LEARNING MADE EASY

4th Edition

# Lean Six Sigma

for dummies®
A Wiley Brand

Enhance process effectiveness and reduce waste

Successfully apply proven tools to projects and activities

Improve and innovate to achieve sustainable results

**Martin Brenig-Jones**
**Jo Dowdall**
Facilitators, trainers, and coaches from Catalyst Consulting

# Lean Six Sigma

4th Edition

by Martin Brenig-Jones
and Jo Dowdall

for dummies®
A Wiley Brand

**Lean Six Sigma For Dummies®, 4th Edition**

Published by: **John Wiley & Sons, Inc.,** 111 River Street, Hoboken, NJ 07030-5774, www.wiley.com



Published simultaneously in Canada

WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTY MAY BE CREATED OR EXTENDED BY SALES REPRESENTATIVES, WRITTEN SALES MATERIALS OR PROMOTIONAL STATEMENTS FOR THIS WORK. THE FACT THAT AN ORGANIZATION, WEBSITE, OR PRODUCT IS REFERRED TO IN THIS WORK AS A CITATION AND/OR POTENTIAL SOURCE OF FURTHER INFORMATION DOES NOT MEAN THAT THE PUBLISHER AND AUTHORS ENDORSE THE INFORMATION OR SERVICES THE ORGANIZATION, WEBSITE, OR PRODUCT MAY PROVIDE OR RECOMMENDATIONS IT MAY MAKE. THIS WORK IS SOLD WITH THE UNDERSTANDING THAT THE PUBLISHER IS NOT ENGAGED IN RENDERING PROFESSIONAL SERVICES. THE ADVICE AND STRATEGIES CONTAINED HEREIN MAY NOT BE SUITABLE FOR YOUR SITUATION. YOU SHOULD CONSULT WITH A SPECIALIST WHERE APPROPRIATE. FURTHER, READERS SHOULD BE AWARE THAT WEBSITES LISTED IN THIS WORK MAY HAVE CHANGED OR DISAPPEARED BETWEEN WHEN THIS WORK WAS WRITTEN AND WHEN IT IS READ. NEITHER THE PUBLISHER NOR AUTHORS SHALL BE LIABLE FOR ANY LOSS OF PROFIT OR ANY OTHER COMMERCIAL DAMAGES, INCLUDING BUT NOT LIMITED TO SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES.

For general information on our other products and services, please contact our Customer Care Department within the U.S. at 877-762-2974, outside the U.S. at 317-572-3993, or fax 317-572-4002. For technical support, please visit https://hub.wiley.com/community/support/dummies.

Wiley publishes in a variety of print and electronic formats and by print-on-demand. Some material included

with standard print versions of this book may not be included in e-books or in print-on-demand. If this book refers to media such as a CD or DVD that is not included in the version you purchased, you may download this material at http://booksupport.wiley.com. For more information about Wiley products, visit www.wiley.com.

Library of Congress Control Number: 2021946527

ISBN 978-1-119-79671-8 (pbk); ISBN 978-1-119-79672-5 (ebk); ISBN 978-1-119-79673-2 (ebk)

# Lean Six Sigma For Dummies®

## To view this book's Cheat Sheet, simply go to www.dummies.com and search for “Lean Six Sigma For Dummies Cheat Sheet” in the Search box.

# Table of Contents

# List of Tables



# List of Illustrations

## Chapter 4



## Chapter 5



## Chapter 6

## Chapter 7



## Chapter 8

## Chapter 9



## Chapter 10



## Chapter 11

## Chapter 12



## Chapter 13



## Chapter 14



## Chapter 15

## Chapter 16



## Chapter 17



## Chapter 18



## Chapter 19

# Introduction

Lean Six Sigma provides a rigorous and structured approach to help manage and improve quality and performance, and to solve potentially complex problems. It helps you use the right tools, in the right place and in the right way, not just in process improvement projects but also in your day-to-day work. Lean Six Sigma really is about getting key principles and concepts into the DNA and lifeblood of your organization so that it becomes a natural part of how you do things.

This book is for practitioners using Lean Six Sigma as well as those who are seeking to "lead and live" Lean Six Sigma in their organizations.

We began to blend Lean and Six Sigma together more than 20 years ago, welcoming a pragmatic rather than purist approach. We discovered how essential it has been to consider people and Change Management when improving processes too — leading to higher levels of acceptance and more effective change.

