

LEARNING MADE EASY



4th Edition

# Lean Six Sigma

for  
**dummies**<sup>®</sup>  
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**<sup>®</sup>  
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](http://www.wiley.com)

Copyright © 2022 by John Wiley & Sons, Inc., Hoboken, New Jersey

Published simultaneously in Canada

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without the prior written permission of the Publisher. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permissions>.

**Trademarks:** Wiley, For Dummies, the Dummies Man logo, Dummies.com, Making Everything Easier, and related trade dress are trademarks or registered trademarks of John Wiley & Sons, Inc., and may not be used without written permission. All other trademarks are the property of their respective owners. John Wiley & Sons, Inc., is not associated with any product or vendor mentioned in this book.

<p>LIMIT OF LIABILITY/DISCLAIMER OF WARRANTY: WHILE THE PUBLISHER AND AUTHORS HAVE USED THEIR BEST EFFORTS IN PREPARING THIS WORK, THEY MAKE NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS WORK AND SPECIFICALLY DISCLAIM ALL WARRANTIES, INCLUDING WITHOUT LIMITATION ANY IMPLIED</p>
--

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](http://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](http://www.dummies.com) and search for “Lean Six Sigma For Dummies Cheat Sheet” in the Search box.

## Table of Contents

[Cover](#)

[Title Page](#)

[Copyright](#)

[Introduction](#)

[About This Book](#)

[Foolish Assumptions](#)

[Icons Used In This Book](#)

[Beyond This Book](#)

[Where to Go From Here](#)

[\*\*Part 1: Understanding Lean Six Sigma\*\*](#)

[\*\*Chapter 1: Defining Lean Six Sigma\*\*](#)

[Introducing Lean Thinking](#)

[Sussing Six Sigma](#)

[Adding More to the Mix](#)

## **Chapter 2: Understanding the Principles of Lean Six Sigma**

[Considering the Key Principles of Lean Six Sigma](#)

[Improving Existing Processes: Introducing DMAIC](#)

[Reviewing Your DMAIC Phases](#)

[Taking a Pragmatic Approach](#)

## **Part 2: Lean Six Sigma Foundations**

### **Chapter 3: Identifying Your Process Customers**

[Understanding the Process Basics](#)

[Getting a High-Level Picture](#)

### **Chapter 4: Understanding Your Customers' Needs**

[Considering Kano](#)

[Obtaining the Voice of the Customer](#)

[Researching the Requirements](#)

[Avoiding Bias](#)

[Considering Critical To Quality Customer Requirements](#)

[Establishing the Real CTQs](#)

### **Chapter 5: Understanding the Process**

[Finding Out How the Work Gets Done](#)

[Painting a Picture of the Process](#)

### **Chapter 6: Managing People and Change**

[Getting into the Grey Matter](#)

[Gaining Acceptance](#)

[Sizing Up the Status Quo](#)

[Coping with Change](#)

[Creating the Vision](#)

[Busting Assumptions](#)

## **Part 3: Understanding Performance and Analyzing the Process**

### **Chapter 7: Gathering Data**

[Managing by Fact](#)

[Developing a Data Collection Plan](#)

## **Chapter 8: Presenting Your Data**

[Delving into Different Types of Variation](#)

[Recognizing the Importance of Control Charts](#)

## **Chapter 9: Identifying Root Causes**

[Unearthing the Suspects](#)

[Generating Your List of Suspects](#)

[Confirming the Causes](#)

## **Chapter 10: Identifying Non-Value-Adding Steps and Waste**

[Defining Value-Adding](#)

[Looking at the Eight Wastes](#)

## **Chapter 11: Getting the Process to Flow**

[Applying the Theory of Constraints](#)

[Managing the Production Cycle](#)

[Looking at Your Layout](#)

## **Part 4: Improving and Innovating**

### **Chapter 12: Thinking Differently and Generating Solutions**

[Getting Immersed in Ideas](#)

[Prioritizing the Ideas](#)

[Testing the Ideas to See What Will Fly](#)

