

INTRODUCTION

Different Methods for Different Purposes

The Evolution of Six Sigma

Six Sigma (or “Lean Six Sigma,” as some refer to it) evolved into a rich set of different standardized methods, tools, and best practices. Six Sigma started as a problem-solving approach to reduce variation in a product and manufacturing environment. That application has expanded to process improvement and other areas of the business, including product or process redesign, research, and technology design, offering portfolio renewal, product development, and post-launch operations management. Six Sigma application stretches beyond the manufacturing enterprises into the services industry and non-profit organizations. Regardless of the application, businesses search for simplicity without jeopardizing the need for robust data. Six Sigma offers a set of methods and tools from which to choose. Six Sigma methods build from a common core foundation yet allow flexibility to adapt to changing environment needs. Part of the flexibility stems from a plethora of candidate tools available, depending on the situation. The tool library ranges from rigorous statistical and quantitative tools to “soft” qualitative ones. The purpose of this book is to help in selecting the most appropriate method and the most appropriate tool within the suite of available candidate tools.

Common Approach to Leverage Everyone’s Contribution, Regardless of Business Model

A *method* establishes the foundation for how work gets accomplished. It defines the who, what, when, where, why, and how of a *process*; wherein a process describes a series of logically sequenced tasks to complete work. It answers the questions such as, “what gets done;” “who does the work;”

“when the work starts and stops;” “where the work is done;” “why the work is being done;” and “how the work is to be completed.” A well-deployed method orchestrates and integrates the people working in a process in an efficient and effective (streamlined) set of activities. It organizes the work as defined by a set of customer requirements. The work produces the agreed-to deliverables according to their “acceptance” criteria. A well-constructed method defines a set of tasks that circumvent redundancies and gaps. Activities done beyond the prescribed work to produce the required deliverables arguably could be called unnecessary or a “waste.” A method defines which tool best supports a task and will produce the desired results, providing a common language of terms and tools and a common way of working for those involved in the process.

Overview of Six Sigma Method

The methods used in Six Sigma (including Lean Six Sigma) contain several common principles, such as data-driven decision-making and project management fundamentals. Part I, “Six Sigma Methodology Overview—Choosing the Right Approach to Address the Requirements,” uses these principles to organize its content.

Tool-Task-Deliverables Linkage

Six Sigma methods represent a structured thought process that starts with thoroughly understanding the *requirements* (or key business questions) before proceeding. The requirements, in turn, define the *deliverables* to be produced and the *tasks* needed to produce those deliverables and, last, the supporting *tools* to be used to complete the tasks and produce the deliverables. This structure is often called the *Tools-Tasks-Deliverables* combination to indicate the interdependencies. The *Tools-Tasks-Deliverables* linkage is executed in “reverse” or from right-to-left, starting with Deliverables. Hence, a tool is selected only *after* the requirements, deliverables, and tasks are well understood to ensure that the appropriate tool is used for a given task and to avoid the “rut” of treating everything as if it were a nail when the only tool you use is a hammer. The various Six Sigma methods suggest a variety of applicable tools to choose from, but rarely does a given project require the utilization of every tool. No tool fits every situation. Determining which tool fits best depends on the situation. Thus, tool selection is done only after the requirements, resulting deliverables, and tasks are completely understood. [Part II of this book provides not only an inventory of potential tools, but also information on how to apply and interpret results to help you in tool selection.] Remember: *Use the right tool at the right time to help ask and answer the right questions.*

Result-metrics

The *result-metrics* focus is a distinguishing principle of Six Sigma methods. These fact-based metrics determine whether (internal or external) customer requirements are achieved. Performance typically is evaluated via a statistical metric of the process or offering (e.g. product, services, or information).

High-level process and performance metrics define what critical-to-quality is and encompass the critical parameters necessary to meet requirements. Eventually, these metrics should be translated into a language that is “meaningful” to a process worker involved in providing either the inputs or process deliverables (outputs). Depending on the requirements, the result-metrics may be “hard” or “soft” measurements—quantitative or qualitative; continuous or attribute data. A good litmus test for translated critical-to-quality metrics is whether a “new hire” understands clearly what is expected of him/her to meet requirements with no “fuzzy” or nebulous evaluation of what characterizes “good” or “poor” performance.

