Program Details

Diagnostic Practices Description

The Diagnostic Practices program will endow the participant with the knowledge and insights necessary to judiciously plan and successfully execute a diagnostic study. Participants will learn how to fully characterize the statistical performance of a process and identify the dominant families of variation. In many instances, the simple application of a few diagnostic tools can often preclude the need for exhaustive experimentation. Of course, such an action has the potential to shorten the total time it takes to execute an improvement project.

Students will discover a selected array of powerful analytical and statistical tools that are essential for isolating critical sources of variation related to process centering and spread. Major emphasis is given to the methods and techniques for statistically analyzing, describing, and displaying performance data – for virtually all types of products, processes, services and transactions. In particular, the participant will learn how to select the right variables and parameters for inclusion in a factorial experiment. Participants will learn how to establish operating tolerances for almost any type of product, process or service. Of special interest, the participant will learn the theory and application of common sampling methods as well as how to draw valid conclusions and make statistical inferences from a sampling distribution. In support of this, the participant will also learn how to draw such conclusions with known degrees of statistical risk and confidence.

Of course, the critical tools and concepts associated with statistical hypothesis testing is thoroughly discussed and then related to the use of diagnostic tools, design-of-experiments, and statistical process control methods. Related to this instructional goal, the participant will also be taught how to construct statistical hypotheses and then how to test those hypotheses using well established methods, such as the common t-test, analysis-of-variance, and regression, just to mention a few. However, when the assumptions underlying the use of parametric tools can not be reasonably satisfied, the practitioner sometimes finds it necessary to employ nonparametric methods, or so called “distribution free” methods. To this end, the participant will learn how to employ such tools as the median test (and sign test) to evaluate a relatively diverse range of statistical hypotheses.

The knowledge gained from this curriculum is paramount to the effective use of performance metrics and indices of process capability. Reinforcement of the major techniques and applications is realized through exercises, scenarios, and case studies. Total instructional time for this program is approximately 60 hours.

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Diagnostic Practices Outline

Run Time (h:mm:ss)

Global Concepts — 11:07:36

Training Orientation — 1:29:43

Excel Orientation	*Explore the Excel software package*	0:29:01
Minitab Orientation	*Explore the Minitab software package*	0:31:42
Simulator Orientation	*Explore the Process Simulator*	0:29:00

Breakthrough Vision — 1:31:26

Deterministic Reasoning	*Describe a basic cause-and-effect relationship in terms of Y=f(X)*	0:52:57
Leverage Principle	*Relate the principle of leverage to an improvement project*	0:38:29

Process Management — 8:06:27

Performance Yield	*Explain why final yield is often higher than first-time yield*	1:14:06
Hidden Processes	*Describe the non-value added component of a process*	0:40:57
Measurement Power	*Describe the role of measurement in an improvement initiative*	0:33:38
Establishing Baselines	*Explain why performance baselines are essential to realizing improvement*	0:45:52
Defect Opportunity	*Understand the nature of a defect opportunity and its role in metrics reporting*	1:01:18
Process Models	*Define the key features of a Six Sigma performance model*	1:11:11
Process Capability	*Identify the primary indices of process capability*	1:21:53
Design Complexity	*Describe the impact of complexity on product and service quality*	1:17:32

