

IASSC Universally Accepted Lean Six Sigma Body of Knowledge for **Yellow**, **Green** & **Black** Belts

1.0 Define Phase

1.1 The Basics of Six Sigma

- 1.1.1 Meanings of Six Sigma
- 1.1.2 General History of Six Sigma & Continuous Improvement
- 1.1.3 Deliverables of a Lean Six Sigma Project
- 1.1.4 The Problem Solving Strategy $Y = f(x)$
- 1.1.5 Voice of the Customer, Business and Employee
- 1.1.6 Six Sigma Roles & Responsibilities

1.2 The Fundamentals of Six Sigma

- 1.2.1 Defining a Process
- 1.2.2 Critical to Quality Characteristics (CTQ's)
- 1.2.3 Cost of Poor Quality (COPQ)
- 1.2.4 Pareto Analysis (80:20 rule)
- 1.2.5 Basic Six Sigma Metrics
 - a) including DPU, DPMO, FTY, RTY Cycle Time, deriving these metrics and these metrics

1.3 Selecting Lean Six Sigma Projects

- 1.3.1 Building a Business Case & Project Charter
- 1.3.2 Developing Project Metrics
- 1.3.3 Financial Evaluation & Benefits Capture

1.4 The Lean Enterprise

- 1.4.1 Understanding Lean
- 1.4.2 The History of Lean
- 1.4.3 Lean & Six Sigma
- 1.4.4 The Seven Elements of Waste
 - a) Overproduction, Correction, Inventory, Motion, Overprocessing, Conveyance, Waiting.
- 1.4.5 5S
 - a) Sort, Straighten, Shine, Standardize, Self-Discipline

2.0 Measure Phase

2.1 Process Definition

- 2.1.1 Cause & Effect / Fishbone Diagrams
- 2.1.2 Process Mapping, SIPOC, Value Stream Map
- 2.1.3 X-Y Diagram
- 2.1.4 Failure Modes & Effects Analysis (FMEA)

2.2 Six Sigma Statistics

- 2.2.1 Basic Statistics
- 2.2.2 Descriptive Statistics
- 2.2.3 Normal 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 Repeatability & Reproducibility
- 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

3.0 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 Central Limit Theorem
- 3.3 Hypothesis Testing
 - 3.3.1 General Concepts & Goals of Hypothesis Testing
 - 3.3.2 Significance, Practical vs. Statistical
 - 3.3.3 Risk; Alpha & Beta
 - 3.3.4 Types of Hypothesis Test
- 3.4 Hypothesis Testing with Normal Data
 - 3.4.1 1 & 2 sample t-tests
 - 3.4.2 1 sample variance
 - 3.4.3 One Way ANOVA
 - a) Including Tests of Equal Variance, Normality Testing and Sample Size calculation, performing tests and interpreting results
- 3.5 Hypothesis Testing with Non-Normal Data
 - 3.5.1 Mann-Whitney
 - 3.5.2 Kruskal-Wallis
 - 3.5.3 Mood's Median
 - 3.5.4 Friedman
 - 3.5.5 1 Sample Sign
 - 3.5.6 1 Sample Wilcoxon
 - 3.5.7 One and Two Sample Proportion
 - 3.5.8 Chi-Squared (Contingency Tables)
 - a) Including Tests of Equal Variance, Normality Testing and Sample Size calculation, performing tests and interpreting results

4.0 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 & Prediction Intervals
 - 4.2.4 Residuals Analysis
 - 4.2.5 Data Transformation, Box-Cox
- 4.3 Designed Experiments

- 4.3.1 Experiment Objectives
- 4.3.2 Experimental Methods
- 4.3.3 Experiment Design Considerations
- 4.4 Full Factorial Experiments
 - 4.4.1 2k Full Factorial Designs
 - 4.4.2 Linear & Quadratic Mathematical Models
 - 4.4.3 Balanced & Orthogonal Designs
 - 4.4.4 Fit, Diagnose Model and Center Points
- 4.5 Fractional Factorial Experiments
 - 4.5.1 Designs
 - 4.5.2 Confounding Effects
 - 4.5.3 Experimental Resolution

5.0 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 Xbar-S Chart
 - 5.2.8 CuSum Chart
 - 5.2.9 EWMA Chart
 - 5.2.10 Control Methods
 - 5.2.11 Control Chart Anatomy
 - 5.2.12 Subgroups, Impact of Variation, Frequency of Sampling
 - 5.2.13 Center Line & Control Limit Calculations
- 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