Process-centric

Another principle employs a *process-centric* view. Understanding *how* inputs to a process are integrated and how value is added to a product, information, or services offering is as important as *what* is being added. Understanding the combination of *what* and *how* inputs and other key variables come together to produce the final outputs (or deliverables) enables a more accurate forecast of whether customer requirements (or targets) will be satisfied. Prior “results” alone are poor predictors of future outcomes, and without knowledge of the process, any forecast is blinded; any successful forecast would be by chance. Because business prefers accurate forecasts of performance, a process-centric view becomes an integral ingredient.

Adaptive and Iterative

Methods used in Six Sigma are *adaptive* and *iterative*. Adaptive implies the fact that it can be tailored to a variety of situations and business contexts. Moreover, any given Six Sigma method can be integrated with another process or methodology as an underpinning to identify, gather, analyze, and report on critical parameters in a proactive or reactive manner. For example, if your firm has an existing standard product development process or customer account selling approach, Six Sigma can supplement it and make it more robust. The adaptive nature of these methods also speaks to the wide array of industries and situations in which they can be applied. The breadth of industries includes military, government, automotive, aerospace, high-tech, manufacturing, office products, financial

4 Introduction

services, e-commerce, logistics and supply chain, healthcare, and pharmaceutical industries. Within companies, multiple disciplines have embraced Lean Six Sigma: manufacturing, engineering, finance, administration, customer operations, maintenance, services deployment, and marketing and sales. The approach can even be applied to personal and social situations. Of the Top 100 companies in the 2005 Fortune 500 list, 70 of them have been in the top 100 for five or more years. Interestingly, of those 70 companies, 63% of them publicly acknowledge implementing Six Sigma to some degree. Through further analysis, we have found that these same 44 Six Sigma users also reported 49% higher profits (compounded annually) on average than their peers.

The iterative nature of the Six Sigma methods stems from the fact that more information on a variable or potential root cause gets revealed as the project progresses. Hence, one path of inquiry based on one assumption may prove to be a dead-end or altered, as more data on the current state becomes known. Although Six Sigma methods use a project-structure with phase-gates, a fundamental principle across the various approaches encourages informed updates to prior step deliverables, as appropriate, and promotes proper communication. Use the best information available at the time but continue to ask questions and keep an open mind. Six Sigma projects involve a discovery process wherein an individual serves as a “sleuth,” investigating, exploring, hypothesizing, and testing assumptions.

Data-driven Decision-making

Given the uncertain nature of projects, when seeking facts that answer key business questions, revisions to earlier project work reflect the evolving discovery of fact-based results. For example, a business operations review may focus on a set of key metrics to manage a process. If a chronically missed target evokes a Six Sigma project, an interim project deliverable could identify that some of the metrics associated with the key variables driving the desired business outcomes are missing, hence the “dashboard” requirements become refined to reflect the vital few parameters, comprised of both leading and lagging metrics. Next, the project could focus on establishing baseline data for the “new” critical metrics to re-evaluate performance and better understand any cause-and-effect relationship(s).

Project-based Methods

As previously referenced, Six Sigma methods tend to use a *project structure*. A project structure has a distinct beginning and end to the work performed. The requirements phase determines the boundaries of this definitive timeframe. A project team, with defined roles, forms only for the duration of the project’s timeframe. A project structure adds the rigor of requiring completed deliverables approvals (often gained in a phase-gate review

meeting with the project and key stakeholders) before exiting a given phase-gate or step and starting another one. Project structure borrows heavily from the project management discipline and its nine knowledge areas to manage the lifecycle of the project: scope, time, budget/cost, risk, quality, communications, human resources, procurement, and integration.