General Practices — 22:18:51

Quality Tools — 13:13:18

Variable Classifications	*Define the various types of variables commonly encountered during quality improvement*	0:08:32
Measurement Scales	*Describe each of the four primary scales of measure and their relative power*	0:50:01
Problem Definition	*Characterize the nature of a sound problem statement*	0:35:25
Focused Brainstorming	*Explain how focused brainstorming is used to facilitate improvement efforts*	0:11:57
Process Mapping	*Understand how to define the flow of a process and map its operations*	0:24:20
SIPOC Diagram	*Describe the nature and purpose of an SIPOC diagram*	0:08:26
Force-Field Analysis	*Utilize force field analysis to solve problems*	0:14:49
Matrix Analysis	*Understand how matrices are created and used to facilitate problem solving*	0:16:56
C&E Analysis	*Explain how C&E matrices can be used to solve quality problems*	0:06:02
Failure Mode Analysis	*Understand how FMEA is used to realize process and design improvements*	0:11:18
Performance Sampling	*Explain how to design and implement a sampling plan*	0:20:17
Check Sheets	*Understand how check sheets can be used for purposes of data collection*	0:12:59
Analytical Charts	*Identify the general range of analytical charts that can be used to assess performance*	0:20:02
Pareto Charts	*Explain how Pareto charts can be used to isolate improvement leverage*	0:24:25
Run Charts	*Utilize run charts to assess and characterize time-based process data*	0:10:59
Multi-Vari Charts	*Define the major families of variation and how they can be graphed*	0:49:29
Correlation Charts	*Utilize a correlation chart to illustrate the association between two variables*	1:01:24
Frequency Tables	*Explain how to construct and interpret a frequency table*	0:14:42
Performance Histograms	*Construct and interpret a histogram and describe several purposes*	1:14:40
Basic Probability	*Understand basic probability theory and how it relates to process improvement*	0:29:16
Pre-Control Charts	*Describe the fundamental rules that guide the operation of a standard pre-control plan*	0:41:25
Control Charts	*Explain the purpose of statistical process control charts and the logic of their operation*	1:41:11
Score Cards	*Understand the purpose of Six Sigma score cards and how they are deployed*	0:31:24

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Search Patterns	*Explain how the use of designed experiments can facilitate problem solving*	0:32:13
Concept Integration	*Understand how to sequence a given selection of quality tools to better solve problems*	1:02:54
Quality Simulation	*Employ the related quality tools to analyze data generated by the process simulator*	0:18:12

Basic Statistics — 9:05:33

Performance Variables	*Identify and describe the types of variables typically encountered in field work*	0:10:26
Statistical Notation	*Recognize and interpret the conventional forms of statistical notation*	0:44:53
Performance Variation	*Explain the basic nature of variation and how it can adversely impact quality*	0:22:24
Normal Distribution	*Describe the features and properties that are characteristic of a normal distribution*	0:49:36
Distribution Analysis	*Explain how to test the assumption that a set of data is normally distributed*	1:21:06
Location Indices	*Identify, compute, and interpret the mean, median, and mode*	0:42:05
Dispersion Indices	*Identify, compute, and interpret the range, variance, and standard deviation*	1:16:37
Quadratic Deviations	*Understand the nature of a quadratic deviation and its basic purpose*	0:24:47
Variation Coefficient	*Compute and interpret the coefficient of variation*	0:07:17
Deviation Freedom	*Explain the concept of degrees-of-freedom and how it is used in statistical work*	0:29:47
Standard Transform	*Describe how to transform a set of raw data into standard normal deviates*	0:47:51
Standard Z-Probability	*Describe how to convert a standard normal deviate into its corresponding probability*	0:40:58
Central Limit	*Understand that the distribution of sampling averages follows a normal distribution*	0:17:29
Standard Error	*Recognize that the dispersion of sampling averages is described by the standard error*	0:13:32
Student's Distribution	*Understand that the T distribution applies when sampling is less than infinite*	0:06:07
Standard T-Probability	*Describe how to convert a T value into its corresponding probability*	0:15:26
Statistics Simulation	*Employ basic statistics to analyze data generated by the process simulator*	0:15:12

Technical Practices — 25:49:13

Hypothesis Testing — 6:05:49

Statistical Inferences	*Explain the concept of a statistical inference and its primary benefits*	0:23:00
Statistical Questions	*Explain the nature and purpose of a statistical question*	0:20:35
Statistical Problems	*Understand why practical problems must be translated into statistical problems*	0:10:43
Null Hypotheses	*Define the nature and role of null hypotheses when making process improvements*	0:31:29
Alternate Hypotheses	*Define the nature and role of alternate hypotheses when making process improvements*	0:18:03
Statistical Significance	*Explain the concept of statistical significance versus practical significance*	0:56:05
Alpha Risk	*Explain the concept of alpha risk in terms of the alternate hypothesis*	0:24:18
Beta Risk	*Define the meaning of beta risk and how it relates to test sensitivity*	0:38:41
Criterion Differences	*Explain the role of a criterion difference when testing hypotheses*	0:15:49
Decision Scenarios	*Develop a scenario that exemplifies the use of hypothesis testing*	0:17:09
Sample Size	*Define the statistical elements that must be considered when computing sample size*	1:49:57