In this 4th Edition of *Lean Six Sigma For Dummies,* we have added a few more ingredients into the cocktail. You can find out how Agile approaches (and an Agile mindset) can accelerate results. We also discuss how Design Thinking approaches, tools, and techniques for creativity can encourage different thinking about the way the work gets done. This stuff really works.

## *About This Book*

This book makes Lean Six Sigma easy to understand and apply. We wrote it because we know that Lean Six Sigma can help organizations of all shapes and sizes, both

private and public, improve their performance in meeting their customers' requirements. We know this because we have seen it!

We also wanted to demonstrate a pragmatic approach and the genuine synergy achieved through the combination of Lean and Six Sigma. For some reason unknown to us, a few people still feel they can use only Lean or Six Sigma, but not both. How wrong they are! In this book, you can discover how to create genuine synergy by applying the principles of Lean and Six Sigma together in your day-to-day operations and activities. And not just that: Change Management, Agile, Design Thinking and Design for Six Sigma are included too. In the true spirit of Continuous Improvement, we are always looking to enhance the approach, adapt the toolkit, and learn as we go.

# Foolish Assumptions

In Lean Six Sigma, avoiding the tendency to jump to conclusions and make assumptions about things is crucial. Lean Six Sigma really is about managing by fact. Despite that, we've made some assumptions about why you may have bought this book:

- You're contemplating applying Lean Six Sigma in your business or organization, and you need to understand what you're getting yourself into.
- Your business is implementing Lean Six Sigma and you need to get up to speed. Perhaps you've been lined up to participate in the program in some way.
- Your business has already implemented either Lean or Six Sigma and you're intrigued by what you might be missing.

- You're considering a career or job change and feel that your CV or resume will look much better if you can somehow incorporate Lean or Six Sigma into it.
- You're looking to boost the results and progress of your Lean Six Sigma program and are considering how approaches like Change Management, Agile, and Design Thinking can help.
- You're a student in business, operations or industrial engineering, for example, and you realize that Lean Six Sigma could help shape your future.

We also assume that you realize that Lean Six Sigma demands a rigorous and structured approach to understanding how your work gets done and how well it gets done, and how to go about the improvement of your processes.

# Icons Used In This Book

Throughout the book, you'll see small symbols called *icons* in the margins; these highlight special types of information. We use these to help you better understand and apply the material. Look out for the following icons:

TIP Keep your eyes on the target to find tips and tricks we share to help you make the most of Lean Six Sigma.

REMEMBER Bear these important points in mind as you get to grips with Lean Six Sigma.

EXAMPLE Throughout this book, we share true stories of how different companies have implemented Lean Six Sigma to improve their processes.

WARNING This icon highlights potential pitfalls to avoid.

# Beyond This Book

In addition to the material in the print or e-book you're reading right now, this book also comes with some access-anywhere goodies on the web. To view the free Cheat Sheet, go to www.dummies.com and type "Lean Six Sigma For Dummies Cheat Sheet" in the search box.

# Where to Go From Here

In theory, when you read you begin with ABC, and when you sing you begin with doh-ray-me (thank you Julie Andrews). But with a *For Dummies* book, you can begin where you like. Each part and, indeed, each chapter is self-contained, which means you can start with whichever parts or chapters interest you the most.

That said, if you're new to the topic, starting at the beginning makes sense. Either way, lots of cross-referencing throughout the book helps you to see how things fit together and put them in the right context.

# Part 1

# Understanding Lean Six Sigma

# IN THIS PART ...

Grasp the basics of Lean and Six Sigma.

Comprehend exactly what “sigma” means and why the term is important in Lean Six Sigma.

Get a clear picture of the synergy created by merging Lean and Six Sigma, and understand the key principles underpinning the approach.

Examine the process improvement method known as DMAIC: Define, Measure, Analyze, Improve, and Control.

Get ready to begin by defining the problems you want to solve using Lean Six Sigma.

# Chapter 1

# Defining Lean Six Sigma

**IN THIS CHAPTER**

- **» Finding out the fundamentals of both “Lean” and “Six Sigma”**
- **» Getting to grips with key concepts**
- **» Bringing new thinking into the Lean Six Sigma mix**

Throughout this book, we cover the tools and techniques available to help you achieve real, sustainable improvement in your organization. In this chapter, we aim to move you down a path of different thinking that gets your improvement taste buds tingling. We look at the main principles behind Lean and Six Sigma and what today’s “Lean Six Sigma” is made up of. We’ll also introduce some of the main concepts and terminology to help you on your way.

