Online Black Belt Training

Course Objectives

After successful completion of this course, students will be able to:

- Participate in the development of a successful Six Sigma program.
- Contribute to the definition of project selection criteria and develop project proposals to meet those criteria.
- Lead a Six Sigma project team, using the DMAIC problem solving methodology and team building skills.
- Apply and interpret basic and advanced Six Sigma tools, as necessary, for project definition, process baseline analysis, process improvement, and process control. (See list of tools in *Topic Overview*, below).

Prerequisites

Black Belt candidates generally have college degrees in industry-related fields, including business, engineering, or sciences. They are comfortable using mathematics, are experienced problem solvers, have college-level reading comprehension skills, and are proficient in using Windows-based computer software, including MS Office and general statistical software.

Intended Audience

This training is suitable for anyone with the appropriate pre-requisites with the desire to lead teams using the DMAIC methodology and advanced statistical tools.

PC Requirements

To access this course and Study Guide, users need:

- An Internet connection
- A suitable browser, such as Internet Explorer 5.0 or higher, with cookies enabled.

To run the Green Belt XL software, users need one of the following Microsoft Excel versions running in MS Windows: Excel 97, Excel 2000, Excel 2002 or Excel XP. Black Belts should also have a general statistical software package, such as Minitab.

Materials Provided

In addition to the online access, each course includes the following materials for a complete learning experience (a $400 value):

- *Six Sigma Demystified* by Paul Keller
- *Six Sigma Handbook* by Thomas Pyzdek
- *Black Belt* Notebook
- Green Belt XL software (Student Version) by Quality America

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Topic Overview

1. Why Do Six Sigma
   a) Definition and graphical view of Six Sigma
      (i) Overview of business applications
      (ii) Example Sigma Levels
      (iii) Introduction to DPMO and cost as metrics.
   b) Comparisons between typical TQM and Six Sigma Programs.
   c) Origins and Success Stories.
2. How to Deploy Six Sigma
   a) Leadership responsibilities.
   b) Description of the roles and responsibilities.
   c) Resource allocation.
   d) Data driven decision making.
   e) Organizational metrics and dashboards.
3. Six Sigma Projects
   a) Project Focus.
   b) Selecting Projects.
   c) Overview of DMAIC methodology.
   d) Project Reporting.
4. Incorporating Voice of the Customer
   a) Goal Posts vs. Kano.
   b) Customer Focus and the Leadership Role.
   c) Overview of QFD.
   d) Customer Data.
   e) Big Y's, Little Y's.
5. DEFINE: Project Definition
   a) Tasks.
   b) Work Breakdown Structure.
   c) Pareto Diagrams.
   d) Process Maps.
   e) Matrix Diagrams.
   f) Project Charters.
   g) Reporting.
6. DEFINE: Project Financials
   a) Quality Cost Classifications.
   b) Quantifying Project Benefits.
   c) Calculations.
7. DEFINE: Goals & Metrics
   a) CTC, CTQ, CTS Parameters.
   b) CTx Flow-down Model (Big Y's, Little y's).
   c) Measurement & Feedback.
   d) Calculating Sigma Levels.

8. DEFINE: Project Scheduling
   a) Activity Network Diagram.
   b) PERT Analysis.
   c) GANNT Chart.

9. DEFINE: Change Management / Teams
   a) Problems with Change.
   b) Achieving Buy-In.
   c) Team Formation, Rules & Responsibilities.
      (i) Stages of Team Development.
      (ii) Overcoming Problems.
   d) Consensus Building
      (i) Affinity Diagram.
      (ii) Nominal Group Technique.
      (iii) Prioritization Matrix.

10. MEASURE: Tools
   a) Measure Stage Objectives
   b) Flowcharts.
   c) Process Maps.
   d) SIPOC.
   e) Box-Whisker Plots.
   f) Cause & Effect Diagrams.
   g) Check Sheets.
   h) Interrelationship Digraph.
   i) Stem & Leaf Plots.

11. MEASURE: Establishing Process Baseline
   a) Enumerative vs. Analytic Statistics.
   b) Process Variation.
      (i) Deming's Red Bead.
   c) Benefits of Control Charts.
   d) Requirements vs. Control.
      (i) Tampering.
   e) Control Chart Interpretation.
      (i) Relative to Process Baseline Estimates.

12. MEASURE: X-Bar Charts
   a) Uses.
   b) Construction & Calculations.
   c) Assumptions.
   d) Rational Subgroups.
   e) Sampling Considerations.
   f) Interpretation.
      (i) Run Test Rules.

13. MEASURE: Individuals Data
   a) Uses.
   b) Construction & Calculations.

- c) Assumptions.
- d) Sampling Considerations.
- e) Interpretation.
- f) Overview of Other Individuals Charts.
  - (i) Run Charts.
  - (ii) Moving Average Charts.
  - (iii) EWMA Charts.

