Deploying the 'D' in DFSS

by **Douglas P. Mader**

As Six Sigma initiatives at many organizations have matured, the switch from reactive improvement—based on the define, measure, analyze, improve and control (DMAIC) methodology—to proactive improvement—based on design for Six Sigma (DFSS)—has become pervasive.

As a lead facilitator for deployment of DFSS systems at several companies, I've noticed a few characteristics of successful deployments. These organizational opportunities fall into three categories: strategies, tactics and tools. I'll highlight each of these categories of DFSS deployment and provide recommendations to bolster an existing deployment as well as help plan a new launch.

Strategies To Consider

For successful deployment of a DMAIC based Six Sigma program, many organizations have learned the overall objective of the program must be defined first and foremost. Some organizations have chosen to make Six Sigma pervasive and part of their culture. Others have chosen to exploit the gains possible with Six Sigma and use a stealth approach—perhaps rebranding Six Sigma terminology and methods to mask any link to the General Electric model. Still, other organizations have allowed Six Sigma to start as a grass-roots program in which middle management shepherds the program to success or failure.

A Six Sigma program sometimes can be misunderstood when it fails to yield immediate gains similar to ones larger companies have enjoyed after making Six Sigma pervasive in their organizations. In this scenario, the leadership has failed to recognize the difference between how the larger companies deployed Six Sigma in terms of resources, objective setting and commitment by middle management.

In DFSS deployments, a similar problem unfortunately seems to present itself quite often. Some organizations deploy DFSS simply because it is a natural evolution of DMAIC based Six Sigma. Others add DFSS as a training option under the Six Sigma program. Relatively few organizations actually have made the commitment in product and process design functions to fundamentally change the way the design process is executed.

One of the keys to a successful deployment of DMAIC based Six Sigma is to ensure the deployment

Thoughtful planning, strategy and tools help launch a successful program.

plan is linked fundamentally to the strategic plan via the policy deployment system. The strategic planning process involves several key steps:

- Arrange to create the plan.
- Conduct stakeholder analysis.
- Formulate the mission of the organization based on stakeholder feedback.
- Create a viable business model for the planning horizon.
- Audit the current performance of the organization.
- Perform a gap analysis.

If the gaps can be resolved through a specific program—sometimes called strategic thrusts—then implementation planning can be initiated, contingency plans created and the implementation of the strategic plan undertaken.

Another key to success is the business model. Based on an assessment of market growth and competitive position as well as many other potential factors, a business will choose high level strategies for each current or potential product line.

Strong market growth and a strong competitive position for a product line imply a focus on product development and innovation. A stagnant market and weak competitive position imply a focus on cost cutting, retrenchment or divestiture. DFSS is clearly a better investment in the for-

mer case, while DMAIC based Six Sigma or lean Sigma is a better investment in the latter.

An organization should look carefully at how the functions within the organization contribute to the design of new products and processes, including manufacturing and business processes. The policy deployment system then should be structured so the performance of each business function—particularly its management team—is judged according to execution of the strategic plan.

Training Tips

Identifying target audiences for training is another essential activity for proper DFSS deployment. Only then can you properly define the design processes used by the personnel involved in product, process and service design. Training can be customized to deliver DFSS skill sets in a context fitting the design scenario for the segment.

Often, organizations mistakenly design generic DFSS training intended to suit all audiences. Training then falls short. An engineer may want a more technical approach or service personnel may wonder how to apply techniques, for example. A customized approach has proved successful at several organizations. The DFSS project selection process also can be integrated effectively into the customized training.

Tools To Leverage

For an effective DFSS deployment at the tools level, it's important to remember core skills for all types of design include different qualitative and quantitative approaches. The common skills for DFSS must include:

- Project selection.
- Project definition.
- Project management.
- Voice of the customer analysis.
- Requirements generation.
- Concept selection.
- Risk and importance analysis.
- Qualitative variables reduction.
- Quantitative variables reduction.
- Design optimization.

- Design validation.
- Control plan development.
- Project closure.

In segmenting the training approach, you must recognize the common skills—beginning with project selection and ending with qualitative variables reduction—can be applied equally well for product and service design. These tools have been encapsulated effectively in software such as NextSigma SigmaWorks.

However, when we begin applying quantitative variables reduction and design optimization, the approach must be tailored to the individual design scenario.

Product designers can make use of the probabilistic design methodology based on experimental design techniques—screening, optimization, transfer function generation and modeling, and simulation. Service designers must focus on the generation of an effective "should be" process map, and they can use quantitative techniques in conjunction with a discrete event simulation software tool such as ProcessModel.

Fixes to Common Pitfalls

An organization can avoid common pitfalls of DFSS deployment by following these few simple recommendations:

- Ensure the strategic plan dictates the goals of the organization as well as ways to achieve them. The DFSS program should be designed to support and further these goals.
- Adjust the policy deployment system so DFSS goals are fully integrated into the organizational measurement system. This allows managers and senior technical personnel to choose good DFSS projects and maximize return on investment for the program. The design of training can begin, customized according to the design scenario and tools required for effective implementation.
- Ensure DFSS training targets the task level, not the program level.

DFSS training should address the activities of engineers, designers and small teams, not the overall program level design process.

- Ensure DFSS training has been fully customized according to a valid needs assessment. This allows technical personnel to directly apply tools and techniques rather than rely on mentoring to determine how to adapt general concepts to the respective design scenario.
- Measure results to determine progress and promote further development. Design scorecards to include cost, quality and design time metrics, which can go a long way toward the creation of a more effective design process.

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