### **Chapter 13: Discovering the Opportunity for Prevention**

[Looking at Prevention Tools and Techniques](#)

[Workplace Organization](#)

[Using Visual Management](#)

[Profiting from Preventive Maintenance](#)

[Avoiding Peaks and Troughs](#)

[Building in Business Process Robotics](#)



## **Chapter 14: Introducing Design for Six Sigma**

[Introducing DfSS](#)

[Introducing DMADV](#)

[Defining What Needs Designing](#)

[Considering Quality Function Deployment \(QFD\)](#)

[Making Decisions](#)

## **Chapter 15: Discovering Design Thinking**

[The Principles of Design Thinking](#)

[Comparing DMADV and Design Thinking](#)

[Walking through the Design Thinking Steps](#)

[Deciding on Design Thinking](#)

## **Chapter 16: Applying Agile to Lean Six Sigma Projects**

[Understanding Agile Principles](#)

[Embracing an Agile Mindset](#)

[Succeeding in the Scrum](#)

[Capitalizing on Kanbans](#)

[Combining Agile and Lean Six Sigma](#)

## **Part 5: Deploying Lean Six Sigma and Making Change Happen**

### **Chapter 17: Running Rapid Improvement Events and Solving Problems with DMAIC**

[Raving about Rapid Improvement](#)

[Understanding the Facilitator's Role](#)

[Creating a Checklist for Running Successful Events](#)

[Practicing Problem Solving](#)

### **Chapter 18: Ensuring Everyday Operational Excellence**

[Standardizing the Process](#)

[Making Everyday Operational Excellence a Reality](#)

[Understanding Organizational Culture](#)

## **Chapter 19: Leading the Deployment and Selecting the Right Projects**

[Considering Key Factors for Successful Deployment](#)

[Understanding Executive Sponsorship](#)

[Considering Size and Sector](#)

[Recognizing the Important Role of Managers](#)

[Introducing the Deployment Program Manager](#)

[Starting Your Lean Six Sigma Program](#)

[Understanding What Project Sponsors Do](#)

[Driving Strategy Deployment with Lean Six Sigma](#)

[Generating a List of Candidate Improvement Projects](#)

[Deciding Whether Lean Six Sigma Is the Right Approach](#)

[Setting Up a DMAIC Project](#)

## **Chapter 20: Putting It All Together: Checklists to Support Your DMAIC Project**

[Defining the Project](#)

[Moving into the Measure Phase](#)

[Analyzing to Identify Root Causes](#)

[Quantifying the Opportunity](#)

[Identifying and Planning the Improvements](#)

[Confirming the Customer and Business Benefits](#)

[Implementing the Solutions and Controlling the Process](#)

[Conducting the Final Benefit Review](#)

## **Part 6: The Part of Tens**

### **Chapter 21: Ten Tips for Best-Practice Project Storyboards**

[Keep It Brief](#)

[Make It Visual](#)

[Make It Flow](#)

[Weave the Story Together with a Golden Thread](#)

[Keep It Up to Date as You Go Along](#)

[Don't Forget the "Happily Ever After" Part](#)

[Keep It Simple](#)

[Develop a One-Page Summary](#)

[Reflect on the Lessons Learned](#)

[Share, Share, Share!](#)

## **Chapter 22: Ten Pitfalls to Avoid**

[Jumping to Solutions](#)

[Coming Down with Analysis Paralysis](#)

[Falling into Common Project Traps](#)

[Stifling the Program Before You've Started](#)

[Ignoring Change Management](#)

[Getting Complacent](#)

[Thinking That You're Already Doing It](#)

[Believing the Myths](#)

[Doing the Wrong Things Right](#)

[Overtraining](#)

## **Chapter 23: Ten (Plus One) Places to Go for Help**

[Your Colleagues](#)

[Your Sponsor](#)

[Other Organizations](#)

[The Internet](#)

[Social Media](#)

[Networks and Associations](#)

[Conferences](#)

[Books](#)

[Periodicals](#)

[Software](#)

[Training and Consulting Companies](#)

