Essentials
of
Lean *Six Sigma*
Essentials of Lean Six Sigma

Salman Taghizadegan
To my loving wife, Leila and our daughters, Sara and Setareh.
To my father and my late mother who asked so little and gave so much.
Contents

Preface xiii
Acknowledgments xv
About the Author xvii

PART I
Statistical Theory and Concepts

Chapter 1
Introduction to Essentials of Lean Six Sigma (6σ) Strategies
  1.1 Lean Six Sigma (6σ) Concept Review 1
      1.1.1 The Philosophy 1
      1.1.2 Lean/Kaizen Six Sigma Engineering 2
  1.2 Six Sigma Background 3
  1.3 Some Six Sigma Successes 4

Chapter 2
Statistical Theory of Lean Six Sigma (6σ) Strategies
  2.1 Normal Distribution Curve 7
  2.2 Six Sigma Process Capability Concepts 7
      2.2.1 Six Sigma Short-Term Capability 10
      2.2.2 Estimation of Six Sigma Long-Term Capability 13
Chapter 3
Mathematical Concepts of Lean Six Sigma Engineering Strategies

3.1 Process Modeling—The Heart of Lean Six Sigma 21
3.2 The Normal Distribution 25
3.3 The Standard Normal Distribution 27
3.4 t-Distribution 29
  3.4.1 Confidence Interval for the Difference of Two Means 29
3.5 Binomial Distribution 32
3.6 Poisson Distribution 34
3.7 Exponential Distribution 35
3.8 Hypergeometric Distribution 35
3.9 Normality Tests 36
  3.9.1 Kurtosis 37
  3.9.2 Anderson Darling 37
3.10 Reliability Engineering and Estimation 38
3.11 Quality Cost 41

PART II
Six Sigma Engineering and Implementation

Chapter 4
Six Sigma Continuous Improvement

4.1 Six Sigma Continuous Improvement Principles 43
4.2 Six Sigma Systems 44
4.3 Six Sigma Improvement and Training Models 45

Chapter 5
Design for Six Sigma: Roadmap for Successful Corporate Goals

5.1 Design for Six Sigma (DFSS) Principles 49
5.2 Design for Six Sigma Steps 51
5.3 Six Sigma Ergonomics 54
Chapter 6
Design for Lean/Kaizen *Six Sigma*

6.1 **Lean *Six Sigma* and Principles** 59  
6.1.1 Elements of Lean Manufacturing/Production 61  
6.1.2 Waste Types in Lean Manufacturing 63  
6.1.3 The Five Lean Themes and Steps 66  
6.2 **The Elements of Lean Performance Measurements** 68  
6.2.1 Strategic Measurement Model 69  
6.2.2 Key Elements That Make a Product Successful in the Marketplace 71  
6.3 **Competitive Product Benchmarking Concepts** 71  
6.4 **Integration of Kaizen, Lean, and *Six Sigma*** 73  
6.4.1 *Six Sigma*, Lean, and Kaizen Principles 73  
6.4.2 Prolong Production Performance (PPP) 76  
6.4.3 A Lean Concept in Reduction of Lead Time 79  
6.5 **Lean/Kaizen *Six Sigma* Infrastructure Evolution Tools and Highlights in Summary** 80  
6.5.1 Corporate Commitment 80  
6.5.2 Steps to Achieve the *Six Sigma* Goals 81  
6.6 **Mathematical Modeling of Lean *Six Sigma* Relations** 84  
6.6.1 Lean *Six Sigma* Experimental Design 85  

Chapter 7
Roles and Responsibilities to Lean *Six Sigma* Philosophy and Strategy

7.1 **The Roadmap to Lean *Six Sigma* Philosophy and Strategy** 103  
7.2 **Creation of *Six Sigma* Infrastructure** 103  
7.2.1 Executive Sponsor 104  
7.2.2 Champion 104  
7.2.3 Master Black Belt 104  
7.2.4 Black Belt (Team Leader) 105  
7.2.5 Green Belt (Team Participant) 106  
7.2.6 Team Recognition/Compensation 106
Chapter 8
Road Map to Lean Six Sigma Continuous Improvement Engineering Strategies

8.1 Six-Sigma Continuous Improvement Engineering 107
8.2 Definition and Measurement 108
  8.2.1 Phase 0: Process Definition/Project Selection 108
  8.2.2 Phase I: Process Measurement 116
8.3 Evaluation of Existing Process Sigma/Baseline Sigma 143
8.4 Data Analysis 143
  8.4.1 Phase II: Process Analysis 143
8.5 Optimization and Improvement 150
  8.5.1 Phase III: Process Improvement 150
8.6 Evaluation of New Sigma 159
8.7 Process Control 160
  8.7.1 Phase IV: Process Control and Maintain 160

