



Design for Six Sigma for Green Belts and Champions: Applications for Service Operations--Foundations, Tools, DMADV, Cases, and Certification, (paperback)

By Howard S. Gitlow, David M. Levine, Edward A. Popovich

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Preface

Introduction

I'll bet at some point in your life you had a great idea for a new product, service, or process. All your friends agreed that it was a great idea. Well, that great idea was the beginning of the invention and innovation processes.

Invention is the process of creating new products, services, or processes that are usable in accomplishing human objectives that were formerly difficult or impossible. The first club used by a caveman to kill animals to feed his family is an example of an invention. Some of the most significant inventions were created before recorded history—for example, crude tools, weapons, speech, cultivation of plants, domestication of animals, building techniques, production and control of fire, pottery, political systems, and the wheel. The period of recorded history began with the invention of cuneiform script by the Sumerians of Mesopotamia around 3000 b.c.

Innovation is the process by which invention is put to use for the betterment of humanity. Thomas Edison was both an inventor (of the electric light bulb) and an innovator because he was critical to the electrification of New York City and the establishment of the General Electric Company.

All inventions and innovations do not have to be generated from complex, theoretical, and radical ideas. Sometimes they come from the simplest of ideas. For example, whoever thought it was possible to create an improved corkscrew? Yet, in the last decade or two, a new corkscrew was invented. This corkscrew has wings or handles that allows the corkscrew to pull the cork out of the bottle. Another example of a product that you might not think could be improved is the teabag. Surprise! Lipton invented a teabag with two strings that allows the user to squeeze the last drops of tea out of the bag without burning his or her fingers. Ingenious!

Design for Six Sigma (DFSS)

Design for Six Sigma (DFSS) is the method used by a Six Sigma project team to invent and innovate products, services, and processes. DFSS can be used to design entirely new products, services, and processes, or major new features of existing products, services, or processes that are *consistently* reliable and able to be manufactured, and *uniformly* surpass customer requirements. Additionally, DFSS creates designs that are: (1) based on stakeholder needs and wants; (2) resource efficient; (3) minimal in complexity; (4) capable of generating high yields; (5) robust to process variations; and (6) quick to generate a profit.

An organization can reap many benefits from employing the DFSS methodology. The list of benefits includes: launching projects on time and on budget; reaping additional incremental revenues sooner; achieving greater market share; minimizing problems uncovered at launch; improving rolled throughput yield (RTY) significantly; ensuring quality and efficient production through data-driven scorecards; and differentiating products, services, and processes due to a customer focus.

DFSS is a method that embodies several principles. The first principle is for all areas within an organization to simultaneously design the product, service, and/or process to minimize future problems. The second principle is to design the product, service, and/or process to minimize variability in critical to quality characteristics (CTQs) important to customers and maximize customer satisfaction. The third principle is to design a process capable of delivering the quantity and quality of products or services desired by customers in a timely fashion. The fourth principle is to include suppliers early in the design process. These four

principles are the bedrock of the DFSS method.

It is not always apparent, but more businesses in the United States today are actually engaged in providing "services" rather than products. They are providing work, information, or some other less tangible utility. In order to compete in those markets, service providers must "design" their service(s) to meet and surpass the needs and expectations of those using or consuming those services. Design principles here do not very readily tie into traditional engineering disciplines, and the DFSS tools and methods must be adapted accordingly.

Finally, whether you are preparing to manufacture a new product or deliver a service, you must establish supporting business processes to produce, deliver, and support those products and/or services. In the case where you are putting in place processes that previously did not exist, then you must "design" those processes.

The DMADV Model

There are at least three very distinct flavors of DFSS, and no one of these can be universally applied to any design effort. To be more descriptive, it may be helpful to more precisely designate them as DFSS–Product, DFSS–Service, and DFSS–Process. Although it is helpful for organizations to have a simple, standard design methodology, the specific techniques employed and the deliverables produced will vary by DFSS flavor.

DMADV is a five-phase process for progressing through a design project. Even though there may be at least three flavors of DMADV, there are some common themes across all flavors. However, variation exists at the tool level.

The "**D**" or "Define" Phase is essentially a good conventional program management phase to set the stage for success. You can think of this phase as verifying that the project is ready to move forward with a reasonable chance of success. The key output of the Define Phase is the project charter. A good charter will contain several key elements. It will clearly articulate the purpose of the project, both specifically and how it integrates with other relevant projects. Specific and measurable project goals (both functional and administrative) will be identified. You identify the scope of the project—what will be included, and what will be excluded from consideration and delivery for the project. You identify the key players and other resources, and ensure their availability for the project. You create a formal project plan with schedule and milestones. Finally, you obtain written approval and commitments from all key players to demonstrate acceptance and support.

The "**M**" or "Measure" Phase is primarily concerned with defining the requirements for the project by considering the perspectives of all the relevant stakeholders of the project's outcome(s)—for example, the Voice of the Customer (market segments), the Voice of the Business (employee segments), and the Voice of the Process. Each will have concerns that will differ from the others, and sometimes occur in conflict. The key Measure phase activities are to capture those voices and then translate them into measurable project requirements. At this stage, you are talking about higher-level considerations that will ultimately be distilled down to specifications for the final design. A requirement can be achieved in several different ways. Only after one design alternative has been chosen can you develop exact specifications that deliver on the requirements.

The "**A**" or "Analyze" Phase is concerned with generating high-level design alternatives, which in the judgment of experts, are likely to be able to meet the defined requirements. In truth, all design efforts are faced with contradictory requirements and constraints that must be coordinated. Compromises are always required. The tools used in this phase are designed to sift through the requirements in a methodical manner to

discover the combination(s) of compromises that offer the best overall benefit and value for the imposed constraints. The various design alternatives are then checked against these refined requirement sets to determine which design approach offers the most desired results.

The "D" or "Design" phase is concerned with developing the detailed design requirements for the product, service, or process. This is where exact specifications are developed for the actual elements that will combine to make the desired result. It may be helpful to use a familiar ana...

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