14. MEASURE: Process Capability
    - a) Histograms.
    - b) Probability Plots.
    - c) Goodness of Fit Tests.
    - d) Capability & Performance Indices.
      - (i) Relative to Process Control.
      - (ii) Interpretation.
      - (iii) Estimating Error.

15. MEASURE: Attribute Charts
    - a) Uses.
    - b) Selection.
    - c) Construction & Calculations.
    - d) Sampling Considerations.

16. MEASURE: Short Run SPC
    - a) Uses.
    - b) Calculations.
      - (i) Nominals chart.
      - (ii) Stabilized Chart.

17. MEASURE: Measurement Systems Analysis
    - a) Stability Studies.
    - b) Linearity Analysis.
    - c) R&R Analysis.
      - (i) Range Method Calculations.
      - (ii) Interpretation.
      - (iii) Using Control Charts.
      - (iv) Destructive Tests.
      - (v) ANOVA Method.

18. ANALYZE: Lean Thinking
    - a) Definition of Waste.
    - b) Analyzing Process for NVA.
      - (i) Cycle Efficiencies
      - (ii) Lead Time and Velocity
    - c) Methods to Increase Velocity.
      - (i) Standardization
      - (ii) Optimization
      - (iii) Spaghetti Diagrams
      - (iv) 5S

(v) Level Loading.
(vi) Flow
(vii) Setup Reductions

19. ANALYZE: Sources of Variation
    a) Multi-vari Plots
    b) Confidence Intervals on Mean
    c) Confidence Intervals on Percent
    d) Hypothesis Test on Mean
    e) Hypothesis Test on Mean of Two Samples
    f) Power & Sample Size.
    g) Contingency tables.
    h) Non-parametric Tests.

20. ANALYZE: Regression Analysis
    a) Scatter Diagrams.
    b) Linear Model.
    c) Interpreting the ANOVA Table.
    d) Confidence & Prediction Limits.
    e) Residuals Analysis.
    f) Overview of Multiple Regression Tools
        (i) DOE vs. Traditional Experiments & Data Mining

21. ANALYZE: Multiple Regression
    a) Multivariate Models.
    b) Interaction Plots.
    c) Interpreting ANOVA Tables.
    d) Model Considerations.
    e) Stepwise Regression.
    f) Residuals Analysis.

22. ANALYZE: DOE Introduction
    a) Terminology
    b) DOE vs. Traditional Experiments
    c) DOE vs. Historical Data
    d) Design Planning.
    e) Design Specification.
        (i) Selecting Responses.
        (ii) Selecting Factors and Levels.
    f) Complete Factorials.
    g) Fractional Factorials.
        (i) Aliasing.
        (ii) Screening Designs.

23. ANALYZE: DOE Analysis Fundamentals
    a) Estimating Effects and Coefficients.
    b) Significance Plots.
    c) Estimating Error.
    d) Extending Designs.

e) Power of Design.
f) Lack of Fit.
g) Tests for Surface Curvature.

24. ANALYZE: Design Selection
    a) Desirable Designs.
    b) Performance.
        (i) Balance.
        (ii) Orthogonality.
        (iii) Resolution.
    c) Other Design Models.
        (i) Saturated Designs.
        (ii) Plackett Burman Designs.
        (iii) Johns 3/4 Designs.
        (iv) Central Composite Designs.
        (v) Box Behnken Designs.
        (vi) Taguchi Designs (mention).

25. ANALYZE: Transforms
    a) Need for Transformations.
    b) Non-Constant Variance.
    c) Box-Cox Transforms.
    d) Calculated Parameters.
    e) Taguchi Signal to Noise Ratios.

26. IMPROVE: Tools
    a) Improve Stage Objectives.
    b) Tools to Prioritize Improvement Opportunities.
    c) Tools to Define New Process Flow.
        (i) Lean Tools to reduce NVA and Achieve Flow.
    d) Tools to Define & Mitigate Failure Modes.
        (i) PDPC.
        (ii) FMECA.
        (iii) Preventing Failures.
    e) Reference to Tools for Defining New Process Levels.

27. IMPROVE: Response Surface Analysis
    a) Objectives.
    b) Applications.
    c) Sequential Technique.
    d) Steepest Ascent.

28. IMPROVE: Ridge Analysis
    a) Graphical Method.
    b) Analytical Method.
    c) Overlaid Contours.
    d) Desirability Function.

29. IMPROVE: Simulations
    a) Applications.
    b) Examples.
    c) Applying Probabilistic Estimates.
30. IMPROVE: Evolutionary Operation
    a) Methodology.
    b) Example.
    c) Risks & Advantages.
31. CONTROL: Tools
    a) Control Stage Objectives.
    b) Control Plans.
    c) Training.
    d) Measuring Improvement.
32. CONTROL: Serial Correlation
    a) Applications.
    b) Estimating Autocorrelation.
    c) Interpreting Autocorrelation.
    d) Batch Control Charts.
33. Design for Six Sigma Overview
    a) Methodology.
    b) Tools for DFSS.
    c) System, Parameter and Tolerance Designs.