

Design For Six Sigma

Oct 20-22, 2010 Parkroyal Hotel, Kuala Lumpur

Course Facilitator

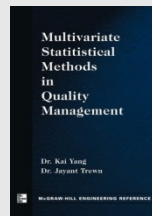
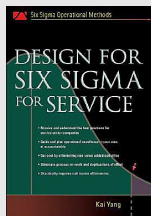
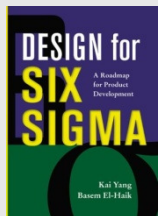


Prof. Yang is a Professor in the department of Industrial and manufacturing Engineering, Wayne State University in Detroit, Michigan. He is a leading expert in the area of quality engineering, reliability engineering, Six Sigma and TRIZ. Prof Yang has been awarded over \$2.5 million dollars of research contracts from such institutions as US National Science Foundation, General Motors Corporation, Ford Motor Company, DaimlerChrysler Corporation and Siemens Corporation. Prof. Yang published more than 70 research papers; most of them are in high quality refereed journals. Prof. Yang has more than 9 years of consulting experience. Prof. Yang has written 4 books, 3 of them have already published, 1 of them are expected to finish in 2007. Prof. Yang's book, "Design for Six Sigma-A Roadmap for Product Development", published by McGraw-Hill, is an Amazon top ranking Design for Six Sigma book, which is also considered as the most authoritative one in DFSS Field. This is the first comprehensive, technical loaded book that links creative design methods, such

as axiomatic design, TRIZ, with other advanced quality methods, such as DOE, Taguchi Method, Design for X, reliability engineering and multi-objective RSM. Prof. Yang's book, "Design for Six Sigma for Service", is the first book that link DFSS into service industry, this book provided a clear roadmap to drastically improve both the value proposition of services and service process. Currently it is one of the most popular books in Six Sigma community.

Prof. Yang received a MS degree in 1985, and a PhD degree in industry engineering in 1990, both of them from the University of Michigan.

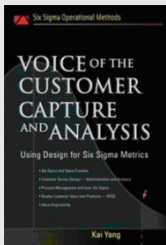
Companies in China who have attended Prof. Yang's course include: Rockwell, Vishay General Semiconductor, TCL, Black & Decker, Midea Microwave and Electrical Appliances, TPO Displays, Bosch Packing Technology, Delta Electronics, TRW Automotive, Emerson Climate Technologies, Lear Engineering, Positec Machinery and many others.



Prof. Yang's areas of expertise in training and consulting

- TRIZ
- Axiomatic Design
- QFD
- FMEA
- Multivariate statistical methods
- Quality management
- Statistical analysis
- Design of Experiments
- Taguchi method
- Response Surface method
- Tolerance design
- Six Sigma
- DFSS deployment
- Lean product development

The Newly Published Book in 2007



Identify key customer needs with Six Sigma

Capturing and analyzing Voice of Customer (VOC) data is one of the hardest tasks faced by many product design teams. Yang gives them the ability to create and deploy surveys, immediately analyze the results, and coordinate and drive responsive actions.

Most design for six sigma product development teams fall short on truly understanding their customers' wants and needs until it is too late. Market research studies and reports are not enough, they need more. In this book, Yang demonstrates how Design for Six Sigma's statistical methods can be deployed to: identify key customer needs and assess the cost of poor quality, design robust product to meet those needs, optimize product life cycles, and accurately validate their findings.

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Prof. Yang Consulting and Training Experience

