Design for Six Sigma

"The Key to Top and Bottom Line Growth"

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Product development is the most complex business process. It requires structure and cross-functional activity for success. At Uniworld Consulting we use the CDOV road map to integrate product development activities and DFSS deliverables from idea generation through production. Proper use of the roadmap will minimize cycle time while maximizing the probability of a problem free product introduction. CDOV is a generic product development process to help your organization link DFSS tools and metrics to your unique product development process

Why should your company pursue Design for Six Sigma? You should ask questions such as, "How many chartered product development projects are launched into production? "How many are killed early in the development cycle versus later after expending considerable funds?" "How many are successful in the marketplace?" "What is the cost of poor product development execution to your company?"

Uniworld's DFSS process provides a common language to support the cross-functional development team of marketing, engineering, and manufacturing. The DFSS roadmap contains tools that provide data to manage decision making, resources, and overall risk. When the DFSS tool outcomes are integrated with your product development process and critical customer parameters are tracked via scorecards, you will have a data driven stage gate process that enables you to identify risks and gaps with respect to customer requirements, question assumptions and value, and realign resources accordingly.

Where's the value to you? ... Improved internal rate of return on new product launches… cost reductions due to product design improvements…cost reductions resulting from improved development process efficiency and effectiveness!

Let's talk about the roadmap that will enable your organization to achieve this value.

CONCEPT

Without the proper customer input in the Concept stage, the product may be destined for failure from the very beginning. Each product idea is evaluated for its value to the business via value analysis and a preliminary business plan. We ask three questions about each potential product opportunity: Is the business opportunity real? Can we win with this product? and Is this project worth doing with respect to cost, return, risk, and strategic fit? If the project "passes" the value proposition, then we initiate the concept engineering roadmap:

1. Gathering and translating the VOC into customer requirements
2. Identifying the most important product functional requirements
3. Generating Concepts
4. Selecting the best Concepts
5. Choosing the best Concept under current business conditions

Particular attention is paid to gathering latent and unfulfilled customer requirements during the VOC step. *Latent* and *unfulfilled* requirements often become *delighters* in the eyes of your customer and *add significant value* to the product being developed.

Learning modules include techniques such as Kano Diagrams, SWOT Analysis, Value Chain Analysis, KJ Analysis, and Pugh Concept Selection.

Concept phase tools are taught in the first week of the DFSS program. During this week the student will learn to:

- Support the development of a business plan
- Translate customer language data into measurable functional requirements
- Focus on gathering latent and unfulfilled customer requirements
- Generate and select the best product concept

Best practice is to include both marketing and technical team members in the first week of training.

DESIGN

With measurable functional requirements defined, we provide a data driven process that creates customer focused designs. Identifying and tracking customer critical parameters with scorecards provides the framework for measuring how well the product meets customer needs.

Designs that are done right the first time must consider manufacturing and supplier process capability, and risk while meeting customer critical requirements. Our process begins with these customer critical parameters and uses Design for Manufacturability and Assembly to simplify the design leading to less error opportunity and ultimately lower costs. We use supplier and manufacturing process capability as critical input to the design to maximize the success of the initial design versus requirements.

Statistical tools are introduced for assessment and comparison of concepts and functionality. Other engineering tools such as Finite Element Analysis and Math Modeling are encouraged and Design of Experiments and Regression are used to confirm theoretical results.

To assess and reduce design risk, the roadmap uses Failure Mode and Effects Analysis. A large risk in most development efforts is measurement error which we assess using measurement system analysis techniques.

Learning modules include: Descriptive Statistics, Graphical Tools, Process Mapping, SPC, Measurement Systems Analysis, Design for Manufacturing, Design for Assembly, Design FMEA, Statistical Tolerancing, Modeling with Variation, Hypothesis Testing, Regression, and Design of Experiments.

Design tools are taught in the 2nd and 3rd week of training. During the two weeks the student will learn the process and supporting tools to:

- Convert data into graphs and statistics
- Evaluate measurement systems
- Measure variability with SPC and Capability
- Design for Manufacturing and Assembly
- Design with statistics to obtain long term tolerances
- Identify and reduce risk using Design FMEA
- Evaluate data against specifications and other products
- Create models using Designed Experiments and Regression
- Add variation to Math and Regression Models and project long term capability

OPTIMIZE

Having created a design we often have to optimize one or more responses to achieve our goals. Responses include performance, variation, robustness, and multiple responses simultaneously.

The objective of the optimize phase is to achieve the best performance with low variation in all conditions. This means that the product or process has to be optimized to perform over the entire range of long-term variation in materials, parts, processes, and environmental conditions. Of course all of this has to be done before releasing the product for production.

Learning modules include: Design of Experiments, Multiple Regression, Response Surface Methods, Multiple Response Optimization, Classical Design of Experiments Optimization, Taguchi Optimization, Simulation Models and HALT Reliability Techniques

Optimize tools are taught during weeks 3, 4, and 5. Five-week sessions are necessary when all of the tools are included. Many of the tools are used in more than one phase. By the end of the 4th or 5th week the student will learn the process and supporting tools to:

- Optimize single responses for a maximum, a minimum or on target performance.
- Optimize multiple responses simultaneously
- Optimize performance in the presence of noise (variation)
- Maximize performance in the presence of environmental conditions using HALT Reliability Techniques

VERIFY

We verify performance through a combination of capability and reliability tests. In addition, it is necessary to transfer all of the critical requirements into manufacturing and supplier specifications.

The objectives of the verify phase are to insure that the product or process truly meets its requirements and that specifications and control plans reflect all of the critical requirements needed.

Learning modules include: Multi-vari studies; Reliability, Capability Analysis, Hypothesis Testing, Design Verification, Control Plans, SPC, Mistake Proofing, and Product Specifications.

Verify tools are taught during weeks 2, 3, 4, and 5. Some of the tools are used in multiple phases. By the end of the 4th or 5th week the student will learn the process and supporting tools to:

- Test, analyze and statistically validate performance
- Set up and analyze reliability testing
- Set up control plans, mistake proofing, and SPC
- Specify critical parameters

CONCLUSIONS:

Product Development has a huge impact on your revenue stream, manufacturing costs, overhead and depreciation expenses, and … Considering the impact of product development on your business results, it is imperative that many companies improve the Product Development Process to achieve “top line” growth, product cost reduction, warranty expense reduction, and better technical resource efficiency and effectiveness. Design for Six Sigma is a proven roadmap that WILL help you get there !

Please contact us at 1-757-877-2611 or on the web at www.uniworld.biz.

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