**Index**

**About the Authors**

**Connect with Dummies**

**End User License Agreement**

# List of Tables

## Chapter 4

[TABLE 4-1 Researching the Requirements](#)

[TABLE 4-2 Pros and Cons of Customer Surveys](#)

[TABLE 4-3 Some Common CTQs](#)

## Chapter 10

[TABLE 10-1 A Value-Add Analysis](#)

[TABLE 10-2 A Waste Walk](#)

## Chapter 13

[TABLE 13-1 Weighing up the risk](#)

## Chapter 15

[TABLE 15-1 DMADV and Design Thinking](#)

[TABLE 15-2 What Is a Prototype?](#)

# List of Illustrations

## Chapter 1

[FIGURE 1-1: The TPS house.](#)

[FIGURE 1-2: Histogram showing the time taken to process orders.](#)

[FIGURE 1-3: Standard deviation.](#)

[FIGURE 1-4: Standard deviation formula.](#)

[FIGURE 1-5: Highlighting defects.](#)

[FIGURE 1-6: Abridged Process Sigma conversion table.](#)

[FIGURE 1-7: Calculating Process Sigma values.](#)

## Chapter 2

[FIGURE 2-1: The five phases of DMAIC.](#)

[FIGURE 2-2: A sample improvement charter.](#)

[FIGURE 2-3: Framing the scope of your improvement project.](#)

## Chapter 3

[FIGURE 3-1: Using a process model.](#)

[FIGURE 3-2: Identifying your internal customers.](#)

[FIGURE 3-3: Process levels.](#)

[FIGURE 3-4: The SIPOC model.](#)

[FIGURE 3-5: Building up the SIPOC model.](#)

## **Chapter 4**

[FIGURE 4-1: Can you Kano? You must know the must-be requirements.](#)

[FIGURE 4-2: Determining the CTQs.](#)

[FIGURE 4-3: Developing a CTQ tree.](#)

[FIGURE 4-4: Paired comparisons: Do you prefer this or that?](#)

## **Chapter 5**

[FIGURE 5-1: A spaghetti diagram.](#)

[FIGURE 5-2: Keeping it simple with process mapping symbols.](#)

[FIGURE 5-3: Which route do we follow?](#)

[FIGURE 5-4: The deployment flowchart.](#)

[FIGURE 5-5: Highlighting the interfaces.](#)

[FIGURE 5-6: Measuring time.](#)

[FIGURE 5-7: Total time showing dead time experienced by customers.](#)

[FIGURE 5-8: Part of a Value Stream Map.](#)

[FIGURE 5-9: Value Stream Map conventions.](#)

[FIGURE 5-10: Identifying the delays.](#)

[FIGURE 5-11: The ABC order process as a Value Stream Map.](#)

[FIGURE 5-12: Building up the Value Stream Map.](#)

[FIGURE 5-13: Developing the picture.](#)

[FIGURE 5-14: Collecting data.](#)

[FIGURE 5-15: Looking at the interfaces.](#)

[FIGURE 5-16: So what's the time?](#)

[FIGURE 5-17: Process mapping and data may help highlight the opportunities for ...](#)

[FIGURE 5-18: A future state map.](#)

## **Chapter 6**

[FIGURE 6-1: A forcefield diagram.](#)

[FIGURE 6-2: Stakeholder analysis.](#)

[FIGURE 6-3: Change reaction.](#)

[FIGURE 6-4: The Golden Circle shows how our communications messages should work...](#)

[FIGURE 6-5: Elements of change model.](#)

[FIGURE 6-6: Chart to assess team progress.](#)

## **Chapter 7**

[FIGURE 7-1: Getting the measure of the CTQs.](#)

[FIGURE 7-2: Matching the voices of the customer and the process.](#)

[FIGURE 7-3: The different variables will all need corresponding measures to hel...](#)

[FIGURE 7-4: Bringing the CTQs into the mix.](#)

[FIGURE 7-5: Checking out the measurement system.](#)

[FIGURE 7-6: Attribute data in action.](#)

[FIGURE 7-7: Making inferences.](#)

