

Solving Technology
Problems Through
Applied Statistics



CONSULTING AND TRAINING IN APPLIED STATISTICS

COMMENTS FROM PREVIOUS CLIENTS

On Consulting

"Practical approaches that work."

"Quick grasp of problems and rapid focus on solutions."

"Analysis and modeling saved our bacon in six crisis situations."

On Training

"Outstanding instructor, very knowledgeable, effective speaking style."

"Very practical and useful information for engineering applications."

"Excellent examples of real life data presented in an easy to understand manner."

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Consulting and Training

Quality, Reliability (Component, Equipment, and Software), Design of Experiments, Statistical Process Control, Forecasting, Data Analysis, Modeling, Statistical Software (SAS, JMP, EXCEL, RS/I), ISO 9000, Total Quality Management

CONSULTING SERVICES

Practical and Rapid Solutions for Technical Industries

We provide consulting in the following areas: data analysis, design of experiments (DOE), product characterization, manufacturing capability, process control (SPC), quality measures (TQM), component and equipment reliability modeling and prediction, yield improvement, forecasting, graphical methods, statistical software tools, statistical techniques for ISO 9000, and sampling.

Example of Successful Consulting Projects

- Reliability comparison of pump versus valve system for chemical handling in integrated circuit (IC) manufacturing
- Design of experiment for IC yield improvement
- X-ray photolithography modeling
- Forecasting of booking and billings data
- Interpretation of human resource employee survey data
- Reliability analysis of bake recoverable failures
- Electromigration modeling and field reliability
- SPC for batch processes
- Analysis of compensation and bonus matrix
- Maintenance procedures for semiconductor processing equipment
- ISO 9000 requirements for statistical techniques
- Design of experiment for lifetime evaluation of surgical device.

List of Previous Clients for Consulting and Training

Companies

- IBM
- Advanced Micro Devices (AMD)
- National Semiconductor
- General Instrument
- Silicon Graphics
- Western Digital
- Storage Technology
- Force Computers
- Next Computers
- INSYNC Systems
- General Surgical Innovations

Universities

- Santa Clara University
- University of Vermont
- San Jose State University

Organizations

- Council for Continuous Improvement
- Ming Quong Foundation

TRAINING SERVICES

Institute of Applied Statistics (On Site Training)

Applied Reliability

Applied Reliability I

For Engineers and Technicians

16 hours: Two Days or Four Half Days

Integrated Circuit (IC) Component Reliability. Based on the text *Applied Reliability*, second edition, by Tobias and Trindade. Practical statistical techniques for planning reliability studies and analyzing data. Fundamentals of descriptive statistics. Reliability terminology. Censored data. Calculations under various lifetime distributions (exponential, Weibull, and lognormal). Graphical analysis. Accelerated testing and modeling. System models (parallel, serial, active and standby redundancy). Projection to usage conditions. Features in Microsoft EXCEL useful for solving reliability problems. Many examples from the semiconductor industry.

Applied Reliability II

For Engineers and Technicians

4 hours: One Half Day

Quality Control in Reliability. Continuation of Applied Reliability I. Calculations under the discrete distributions: binomial, Poisson, and hypergeometric. Confidence limits for low PPM. Acceptance sampling plans. Operating characteristic curves. Acceptable quality level (AQL). Average outgoing quality (AOQ). Average outgoing quality limit (AOQL). Lot tolerance percent defective (LTPD). Statistical process control (SPC) for reliability. Cumulative count control (CCC) charts for low PPM processes.

Special statistical courses can be created that are tailored to the needs of the customer.

Applied Reliability III

For Engineers and Technicians

4 hours: One Half Day

Systems and Equipment Reliability. Continuation of Applied Reliability I and II. Repairable system reliability. Repairable versus non-repairable systems. Renewal processes. Graphical analysis. Superposition. Spare parts provisions. Poisson process. MTBF demonstration. Confidence limits. Testing for trends. Reverse arrangement test. Composite test. Non-homogeneous Poisson processes (NHPP) and models. Software reliability. Simulation. Reliability growth.

Reliability Overview

Design of Experiments

Design of Experiments I

For Engineers and Technicians

16 hours: Two Days or Four Half Days

Factorial Designs. Based on the text *Statistics for Experimenters* by Box, Hunter, and Hunter. Practical statistical techniques for planning and running statistically designed experiments. Comparing two treatments. Blocking and randomization. Comparing many treatments. Interactions. Factorial designs. Graphical methods for analysis. Features in Microsoft EXCEL and SAS JMP useful for constructing and analyzing designed experiments. Many application examples from the semiconductor industry.

