controls

- 5.1.1 Control Methods for 5S
- 5.1.2 Kanban
- 5.1.3 Poka-Yoke (Mistake Proofing)

5.2 Statistical Process Control (SPC)

- 5.2.1 Data Collection for SPC
- 5.2.2 I-MR Chart
- 5.2.3 Xbar-R Chart
- 5.2.4 U Chart
- 5.2.5 P Chart
- 5.2.6 NP Chart
- 5.2.7 X-S chart
- 5.2.8 CumSum Chart
- 5.2.9 EWMA Chart
- 5.2.10 Control Methods
- 5.2.11 Control Chart Anatomy

5.2.12 Subgroups, Variation, Sampling

5.2.13 Center Line & Control Limits

5.3 Six Sigma Control Plans

- 5.3.1 Cost Benefit Analysis
- 5.3.2 Elements of the Control Plan
- 5.3.3 Elements of the Response Plan