## *Introducing Lean Thinking*

Lean thinking focuses on enhancing value for the customer by improving and smoothing the process flow (covered in Chapter 11) and eliminating waste (discussed in Chapter 10). Lean thinking has evolved since Henry Ford’s first production line, and much of the development has been led by Toyota through the Toyota Production System (TPS). Toyota built on Ford’s production ideas, moving from high volume, low variety, to high variety, low volume.

Although Lean thinking is usually seen as being a manufacturing concept and application, many of the tools and techniques were originally developed in service organizations. These include, for example, spaghetti diagrams, and the visual system used by supermarkets to replenish shelves. Indeed, it was a supermarket that helped shape the thinking behind the Toyota Production System. During a tour to General Motors and Ford, Kiichiro Toyoda and Taiichi Ohno visited Piggly Wiggly, an American supermarket, and noticed *Just in Time* and *kanban* being applied. This innovation enabled Piggly Wiggly customers to "buy what they need at any time" and avoided the store holding excess stock.

TIP *Kanban* is a Japanese word meaning "card you can see." At the Piggly Wiggly, it was a card that provided the signal to order more stock. You'll see kanbans turning up again in Chapter 16 when we look at how Agile principles and approaches can be used to accelerate Lean Six Sigma projects.

Lean is called "Lean" not because things are stripped to the bone. Lean isn't a recipe for your organization to slash its costs, although it will likely lead to reduced costs and better value for the customer. We trace the concept of the word "Lean" back to 1987, when John Krafcik (who later led Google's self driving car project) was working as a researcher for MIT as part of the International Motor Vehicle Program. Krafcik needed a label for the TPS phenomenon that described what the system did. On a white board, he wrote the performance attributes of the Toyota system compared with traditional mass production. TPS:

- Needed less human effort to design products and services.
- Required less investment for a given amount of production capacity.
- Created products with fewer delivered defects.
- Used fewer suppliers.
- Went from concept to launch, order to delivery and problem to repair in less time and with less human effort.
- Needed less inventory at every process step.
- Caused fewer employee injuries.

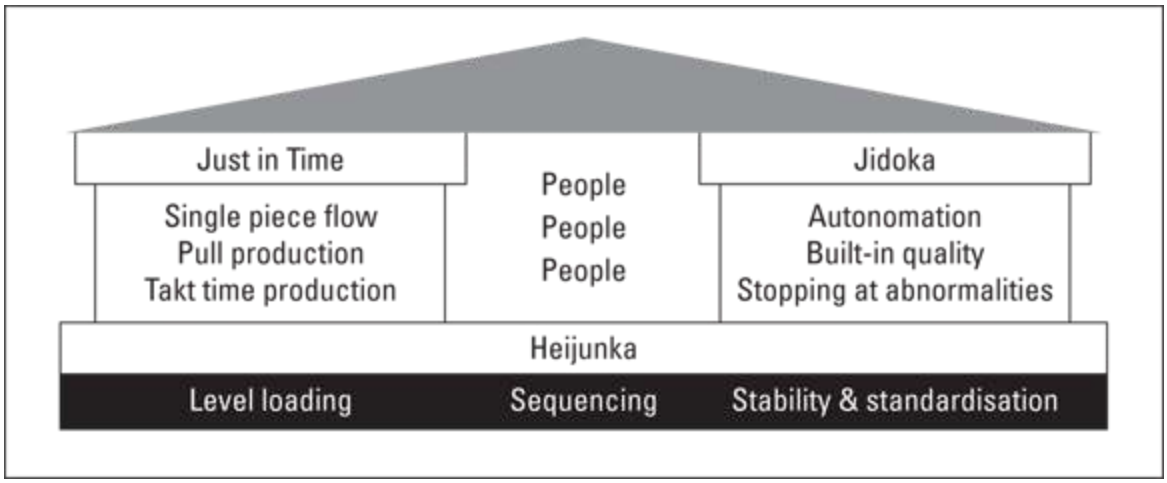
Krafcik commented:

> *It needs less of everything to create a given amount of value, so let's call it Lean.*

And just like that, Lean was born.