Design of Experiments II

For Engineers and Technicians

16 hours: Two Days or Four Half Days

Fractional Factorial Designs, Response Surface Methods, and Taguchi. Continuation of Design of Experiments I. Factorial

For Managers and Engineers

4 hours: One Half Day

Reliability for Managers. Reliability terminology and concepts presented in a practical and easy to understand manner. What's a FIT? What's an acceleration factor? What are defect mechanisms versus competing risks? What's the relationship between mean time to failure and failure rate? Why are defective subpopulations important for predicting field reliability from accelerated testing? Models for reporting reliability results to customers. Many examples from product design, development, manufacturing, assembly, and test.

and fractional factorial designs. Resolution. Fold-over designs. Residual analysis. Modeling. Linear and non-linear regression. Response surface methods. Components of variance. Nested and split plot designs. Taguchi's contributions. Time series and serial correlation. Statistical software (EXCEL and JMP) for DOE.

Design of Experiments Overview

For Managers and Engineers

4 hours: One Half Day

DOE for Managers. Practical overview. How design of experiments (DOE) can help achieve and maintain a competitive advantage. Clear explanations using many simple graphs. Benefits of using DOE in solving problems and improving processes. How to improve a product's quality and cost characteristics. Manager's role. Which questions managers should ask when the technical staff is designing experiments. How to represent and interpret experimental results. Choosing among different courses of action.

Statistics Using EXCEL

Forecasting Using EXCEL

For Administrators and Engineers

4 hours: One Half Day

Forecasting with Microsoft EXCEL. Applications in marketing, sales, engineering, manufacturing, and administration. Concepts of statistical forecasting in a straight forward, user-friendly, and intuitive manner. How to apply the analytical features of EXCEL in making forecasts. Simple—yet highly effective—techniques for prediction. Classical time series. Moving averages (seasonal variation and cyclical effects). Linear regression (trend analysis). Serial correlation. Exploration of stationary and non-stationary processes. Decomposition and superposition. Checking models for fit. Graphical techniques. Practical algorithms for estimating future (e.g., end of quarter) results based on current (e.g., weekly) data.

Data Presentation and Analysis Using EXCEL

For Administrators and Engineers

4 hours: One Half Day

Statistical Analysis in EXCEL. Important ideas of graphical excellence. New and powerful ways to portray complex data. Useful tools in EXCEL for presenting and analyzing data. Subject matter communicated in a non-technical, user-friendly manner, involving active student participation. Simple and effective techniques to visualize, analyze, and improve operational processes: graphical presentation of data, descriptive statistics, histograms, correlation, and regression. Examples from manufacturing, engineering, and administration.



Statistical Process Control (SPC)

Overview of SPC

For All Employees

4 hours: One Half Day

Statistical Process Control and Problem Solving Tools.

Concepts of SPC. Common and special cause variation. The seven QC tools. Quality philosophies of Deming, Juran, and Crosby. Control charts and process capability. Benefits of team approaches.

Introduction to SPC

For Engineers and Technicians

16 hours: Two Days or Four Half Days

Introduction to Statistical Process Control. The fundamentals of SPC. Causes of Variation. Control charts. Control limits versus specification limits. Types of control charts. Capability studies. Metrology. Components of variance. Graphical analysis. Process troubleshooting. Choosing sample sizes. Acceptance sampling. Software (EXCEL and JMP) for SPC.

Total Quality Management (TQM)

Overview of TQM

For All Employees

4 hours: One Half Day

Philosophy and Foundations of TQM. Historical perspective. Quality gurus. The shortcomings of inspection. Variation. In class

exercises. The seven QC tools. Malcolm Baldrige Quality Award. ISO 9000. Ten commandments of continuous improvement.

Background

Dr. Dave Trindade has extensive experience as a consultant, quality improvement leader, and trainer. His fields of expertise include: reliability modeling and engineering, applied statistics (especially DOE, SPC, process capability, forecasting, and PC software for data analysis), variance reduction, SPC implementation, management of quality, technical and organizational leadership, and productivity improvement. He has taught statistical topics to over 5,000 individuals in industries worldwide and academia. He is adjunct professor for graduate instruction in the Applied Mathematics Department at Santa Clara

University. He is a pioneer in developing novel and effective training techniques, especially in the utilization of computers for classroom learning. He has written many articles on applied statistics for internal and external publications.

Dr. Trindade is co-author (with Dr. Paul Tobias) of *Applied Reliability*, second edition. He was formerly Director of Reliability, Director of Applied Statistics, and Senior Fellow at AMD. He was honored as Adjunct Lecturer of the Year at Santa Clara University in 1995.

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