PART III
Case Studies

Chapter 9
Six Sigma Green and Black Belt Level Case Studies

9.1 Case Study: Methodology for Machine Downtime Reduction—
  A Green Belt Methodology 175
  9.1.1 Phase 0: Problem Statement 175
  9.1.2 Phase 1: Data Collection and Measurement 175
  9.1.3 Phase 2: Analysis of Measurement 179
  9.1.4 Phase 3: Improve and Verify Analyzed Data 179
  9.1.5 Phase 4: Control and Maintain 182
9.2 Case Study: Methodology for Defect Reduction in Injection
  Molding Tools—A Black Belt Methodology 184
  9.2.1 Phase 0: Definition and Statement of Issues 184
  9.2.2 Phase 1: Data Collection and Measurement 184
  9.2.3 Phase 2: Analysis of Collected Data 191
  9.2.4 Phase 3: The Process of Improvement 191
  9.2.5 Phase 4: The Process of Control and
    Maintenance 197
Chapter 10

Six Sigma Master Black Belt Level Case Study

10.1 Case Study: Defect Reduction in Injection Molding a Multifactor Lean Central Composite Design Approach 205
   10.1.1 Scope of Injection Molded Parts 205
   10.1.2 Scope of Study 205

10.2 Composite Design Methodology 206

10.3 Modeling 212

10.4 Simulation 215

10.5 Conclusion 222

Bibliography 223

Appendix: Statistical Tables Used for Lean Six Sigma
   AI: Highlights of Symbols and Abbreviations 227
   AII: Chapter 10 Case Study Extended Equations 229
   AIII: Values of $y = \exp(-\eta)$ 233
   AIV: DPMO to Sigma to Yield % Conversion Table 235
   AV: Standard Normal Distribution 237
   AVI: Critical Values of t-Distribution 241
   AVII: Critical Values of Chi-Square Distribution with Degrees of Freedom 245
   AVIII: Upper Critical Values of the F-Distribution for $d_{1}$
         Numerator Degrees of Freedom and $d_{2}$ Denominator
         Degrees of Freedom 251
   AIX: Deming’s Condensation of the 14 Points for Management 265
   AX: Scorecard for Performance Reporting 267
   AXI: Scorecard for Performance Reporting (Partly Completed Example) 269

Index 271
Preface

ABOUT THIS BOOK

Before the 1970s, the industry standards were based on $\pm 3\sigma$ and percent (%) defect. Now, as population grows and industrial volume due to global economy becomes mass production, the $\pm 3\sigma$ and percent defect evaluations are no longer valid. The $\pm 6\sigma$ and defect per million are today’s standard for ultimate customer satisfaction and maximum profitability. Knowing that customer satisfaction is the number one priority on any organization’s list, the success of any company depends on quality and competitive product pricing. Today the globalized market allows no space for error. Thus, Six Sigma is necessary for all organizations. The theory of Six Sigma demonstrates the bottom line and customer satisfaction improvement.

Unlike other programs that concentrate on quality only, Six Sigma focuses on customer satisfaction and the bottom line. This also means the highest quality: As defects drop to 3.4 per million, quality improves dramatically.

This book explains the Lean Six Sigma concepts, the essential theory and analysis from the engineering point of view in three different parts. Part I: Statistical Theory and Concepts; Part II: Six Sigma Engineering and Implementation; and Part III: Case Studies. Throughout this book numerous examples have been cited, particularly in the plastics industry of injection molding. All other manufacturers may also benefit to a great extent. Consequently, any other organization may engineer their Six Sigma program using this book, as well. A brief description of each chapter follows:

Part I. Statistical Theory and Concepts
Chapter 1. Reviews Lean Six Sigma concepts and background (history).
Chapter 2. Demonstrates normal distribution, process capability estimation of 1 sigma through Six Sigma.
Chapter 3. Explains essentials of mathematical concepts in Lean Six Sigma engineering strategies, as well as a review of standard normal distribution and normality tests.
Part II. *Six Sigma* Engineering and Implementation
Chapter 4. The essentials of *Six Sigma* continuous improvement principles and training models.
Chapter 5. The essentials of design for *Six Sigma* principles, tools, and techniques.
Chapter 6. The essentials of design for Lean *Six Sigma* and training models.
Chapter 7. The roles and responsibilities to *Six Sigma* philosophy and *Six Sigma* infrastructure.
Chapter 8. The road map to Lean *Six Sigma* continuous improvement engineering strategies.

Part III. Case Studies
Chapter 9. Case studies with complete *Six Sigma* applications in injection molding plastics manufacturing for Green and Black Belts.
Chapter 10. An expanded version of the case study published by the author for the Black Belt level in reduction or minimization of variation in an injection molding plastic industry.

Salman Taghizadegan
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