Confidence Intervals — 2:47:17

Mean Distribution	*Comprehend and characterize the distribution of sampling averages*	0:04:21
Mean Interval	*Compute and interpret the confidence interval of a mean*	0:54:29
Variance Distribution	*Comprehend and characterize the distribution of sampling variances*	0:21:10
Variance Interval	*Compute and interpret the confidence interval of a variance*	0:35:52
Proportion Distribution	*Comprehend and characterize the distribution of sampling proportions*	0:07:22
Proportion Interval	*Compute and interpret the confidence interval of a proportion*	0:27:02
Frequency Interval	*Describe how frequency of defects is related to confidence intervals*	0:17:01

Parametric Methods — 8:19:55

Mean Differences	*Determine if two means are statistically different from each other*	1:37:53
Variance Differences	*Determine if two variances are statistically different from each other*	0:39:34

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Variation Total	*Compute and interpret the total sums-of-squares*	0:16:36
Variation Within	*Compute and interpret the within-group sums-of-squares*	0:10:53
Variation Between	*Compute and interpret the between-group sums-of-squares*	0:11:47
Variation Analysis	*Explain how the analysis of variances can reveal mean differences*	0:32:21
One-Way ANOVA	*Construct and interpret a one-way analysis-of-variance table*	1:16:36
Two-Way ANOVA	*Construct and interpret a two-way analysis-of-variance table*	0:20:05
N-Way ANOVA	*Construct and interpret an N-way analysis-of-variance table*	0:12:49
ANOVA Graphs	*Construct and interpret a main effects plot as well as an interaction plot*	0:37:24
Linear Regression	*Conduct a linear regression and construct an appropriate model*	1:17:34
Multiple Regression	*Conduct a multiple regression and construct an appropriate model*	0:15:59
Residual Analysis	*Compute and analyze the residuals resulting from a simple regression*	0:18:46
Parametric Simulation	*Apply general regression methods to the process simulator*	0:31:38
Chi-Square Methods		**3:18:48**
Statistical Definition	*Describe how to translate a practical problem into a statistical problem*	0:31:53
Model Fitting	*Explain what is meant by the term "Model Fitting" and discuss its practical role in Six Sigma work*	0:58:32
Testing Independence	*Explain how a test of independence can be related to the idea of correlation*	1:01:00
Contingency Coefficients	*Understand how a contingency coefficient relates to a cross-tabulation table*	0:12:53
Yates Correction	*Describe the role of Yates correction in terms of the chi-square statistic*	0:07:17
Testing Proportions	*Test the significance of two proportions using the Chi-square statistic*	0:27:13
Survey Methods		**2:41:53**
Research Design	*Explain how the idea of research design fit with the idea of problem Solving*	0:12:54
Information Sources	*Explain how the idea of research design fit with the idea of problem Solving*	0:09:34
Questionnaire Construction	*Describe the role of survey demographics when analyzing closed-form survey data*	0:19:24
Formulating Questions	*Identify several things that should be avoided when developing survey questions*	0:15:22
Question Quality	*Explain what is meant by the term "question quality" and how this idea relates to data analysis*	0:07:06
Sampling Plans	*Describe several different types of sampling plans commonly used in survey research*	0:07:14
Data Analysis	*Explain how categorical survey data can be analyzed to establish strength of association*	1:30:19
Nonparametric Methods		**1:19:47**
Nonparametric Concepts	*Explain the difference between parametric and nonparametric methods*	0:06:59
Median Test	*Execute a median test on two groups and then determine if the difference is statistically significant*	0:48:55
Runs Test	*Conduct a runs test to determine if a time series pattern is random*	0:08:07
Other Tests	*Identify two nonparametric methods other than a median or runs test*	0:15:46
Measurement Analysis		**1:15:44**
Measurement Uncertainty	*Understand the concept of measurement uncertainty*	0:15:43
Measurement Components	*Describe the components of measurement error and their consequential impact*	0:15:42
Measurement Studies	*Explain how a measurement systems analysis is designed and conducted*	0:44:19
	Total Video Run Time	**59:15:40**

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