The *project* context of Six Sigma methods incorporates a rather short-term perspective (averaging a three, six, or twelve-month project scope). A project may involve an improvement or enhancement to something [often focused on reducing defects, minimizing variance from a target, or improving velocity (speed)], clean-sheet innovation, or design and creation (such as product or services development or portfolio assessment). The technical community (for example, engineering or manufacturing) has embraced a category of Six Sigma methods called Design for Six Sigma (DFSS). A newly emerging field is Six Sigma for Marketing (SSFM). SSFM may be a misnomer, because the various methods apply to the remaining (“non-engineering”) business disciplines, such as marketing, sales, strategic planning, services, and customer operations. Examples of project-based methods include

- DMAIC (Define-Measure-Analyze-Improve-Control, and its variants DMAIIC (with “II” representing Improve-Innovate) and Lean Six Sigma)
- Lean (and its variants PDCA (Plan-Do-Check-Act) / PDSA (Plan-Do-Study-Act) and Lean Six Sigma)
- DFSS category with DMADV (Define-Measure-Analyze-Design-Verify), CDOV (Concept-Design-Optimize-Verify) (and their variants DMEDI (Define-Measure-Explore-Develop-Implement), PIDOV (Plan-Identify-Design-Optimize-Validate), ICOV (Identify-Characterize-Optimize-Verify), and IIDOV (Invent-Innovate-Develop-Optimize-Verify))
- SSFM category with UAPL (Understand-Analyze-Plan-Launch) and (sometimes) IDEA (Identify-Define-Evaluate-Activate)

Operational-based Methods

Managing an ongoing operation, however, is emerging as a new application area. Hence, the application of the Six Sigma method and tools to an operational process may last for years, rather than months as with a short-term project. The objective of operational-based Six Sigma is to manage or sustain an improvement of a launched product and/or services offering, for example, or to adapt and respond to environmental changes. This operational focus of Six Sigma is being applied to business areas such as customer operations (for sales, services, support, administration, financing, and related business disciplines) and strategic

planning (for offerings portfolio management). Some might argue that portfolio management can be handled as a project defined by an annual planning cycle, but others view it as an ongoing area.

Nonetheless, Six Sigma discipline has added a competitive advantage to those firms that have begun to apply its method and tools to this process area. The operations-based methods currently fall within the SSFM (Six Sigma for Marketing) category with LMAD (Launch-Manage-Adapt-Discontinue, for customer operations) and sometimes IDEA (Identify-Define-Evaluate-Activate, for strategic planning), which can be considered operational given that the management and revitalization process of a firm's offerings portfolio is cyclical and can span multiple years.

How Do the Various Six Sigma Methods Fit Together?

In summary, this Introduction overviews the major Six Sigma approaches being used currently. Each Six Sigma method has a valid purpose in today's business world, the selection of which approach best fits a need depends on the key business question being asked at the time. They all fit together and inform one another. The integrated view is as follows:

An enterprise's strategic platform defines its business and offerings, so typically a process flow starts with the business strategy process of portfolio definition and renewal (IDEA — Identify-Define-Evaluate-Activate).

From there, funding gets earmarked for research, tactical, and operational activities. Research and Technical Development (R&TD) efforts are funded to develop forward-looking capabilities that eventually feed product development and commercialization. The approach used to guide Research's activities is called FDOV (Invent-Innovate-Develop-Optimize-Verify).

The specific offering's design, development, and commercialization efforts split into two branches: 1) the technical team that uses CDOV (Concept-Design-Optimize-Verify) to guide its activities and 2) the marketing and business areas that use the UAPL (Understand-Analyze-Plan-Launch) approach.

Finally, the operational and supporting infrastructure and business areas of a post-launch customer value chain environment use the LMAD (Launch-Manage-Adapt-Discontinue) approach to guide and direct their activities.

If any of these areas of an enterprise encounter a trouble spot in an existing process or offering, the Lean Six Sigma DMAIC (Define-Measure-Analyze-Improve-Control) method and any of its variants (that is, DMAIIC (Define-Measure-Analyze-Improve-Innovate-Control), DMADV (Define-Measure-Analyze-Design-Verify), DMEDI (Define-Measure-Explore-Develop-Implement)) focus on the problem and its root cause-and-effect to determine the best correction.

Figure 1 depicts how each method integrates with one another.