- **1996-1997:** Provided consulting and training for USCAR Low Emission Paint Consortium, the training includes Taguchi Method, DOE, FMEA, Response Surface method. Prof. Yang designed several key experiments in order to achieve high transfer efficiency, paint film uniformity and good appearance, the experiments achieved good results.
- **1998-2006:** Consulting for DaimlerChrysler Corporation, Prof. Yang consulted many projects, including spray paint process defect reduction, paint film quality control, body and assembly variation reduction, design evaluation methods for engineering hour reduction.
- **2004:** Consulted for DFSS training material development for Abbott laboratories, in Dallas, Texas.
- **2004:** Provided DFSS training for Lugong Inc (A Chinese heavy machinery company)
- **2004:** Provided DFSS training for York International Inc.
- **2005:** Provided DFSS, FMEA training for Delta Electronics.
- **2005:** Provided DOE, Taguchi Method training for Bosch/Siemens home electronics.
- **2005:** Provided TRIZ training for ZTE Inc.
- **2005:** Provided DOE, Taguchi method Training for Shanghai General Motors Corp.
- **2005:** Provided DFSS Champion training for Siemens, in Orlando, FL
- **2005:** Provided DFSS Training, including TRIZ, Axiomatic design, DOE, Taguchi method, response Surface method, tolerance design for Siemens Power Generation.
- **2006:** Provided 6 training sessions for Siemens Power Generation in both Muelheim, Germany and Orlando, FL, including TRIZ, Axiomatic design, DOE, Taguchi method, response Surface method, and tolerance design. Provided help in Siemens DFSS projects, as an overall DFSS initiative, Siemens successfully launched 25 DFSS projects, many of them are closed successfully.
- **2006:** Provided DFSS champion, DOE, RSM and robust design training for Nissan, China.
- **2006-2007:** Consulted for VA Hospital of Detroit, Michigan, two lean six sigma projects, one is to shorten the waiting time for registration department, the other is to improve the emergency care patient flows.
- **2006:** Consulted for Karmanos Cancer Institute in medical research process benchmarking , management and improvement.
- **2006:** Working as main consultant for DaimlerCrysler's project 'Design-based Engineering Hour Per Vehicle' estimation, evaluation and reduction (Summer, 2006), this is a 'design for manufacturing' project that can analyze how to save labor hours in the early design stage, this project has estimated \$1.5 million economic benefit.
- **2006:** TRIZ coaching for Siemens in Orlando FL, solved one major technical problem during the training with students, The division Prof. Yang trained is the only the second division in the whole Siemens that used TRIZ.
- **2006:** DFSS executive training for Emerson Network Power, in Columbus Ohio, The participants includes, President, VPs for quality, marketing, product development, and many senior executives.
- **2007:** TRIZ training in ASQ (American Society of Quality), in Grand Rapids, Michigan.
- **2007:** DOE training for BASF, in Wyandot, Michigan
- **2007:** DFSS and TRIZ training for Emerson Climate Technologies in Suzhou, China.
- **2008:** Providing QFD training for TRW
- **2008:** Providing DOE training for Apple Computer Inc. Shanghai, Shenzhen
- **2009:** Providing DOE training for Apple Computer, Inc., Cupertino, CA
- **2009:** Providing Lean Six Sigma in Healthcare training for John D. Dingell VA Medical Center, Detroit, MI

Prof. Yang Major Research Projects

- **1991-1999,** Automotive body assembly process variation reduction, new vehicle launch variation reduction, automotive dimensional quality data analysis, funded by GM, \$1.1 Million. As a result of this work, Prof. Yang's graduate students helped GM to developed a powerful software called 'Vehicle data animation tool kits', which visualizes the variation pattern and effectively trouble shoots the root causes. Prof. Yang and his team greatly contributed in helping GM to reduce the body assembly process variation by 50%. Recently, DaimlerChrysler Corp contacted Prof. Yang in helping them to develop the similar system.
- **1999-2002,** computer aided quality analysis for paint operation, funded by DaimlerChrysler, \$387,000. This is a software for real time computer animation of paint process based on paint quality measurement data in production process
- **1995-1997,** multistate reliability model and quality loss analysis, funded by US national Science Foundation, \$200,000.
- **1994-2004,** Electronic packaging process quality improvement, wire bonding process optimization, funded by Ford/Visteon, 1996-2004, \$454,000. Implemented a lot of DFSS methods, such as Taguchi method, TRIZ, response surface, reliability allocation and testing.
- **1992-1994,** fuel system hydro-carbon emission reduction, funded by Ford, \$156,000.
- **2005-2008,** Robust Design Tool Kits development, funded by Siemens Corporation. \$400,000. Prof. Yang and his team are helping Siemens to develop special robust design tools in their product development process. Prof. Yang is helping many of Siemens DFSS projects.
- **2009,** VA System Redesign Capability Improvement Grant, Sponsored by US Department of Veteran Affairs, \$1,350,000 CoPI Duration 1/10-12/13
VISN 11 VA Center for Applied System Engineering, Sponsored by US Department of Veteran Affairs, \$5,000,000 CoPI Duration 8/09-10/11
Assistance in Siemens Gas Turbines Integrated Product Development System, Sponsored by Siemens Energy Inc, \$98,000 PI
- **2010,** Computerized Standard Operating Procedures for Reusable Medical Equipments, Sponsored by US Department of Veteran Affairs, \$100,000 CoPI Duration 5/10-9/10 Duration 5/1/09-4/30/10
- **My total Research grant up to date \$4.05 million**

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Research has shown that over 70% of all quality and reliability related problems are design-related. An efficacious and efficient new product/service development process has become a strategic imperative for differentiation of world-class companies with their competitors. Design For Six Sigma (DFSS) is a systematic methodology that uses tools and techniques, strategies, tactics, project management, etc. to optimize the design process during the designing of products, services and processes, in order to achieve superior designs to maximize customer value. It fundamentally aims at ferreting out the flaws of the product or service or process during the design stage - not at the production stage or quality control stage. By attending this Workshop on DFSS, you can learn about how DFSS can be used to improve your business profitability, maximize customer satisfaction, achieve robust performance of the product/service in the early design stage, reduce product/service development cycle time and avoid costly design-build-test cycles.

