Title:
Design For Six Sigma

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Summary:
Design for Six Sigma (DFSS) is the application of Six Sigma principles to the design of products and their manufacturing and support processes. Whereas Six Sigma by definition focuses on the production phase of a product, DFSS focuses on research, design, and development phases. DFSS combines many of the tools that are used to improve existing products or services and integrates the voice of the customer and simulation methods to predict new process and product performance.
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Article Body:
Design for Six Sigma (DFSS) is the application of Six Sigma principles to the design of products and their manufacturing and support processes. Whereas Six Sigma by definition focuses on the production phase of a product, DFSS focuses on research, design, and development phases. DFSS combines many of the tools that are used to improve existing products or services and integrates the voice of the customer and simulation methods to predict new process and product performance.

DFSS can be compared to DMAIC (Design, Measure, Analyze, Improve, Control) and often the acronym DMADV (Define, Measure, Analyze, Design, Verify) is used to describe the strategy of DFSS. The precise phases or steps of a DFSS methodology are not universally defined. Most organizations will implement DFSS to suit their business, industry, and culture. DFSS methodology, instead of the DMAIC methodology, should be used when:

* A product or process is not in existence at your company and one needs to be developed
* The existing product or process exists and has been optimized (using either DMAIC or not) and still doesn't meet the level of customer specification or six sigma level

DFSS is a way to implement the Six Sigma methodology as early in the product or service life cycle as possible. It is a strategy toward extraordinary ROI by designing to meet customer needs and process capability. DFSS can produce the same order of magnitude in financial benefits as DMAIC. But it also greatly helps an organization innovate, exceed customer expectations, and become a market leader.

DFSS is the Six Sigma approach to product design—namely, designing products that are resistant to variation in the manufacturing process. Using DFSS means designing quality into the product from the start. You are preventing wasteful variation before it happens, thus being able to identify and correct problems early when the solution costs are less. A successful DFSS implementation requires the same ingredients as any other Six Sigma project: a significant commitment and leadership from the top, planning that identifies and establishes measurable program goals and timeline, and the training and involvement of everyone.

Planning for DFSS requires collecting the necessary information that will allow for error free production of defect-free products and processes that satisfy the customer profitably. DFSS attempts to predict how the designs under consideration will behave and to correct for variation prior to it occurring. That means understanding the real needs of your customers and translating those needs into vital technical characteristics of the product and ultimately into critical to quality (CTQ) characteristics of the product and process. You can then use design of experiments (DOE) to develop a robust design that optimizes efficiency and reduces defects.

Valid and reliable metrics to monitor the progress of the project are established early in the project, during the Measure phase if using DMADV. Key inputs are prioritized to establish a short list to study in more detail. With a prioritized list of inputs in hand, the DFSS team will determine the potential ways the process could go wrong and take preemptive action to mitigate or prevent those failures. Through analysis, the DFSS team can determine the causes of the problem that needs improvement and how to eliminate the gap between existing performance and the desired level of performance. This involves discovering why defects are generated by identifying the key variables that are most likely to create process variation. Failure Mode and Effect Analysis (FMEA) and Anticipatory Failure Determination (AFD) can be used for both the design of the product and the design of the process.

DFSS provides a structured way to constructively use the information learned from these analyses. Armed with real data produced by the DFSS process, you can develop competent manufacturing processes and choose processes that are capable

of meeting the design requirements. Further analysis can verify and validate that the product design will meet the quality targets. This can be accomplished through peer reviews, design reviews, simulation and analysis, qualification testing, or production validation testing.

The benefits of DFSS are more difficult to quantify and are more long-term. It can take over six months after the launch of the new product before you will begin to see the true measure of the project improvements. However, the eventual return on investment can be profound. This is especially true when the organization can use the DFSS project as a template for fundamental changes in the way it develops new products and processes across the organization.