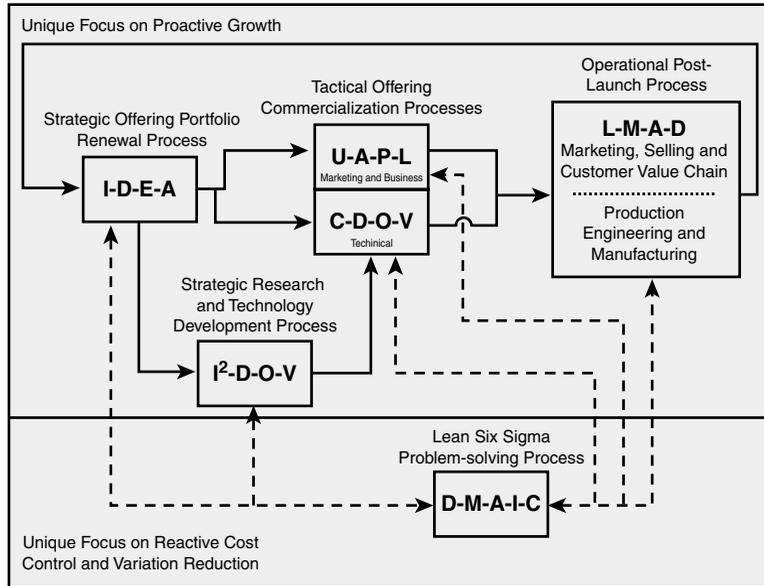


FIGURE 1: Integrated Portfolio of Six Sigma Methods

The various Six Sigma approaches have their appropriate applications. Moreover, their candidate tools and methods sometimes overlap or feature tool variants of another's, as they all build from the core Six Sigma fundamentals.

Right Tool at the Right Time

Part II of this book explores how to select *the most appropriate tool to answer the right question at the right time*. It organizes the tools in alphabetical order and, using an encyclopedia-style article format, describes what question each tool tries to answer and how to use the tool.

Take a closer look at the structure of the various Six Sigma (or Lean Six Sigma) methods to understand their similarities and differences and when best to apply each of them. Start with Part I to understand the various methods and their structure, requirements, deliverables, and list of candidate tools. Afterward examine Part II, the heart of this book, to decide which of the candidate tools might be appropriate for your project. Part II is structured as a desk reference that inventories the different tools and techniques. Each tool "article" describes the main purpose of the tool, how best to use it, how to interpret the results of the tool, and any variations on how to apply the tool or technique. Most importantly, Part I lists the candidate tools aligned with particular requirements and task-deliverable

combinations, but Part II identifies in more detail which key question each tool tries to answer. Remember—an effective Six Sigma practitioner scrutinizes the candidate tool set and selects the *right tool, at the right time, to answer the right question.*

Special Note

Throughout this book, the word “product” references to a generic company “offering” and represents both a *tangible product* as well as a *services offering*. This book discusses technology-based products frequently because of marketing’s interdependency with the technical community. In parallel, R&D, design and production/services support engineering should be using growth and problem prevention-oriented forms of Six Sigma in their phases and gate processes. The Six Sigma approach serves as a common language between the marketing and technical disciplines. The term “solutions” usually involves both technology and services; thus, “product” and “services” encompass the scope of a given solution. Regardless of the offering, the Six Sigma approach we are outlining is the same and can be applied to either a tangible product or a services offering.

In addition, the term “Six Sigma” refers to the generic field or discipline and encompasses the many different approaches. People may distinguish Six Sigma (SS), Lean Six Sigma (LSS), Design for Six Sigma (DFSS) and Six Sigma for Marketing (SSFM) from one another. However, this book uses “Six Sigma” categorically unless otherwise noted.

What this Book Covers

The *Treasure Chest* is organized into three parts: 1) Six Sigma methodology, 2) tools and techniques, and 3) best practices applicable to Six Sigma deployment. The book uses an encyclopedia-like format made up of over 60 topics.

Part I Six Sigma Methodology Overview—Choosing the Right Approach to Address the Requirements

This segment of the book presents an overview the various Six Sigma approaches and describes the purpose of each. With the knowledge of the different methods, this book connects the requirements of a method to the appropriate candidate tools and techniques. This Part serves as the foundation for selecting the right tool for a given purpose.

