Six Sigma Quality: Concepts & Cases - Volume II
Statistical Tools in Six Sigma DMAIC Process with MINITAB®
Applications

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The second volume of this series focuses on the ***ANALYZE***, ***IMPROVE***, and ***CONTROL*** phases of Six Sigma. This volume contains numerous examples, cases, and hands-on exercises. The book uses MINITAB statistical software that allows one to master the Six Sigma concepts. The text provides step-wise computer instructions to learn and apply the Six Sigma tools in real world. To see the Table of Contents and the details of the topics click below.

This volume has been tested in Six Sigma training courses, undergraduate and graduate courses in Quality Management, Quality Engineering, MBA and Executive MBA courses. The content for the training courses are consistent with ASQ (American Society for Quality) and other agencies and universities offering Six Sigma education, training, and certification in the U.S.

Six Sigma Quality Volume II- Highlights

Each chapter contains:

- **Concepts,**
- **Examples,**
- **Computer applications with step-wise instructions,**
- **Cases and projects, and**
- **Hands-on exercises with solutions.**

In Volume II:

- Learn simple to most advanced Six Sigma and Lean Six Sigma tools
- Understand the concepts using numerous examples and computer simulations
- Learn the applications of major concepts and topics using a computer software, such as, MINITAB
- Perform simulations to understand and apply statistics and data analysis concepts
- Learn data analysis and modeling using MINITAB one of the most widely used software used by industries using or planning to use Lean Six Sigma, Design for Six Sigma (DFSS), Data analysis, and Quality tools,
- Learn the statistical tools used in Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control tools)
- Learn the Lean Sigma tools

Learn the following Six Sigma topics with MINITAB computer applications

- Descriptive and Inferential Statistics tools
- Graphical and Visual tools using MINITAB
- Numerical methods and analysis using MINITAB
- Concepts and importance of Probability Theory in Six Sigma
- Discrete Probability Distributions with computer applications and simulations
- Continuous Probability Distributions with computer applications and simulations
- Sampling and Sampling Distributions
- Inference Procedures and Hypothesis Testing
- Simple Regression and Correlation
- Multiple Regression
- Modeling and Nonlinear regression
- Analysis of Variance (ANOVA)
- Chi-Square Applications
- Design of Experiments (DOE)
- Statistical Process Control (SPC)
- Computerized Applications of Control Charts
- Non-parametric Tests

Learn how to perform and analyze the following using MINITAB computer software

- Regression (simple to more advanced)
- Modeling including multiple, non-linear, logistics, all subsets, and step-wise regression using MINITAB. Also, learn how to interpret the computer results
- Analysis of Variance (ANOVA) using computer
- Design of Experiment and how to run and analyze simple to most advanced designs such as one-to-four factor designs, full and fractional factorial designs, 2^k, 3^k, designs with regression models
- Run and interpret simple to advanced designs with step-wise MINITAB instructions
- Control charts concepts and the computerized applications of control charts using MINITAB
- Statistical process control(SPC) concepts and applications
- Lean Six Sigma tools

Six Sigma Quality: Volume II – Major Topics

Six Sigma Analysis Tools with Computer Applications

Presentation and Organization of Data

Descriptive Statistics: Graphical and Numerical Methods

Probability Concepts

Discrete Probability Distributions (with computer applications and simulations)

- Frequency Distribution and Probability Distributions
- Expected Value, Variance, and Standard Deviation of a Discrete Distribution
- Binomial Distribution and Applications
- Approximating Binaomial Distribution with Normal Distributions
- Poisson Distribution
- Poisson Approximation
- Hypergeometric Distribution
- Geometric Distribution
- Negative Binomial or Pascal Distribution
- Multinomial Distributions
- Discrete Uniform Distribution

Continuous Probability Distributions (with computer applications and simulations)