Companies from all over the world, including AlliedSignal, General Electric, and Lockheed Martin are reporting tremendous savings and benefits from the application of statistical methods and statistically-designed experiments to their critical manufacturing processes. Six sigma and multifactor experimentation, which have received much attention in the popular press, are examples of technologies that are changing the face of business, creating efficiencies, improving product, and decreasing costs.

Design of Experiments (DOE) is also called statistically-designed experiments. The purpose of the experiment and data analysis is to find the cause-and-effect relationship between the output and experimental factors in a process. Design of Experiments provides essential methods and strategies for persons having responsibility for improving current processes or products or charged with developing new processes or products.

The Taguchi method is a combination of engineering design principles and Taguchi's version of design of experiment, which is called orthogonal array experiment. It is a special variant of Design of Experiments (DOE). Taguchi method emphasizes on design robustness, which means that not only a product should perform well, but also should perform well under various environmental and usage variation, as well as manufacturing variation. Taguchi method also emphasizes on improving the fundamental functions of the product, rather than chasing various symptoms. The goal of Taguchi method is to create a robust product design that will perform its fundamental functions with extremely high robustness. Taguchi methods have applied to many branches of industries and achieved impressive results.

Day 1

Introduction to DFSS

- What is Design for Six Sigma
- DFSS roadmap and deployment
- Successful DFSS stories

Concept Generation and Design Techniques

- Brain storming
- Pugh Concept selection

Concept Design Techniques

- Quality Function Deployment
- Axiomatic Design
- Theory of Inventive Problem Solving
 - 40 Inventive Principles
 - Separation Principals

Methodologies:

Lecture Audiovisual, Case Study, Group Assignment, Brain Storm, Classroom exercises, Group Discussion, Software Demonstration.

Day 2

Introduction Design of Experiment Overview

- What Can Be Done by Using DOE
- DOE Project Steps
 - Step 1: Project definition
 - Step 2: Selection of response variable
 - Step 3: Choice of factors, levels, and ranges
 - Step 4: Select an experiment design
 - Step 5: Perform the experiment
 - Step 6: Analyze the data
 - Step 7: Conclusion and recommendations
- What Information We Can Get from DOE Data Analysis

Full Factorial Experiments

- General Factorial Experiments
- Two Level Factorial Experiments

Fractional Factorial Experiments

- 2 Level Fractional Factorial Experiments
- Design Resolution
- 3 Level Full Factorial Experiments
- 3 Level fractional Factorial Experiments

Response Surface Methods (RSM)

- Single Response RSM
- Multiple Response RSM

Methodologies:

Lecture Audiovisual, Case Study, Group Assignment, Brain Storm, Classroom exercises, Group Discussion, Software Demonstration.

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Day 3 Taguchi Method and Tolerance Design

Overview of Taguchi Method

Taguchi's Orthogonal Array Experiment

- Orthogonal Arrays
- Taguchi Experiment Design
- Special Techniques
- Taguchi Experiment Data Analysis

Taguchi Robust Parameter Design

- Loss Function
- System Design, Parameter Design, Tolerance Design
- Signal to Noise Ratio
- Inner-Outer Array Experiment

Tolerance Design

- Introduction
- Worst Case Tolerance
- Statistical Tolerance
- Cost based Optimal Tolerance
- Taguchi Tolerance design

Introduction to Advanced Taguchi Robust Design

- Functions and Design Parameters
- Functional Modeling
- Ideal Function
- Dynamic Signal to Noise Ratio
- Robust Technology Development

Objective:

- ✓ Understand what Taguchi method is and the most common concepts in the Taguchi Method;
- ✓ Develop a new way of thinking about product development;
- ✓ Understand main techniques used in Taguchi Method;
- ✓ Learn how to design Taguchi Experiment and how to analyze data;
- ✓ Master a series of tools and approaches of Taguchi Method;
- ✓ Be able to implement Taguchi Method in the real-world situation after this training.

Hands-on Project (3 hours)

- Group of 3-4
- Involve real application of DOE

Methodologies:

Lecture Audiovisual, Case Study, Group Assignment, Brain Storm, Classroom exercises, Group Discussion, Software Demonstration, hands on project