[FIGURE 7-8: Understanding the segmentation factors is vital.](#)

[FIGURE 7-9: Using a systematic approach.](#)

[FIGURE 7-10: Subgroup sampling from a process.](#)

[FIGURE 7-11: Formula for Continuous Data.](#)

[FIGURE 7-12: The formula in practice.](#)

[FIGURE 7-13: Formula for discrete data.](#)

[FIGURE 7-14: Precision is a key factor in sample size.](#)

[FIGURE 7-15: Adjusting the sample size.](#)

[FIGURE 7-16: Bringing the sample size down.](#)

[FIGURE 7-17: Precisely what can we afford?](#)

[FIGURE 7-18: Checking out the check sheet.](#)

[FIGURE 7-19: Coming up to scratch with the concentration diagram.](#)

[FIGURE 7-20: Pulling the data collection plan together.](#)

## **Chapter 8**

[FIGURE 8-1: A typical data set that doesn't reveal very much.](#)

[FIGURE 8-2: Presenting data as a run chart.](#)

[FIGURE 8-3: Control chart for a process exhibiting natural variation.](#)

[FIGURE 8-4: Occurrence of a special cause outside a control limit.](#)

[FIGURE 8-5: New control limits set after a process review and improvement actio...](#)

[FIGURE 8-6: Determining the moving range.](#)

[FIGURE 8-7: Looking at the formula for the X moving R chart.](#)

[FIGURE 8-8: The four states of a process.](#)

[FIGURE 8-9: Taking your driving theory test.](#)

[FIGURE 8-10: The driving needs improvement.](#)

[FIGURE 8-11: The capability formula.](#)

[FIGURE 8-12: Location, location, location.](#)

[FIGURE 8-13: An example histogram.](#)

[FIGURE 8-14: Looking at a long tail.](#)

[FIGURE 8-15: Twin peaks.](#)

[FIGURE 8-16: Looking at the vital few with Pareto.](#)

## **Chapter 9**

[FIGURE 9-1: The fishbone diagram.](#)

[FIGURE 9-2: Creating an affinity diagram.](#)

[FIGURE 9-3: The fishbone diagram meets the interrelationship diagram.](#)

[FIGURE 9-4: Identifying the key drivers.](#)

[FIGURE 9-5: Demonstrating correlation with a scatter plot.](#)

[FIGURE 9-6: Working out the line of best fit.](#)

[FIGURE 9-7: Looking out for thresholds.](#)

[FIGURE 9-8: Bringing home the baby.](#)

[FIGURE 9-9: Sometimes the difference is clear.](#)

[FIGURE 9-10: Being logical.](#)

## **Chapter 10**

[FIGURE 10-1: Mapping the rework loops.](#)

## **Chapter 11**

[FIGURE 11-1: Working on the chain gang.](#)

[FIGURE 11-2: Brian the Bottleneck.](#)

[FIGURE 11-3: Banging the drum for drum, buffer, rope.](#)

[FIGURE 11-4: The benefit of cells.](#)

[FIGURE 11-5: Keeping it in the family.](#)

[FIGURE 11-6: Calculating takt time.](#)

[FIGURE 11-7: Visualizing cycle time versus takt time.](#)

[FIGURE 11-8: Balancing the flow.](#)

## **Chapter 12**

[FIGURE 12-1: A template for brainwriting.](#)

[FIGURE 12-2: Multivoting in action.](#)

[FIGURE 12-3: A criteria selection matrix.](#)

## **Chapter 13**

[FIGURE 13-1: Weighing up the risk with FMEA.](#)

[FIGURE 13-2: Square pegs and round holes: Contact error proofing.](#)

[FIGURE 13-3: A shadow board helps you see at a glance if any tools are missing....](#)

[FIGURE 13-4: Keeping a process performance review meeting tightly focused.](#)

[FIGURE 13-5: An activity board approach to team management.](#)

## **Chapter 14**

[FIGURE 14-1: The DMADV phases.](#)

[FIGURE 14-2: A sample design scorecard.](#)