- Normal Distribution
- Important Properties of Normal Distribution
- Distributions Related to Normal Distribution: t-distribution, F-distribution, Chi-Square Distribution
- Computer Applications: Checking Distributions using Probability Plots
- Fitting Distributions to Data using MINITAB
- Exponential Distribution and Applications
- Simulating Data from Exponential Distribution
- Uniform Distribution and Random Samples
- The Lognormal distribution
- The Weibull Distribution
- Gamma Distribution
- Beta Distribution
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Sampling and Sampling Distribution

- Sampling Techniques
- Random Sampling using MINITAB
- Sampling Distribution
- Central Limited Theorem
- Sampling Distribution of the Sample Proportion
- Sampling from Normal and Non normal Distributions

Computer Simulations: Sampling Applications

Inference Procedure: Parameter Estimation

- Point Estimate: Properties of Estimators
- Confidence Interval Estimation
- Confidence Interval for a Single Mean and Proportion
- Confidence Interval for the Difference between Two Means and Two Proportions
- Confidence Interval for the Variance and Ratio of Two Variances
- Sample Size Determination
- Computer Applications

Inference Procedure: Hypothesis Testing

- Statistical Hypothesis: Concepts
- Type I and Type II Errors
- One-sided and Two-sided Hypothesis Tests
- Test of Hypothesis on the Mean, Variance Known
- Choice of Sample Size
- Relationship to Confidence Interval
- Test of Hypothesis for the Equality of Two Means: Equal and Unequal Variance
- Sample Size Determination
- The Paired t-test
- Test of Hypothesis on One Variance, Two Variances
- Test of Hypothesis on One and Two Proportions

Chi-Square Goodness-of-fit Tests

Nonparametric Tests

Regression and Correlation Analysis and Model Building

Analysis of Variance (ANOVA): Fixed and Random Effect Model

Six Sigma Improvement Tools with Computer Applications

Design of Experiment (DOE) Techniques

- Experimentation
- One-factor Design
- Analysis of Variance (ANOVA)
- Two-factor/Three-factor and Four-factor Designs
- Mult-vari Charts
- Randomized Block Design
- Latin Square Design
- Factorial Designs
- 2k Design
- Two-level Fractional Factorial Designs

- Three-level Fractional factorial Design
- Blocking and Confounding
- Resolution III, IV Designs
- Response Surface Methodology
- Central Composite Designs
- Plakett Burman Design
- Taguchi Method/Process Optimization
- Computer Applications of above designs

Other Improvement Techniques

- JIT and Kaizen (Continuous Improvement)
- Cycle Time Reduction/ Agility
- Process Reengineering
- Process Maps/ High Level Process Maps
- Value Stream Mapping
- Kaizen Blitz/ Poka-yoke
- Lean Principles

Six Sigma Control Tools with Computer Applications

Quality Concepts

- Quality Costs/Quality and Productivity
- Statistical Methods in Quality Improvement
- Describing Variation/Inference about process quality
- Modeling Process Quality
- Quality Audits/Inspection and Planning

Statistical Process Control

- Chance and Assignable Causes of Variation
- Control Chart Theory
- Statistical Basis of Control Chart
- Why and How Control Charts Work
- Types of Control Charts
- Control Limits/Sample Size and Frequency
- Rational Subgroup
- Analysis of Patterns in Control Charts
- Manufacturing and Non-manufacturing Applications of Control Charts
- Computer Applications
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Variables Control Charts

- Control Charts for x-bar and R
- Control Chart for S^2
- Control Chart for S
- Individual Charts
- Median Charts
- Applications and Guidelines for Implementing Control Charts

- Computer Applications
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Other Variables Control Charts

- CUSUM Chart
- EWMA Chart
- Control Charts for Short-run Production
- Selection of Control Charts
- Computer Applications

Attribute Control Charts

- The p-chart
- np-Chart
- c-chart
- u-chart/ The OC Curve and applications

Lean Six Sigma Tools with Computer Applications