## Bringing on the basics of Lean

Figure 1-1 shows the Toyota Production System, highlighting various tools and Japanese Lean thinking terms that we use throughout this book. In this chapter we provide some brief descriptions to introduce the Lean basics and the TPS.




*© Martin Brenig-Jones and Jo Dowdall*

**FIGURE 1-1:** The TPS house.

Toyota's Taiichi Ohno describes the TPS approach very effectively:

> *All we are doing is looking at a timeline from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that timeline by removing the non-value adding wastes.*

The TPS approach really is about understanding how the work gets done, finding ways of doing it better, smoother and faster, and closing the time gap between the start and end points of our processes. And it applies to any process. Whether you're working in the public or private sector, in service, transactional or manufacturing processes really doesn't matter.

Think about your own processes for a moment. Do you feel that some unnecessary steps or activities seem to waste time and effort?

We must point out, however, that simply adopting the tools and techniques of the TPS isn't enough to sustain improvement and embed the principles and thinking into

your organization. Toyota chairperson Fujio Cho provides a clue as to what's also needed:

> *The key to the Toyota way is not any of the individual elements but all the elements together as a system. It must be practiced every day in a very consistent manner — not in spurts. We place the highest value on taking action and implementation. By improvement based on action, one can rise to the higher level of practice and knowledge.*

Perhaps this is why Toyota didn't mind sharing the secrets of their success. It might be easy to replicate certain practices and adopt certain concepts, but it is not easy to replicate a true culture of Continuous Improvement.

## Building people first

"First we build people," stated Toyota chairperson Fujio Cho. "Then we build cars." Figure 1-1 shows that people are at the heart of TPS. The system focuses on developing exceptional people and teams that follow the company's philosophy to gain exceptional results. Consider the following:

- Toyota creates a strong and stable culture wherein values and beliefs are widely shared and lived out over many years.
- Toyota works constantly to reinforce that culture.
- Toyota involves cross-functional teams to solve problems.
- Toyota keeps teaching individuals how to work together.

Being Lean means involving people in the process, equipping them to be able, and feel able, to challenge and improve their processes and the way they work. Never waste the creative potential of people!

## *Looking at the lingo*

You can see from Figure 1-1 that Lean thinking involves a certain amount of jargon — some of it Japanese. This section defines the various terms to help you get Lean thinking as soon as possible:

- **Standardization** seeks to reduce variation in the way the work is carried out, so that everyone operates the process in the "one best way." This highlights the importance of following a *standard operating process* or procedure. In the spirit of Continuous Improvement, of course the "one best way" of carrying out the process will keep changing, as people in the process identify better ways of doing the work. You need to ensure the new "one best way" is understood and fully deployed.
- **Heijunka** encompasses the idea of smoothing processing and production by considering leveling and sequencing:
  - **Leveling** involves smoothing the volume of production in the production period, in order to reduce the ups and downs and peaks and troughs that can make planning difficult. Among other things, leveling seeks to prevent "end-of-period" peaks, where production is initially slow at the beginning of the month, but then quickens in the last days of a sale or accounting period, for example.
  - **Sequencing** may well involve mixing the types of work processed. So, for example, when setting

up new loans in a bank, the type of loan being processed is mixed to better match customer demand, and help ensure applications are actioned in date order. So often, people are driven by internal efficiency targets, whereby they process the “simple tasks” first to get them out of the way and “hit their numbers,” leaving the more difficult cases to be processed later on. This means tasks are not processed in date order, and people are reluctant to get down and tackle a pile of difficult cases at the end of the production period, making things even worse for the customer and the business.

» **Jidoka** concerns prevention; it links closely with techniques such as the Failure Mode Effects Analysis (FMEA), which are covered in Chapter 13. Jidoka has two main elements, and both seek to prevent work continuing when something goes wrong:

- **Autonomation** allows machines or processes to operate autonomously, by shutting down if something goes wrong. This concept is also known as automation with human intelligence. The “no” in auto*no*mation is often underlined to highlight the fact that no defects are allowed to pass to a follow-on process. An early example hails from 1902, when Sakichi Toyoda, the founder of the Toyota group, invented an automated loom that stopped whenever a thread broke. A simple example today is a printer stopping processing copy when the ink runs out.

  Without this concept, automation has the potential to allow a large number of defects to be created very quickly, especially if processing is in batches (see “Single piece flow” below).