[FIGURE 14-3: Choosing between DMAIC and DMADV.](#)

[FIGURE 14-4: The House of Quality.](#)

[FIGURE 14-5: Seven rooms with a view.](#)

[FIGURE 14-6: Competition comparison.](#)

[FIGURE 14-7: The relationship matrix.](#)

[FIGURE 14-8: Grading performance.](#)

[FIGURE 14-9: Assessing the impact of measures on customer CTQs.](#)

[FIGURE 14-10: Developing more Houses of Quality.](#)

[FIGURE 14-11: The Pugh Matrix.](#)

## **Chapter 15**

[FIGURE 15-1: The double diamonds of Design Thinking.](#)

[FIGURE 15-2: The persona map.](#)



[FIGURE 15-3: An empathy map.](#)

[FIGURE 15-4: The “how might we?” template.](#)

[FIGURE 15-5: The experiment grid.](#)

## **Chapter 16**

[FIGURE 16-1: The scrum.](#)

[FIGURE 16-2: The T-shaped person.](#)

[FIGURE 16-3: The user story card.](#)

[FIGURE 16-4: A simple Agile kanban board.](#)

## **Chapter 17**

[FIGURE 17-1: A typical outline Rapid Improvement Event Plan.](#)

[FIGURE 17-2: An example A3.](#)

## **Chapter 18**

[FIGURE 18-1: The Process Management Chart includes essential process informatio...](#)

[FIGURE 18-2: A template to support Leader Standard Work.](#)

[FIGURE 18-3: The cultural web is essentially “the way we do things around here....”](#)

## **Chapter 19**

[FIGURE 19-1: Successful deployment.](#)

[FIGURE 19-2: Applying Lean Six Sigma to processes.](#)

[FIGURE 19-3: So many options to choose from!](#)

[FIGURE 19-4: Three steps to project selection.](#)

[FIGURE 19-5: Identifying where suggestions come from.](#)

[FIGURE 19-6: A list of criteria for assessing project viability.](#)

[FIGURE 19-7: Benefit-effort matrix for screening projects.](#)

[FIGURE 19-8: Being business wise with the business Ys.](#)

# 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](http://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.

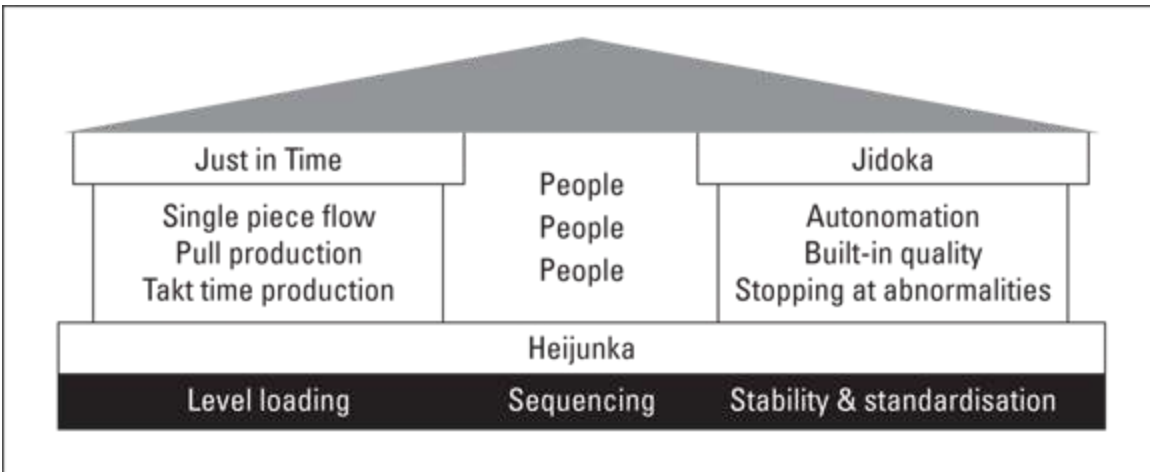
Krafcik commented:

*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 *autonomation* 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).