It discusses the various technical, business and marketing Six Sigma methods, including DMAIC, Lean Six Sigma, Design for Six Sigma (DFSS), and Six Sigma for Marketing (SSFM). Within each approach, a general description, common applications, and key requirements provide an overview of its structure and purpose. In addition, the key requirements determine each method's unique *tools-tasks-deliverables* combination. The Method Section provides the foundation for comparing and contrasting the different approaches. Once a method is selected, it establishes a team's common language, regardless of whether or not people are part of a hetero- or homogeneous team. The method defines the requirements for its work activities. It sets expectations, describes required deliverables and their due dates, and identifies who does what when. A common method is the single most critical unifying theme for a team's work. If it is well understood and followed by each team member, then collaboration, coordination, and communication can occur fluidly.

Part II Six Sigma Encyclopedia of Business Tools and Techniques— Choosing the Right Tool to Answer the Right Question at the Right Time

This Part features an in-depth look at a robust library of tools, organized in alphabetical order for easy reference. By design, it represents the bulk of this book, with an exhaustive review of the Growth and Lean Six Sigma tools and techniques. Each tool (tangible item) or technique (for example, brainstorming) features a "how to" description explaining how to utilize the tool and interpret typical outcomes. Each description identifies the deliverable the tool or technique supports. Part II features the following topics for each of the 60+ tools included in this book:

- The question the tool helps to answer
- Any alternative names or variants associated with the tool
- When best to use the tool or technique
- A brief description and useful real-world examples
- How to implement the tool for your application
- How to analyze and apply its output
- Helpful hints and tips that encourage you to think outside of the box
- Supporting candidate tools that link to the featured tool, depending on the question needing to be answered, by providing either input to or using the output from this featured tool

Part II begins with a useful summary table of tools organized by the type of question it helps to answer. The *Treasure Chest* organizes the candidate tools and techniques alphabetically for easy reference. The encyclopedia includes an array of soft tools and techniques, graphical methods, and statistical tools. The statistical tool descriptions leverage some of the appropriate software

tools such as MINITAB, Minitab's new Quality Champion, Decisioneering Crystal Ball, Visio, and other Microsoft applications, such as Excel.

Part III Best Practices Articles

This portion of the book contains a series of articles written by well-reputed professionals that complements and extends beyond the world of Six Sigma to provide that competitive advantage in growth and operational excellence. It features a collection of technical and humanistic topics ranging from the latest thinking on benchmarking strategy to determining and offering the best portfolio. Articles describe how best to accelerate the development of an offering, how to ensure design robustness, and how to govern projects. Part III includes a discussion on best practices to introduce, deploy, and sustain a major culture change, such as deploying Six Sigma thinking, by featuring a set of articles to support a change initiative including communities of practice and project management; simulation approach to training of new skills, knowledge, and attitudes; and designing collaborative work relationships.

A final note, the "Six Sigma for Marketing" (or SSFM) terminology in the marketplace may mislead prospective practitioners wishing to use Six Sigma to drive innovation and growth. While the primary application of SSFM involves processes typically associated with marketing, the respective work often encompasses additional functional disciplines within a company. Depending on the size of the firm and its business model, the professionals involved in 1) portfolio renewal, 2) offering development and commercialization preparation, and finally 3) post-launch operations management throughout an offering's lifecycle reach beyond just marketing. General business professionals involved in these three processes also represent disciplines such as strategic planning, pricing, finance, customer administration, customer service and support, professional services, and logistics and supply chain. In fact, the third process involving post-launch operations spans the entire customer value chain. Hence, when this book references "SSFM," it follows the marketplace terminology of the emerging Six Sigma focus. In the context of SSFM, the identification of "marketing" (and sometimes sales) distinguishes the new Six Sigma application as different from the classic variation reduction, problem-solving, and cost cutting approach, and as different from the technical DFSS (Design for Six Sigma). However, the *Treasure Chest* intends the reference to marketing as a "loose" association and prefers the broader reference of "general business" to better articulate its broader scope and applicability. This book works nicely as a sequel to the *Six Sigma for Marketing Processes*, co-authored by CM Creveling, L. Hambleton, and B. McCarthy.

Page numbers preceded by PDF: indicate pages available for download at www.prenhallprofessional.com/title/0132300214.

Part IV Appendixes

The Appendixes contain a set of references such as charts and statistical tables for hypothesis testing, a glossary, and a list of references.