

# Preface

Organizations run successful business only when they provide satisfaction to consumers. Competitiveness in quality is not only central to profitability, but also crucial to business survival. Consumer should not be required to make a choice between price and quality of products. Manufacturing and service organizations exist if they learn how to manage quality. In today's tough and challenging business environment, the development and implementation of a comprehensive quality policy is not merely desirable, it is essential. *Six Sigma* is a business process improvement tool to achieve customer satisfaction through a systematic problem-solving approach. It is uniquely driven by close understanding of customer requirements and reinventing business processes. It facilitates people excellence as well as technical excellence in terms of creativity, collaboration, communication, dedication and above all increases the accountability of what one does in an organization.

The Six Sigma philosophy works under a five-phase improvement cycle, called DMAIC, where D for define, M for measure, A for analysis, I for improvement and C for control. It can apply to both process improvement and product improvement or even design redesign efforts. A Six Sigma initiative includes enterprise resource planning (ERP), e-commerce and services, lean manufacturing, customer relationship management systems, strategic business partnerships, knowledge management, activity-based management, just-in-time inventory and globalization. Organizational excellence is a result of continuous improvement, which can attain only through systematic reduction of defects and variations in the process activities. Here comes the importance of Six Sigma methodology.

## Who Will Read?

This book serves three main purposes: first, an academic book for students and teachers; second, this book can be used as a reference material for engineers and managers working as Six Sigma professionals and Black Belt trainers; third, this

book could be a user manual for practitioners and project consultants. The emphasis is laid on understanding and applying the concepts of quality through project management and technical analysis by using statistical methods. The contents are prepared in a ready-to-use form with continuity established for each phases of Six Sigma project. This will help practitioners to implement the Six Sigma projects without any hurdles. Three most important aspects of Six Sigma project—Sigma estimation, sample size calculation and Sigma-level estimation—are separately treated in different chapters. Necessary tables, graphs, descriptions and checklists are provided to ease the referencing of tools and techniques. The concepts are critically assessed, reasoned and explained to enable their uses in managerial decision making. The objectives of each chapter and its continuity with subsequent chapters are also clearly established for a smooth reading. Charts and plots, a number of worked-out examples, case studies and necessary tables are provided for better understanding of the concepts.

Students of undergraduate, postgraduate and research students can make optimum use of the integrated concepts of quality engineering and management tools of statistics. The science of Six Sigma project management, integrated through engineering concepts, is explained through statistical tools and that is the uniqueness of this book. The book could also serve as a concise book for Six Sigma Green Belt, Black Belt and Master Black Belt training.

## **Inspiration**

The content is based on the author's own teaching experience, lecture notes, research publications, private communications, book references, article citations and training and consulting materials. The content is highly inspired with some available books: *The Six Sigma Way* by Peter S. Pande et al. (2003), *Juran's Quality Planning and Analysis for Enterprise Quality* by Frank M. Gryna et al. (2008), *Lean Six Sigma Statistics* by Alastair Muir (2005), *The Certified Six Sigma Black Belt Handbook* by T.M. Kubiak and Donald W. Benbow (2009), *Introduction to Statistical Quality Control* by Douglas C. Montgomery (2009), and *Statistical Process Control* by John S. Oakland (2012). The author has consulted a number of other books on Six Sigma, lean, management, engineering and general statistical books for integrating the things, as required by Six Sigma professionals.

## **About the book**

This book integrates three main disciplines: Science, Engineering and Management. The author has tried to maintain a balance of these three disciplines from a practitioner's point of view. Chapter 1 is like an introduction to various Six Sigma concepts practiced by professionals and organizations, globally. Various

perceptions and their implementation styles are critically examined in this chapter. Chapter 2 details the importance of Six Sigma project management concepts. The necessity of model-based projects is statistically emphasized. Apart from this, the importance of quantitative project management and its risk assessment and critical evaluation are also discussed in this chapter. The importance of process-based projects and models are included in Chap. 3. This is followed by the understanding of the process variation, which is an essential part of a Six Sigma project. The sources of identifying variation and possible identification of variations are discussed in Chap. 4. Since Sigma is being considered as a measure of variation, the estimation of Sigma is a vital issue in a statistical study. This is considered in detail in Chap. 5. A number of methods of estimation of Sigma is considered in the chapter. Chapter 6 details one of the important issues of project management, and that is the sample size determination. From a practitioner's point of view, many simple and easy-to-implement methods of sample size calculations are presented in the chapter. Chapters 7–11 discuss the Six Sigma philosophy, systematically, detailing with the necessary tools and techniques of statistics to execute a project. The management quality improvement topics covered in these phases are SIPOC, voice of customer, value stream mapping, brainstorming, root-cause analysis, failure-mode effect analysis, seven quality tools, Kaizen, 5S, designed for Six Sigma, quality function deployment, understanding of defect per unit (DPU) and defect per million opportunities (DPMO), Sigma-level estimation, cost of poor quality, etc.

Statistical topics include descriptive statistics, the basic notions on probability and probability distributions, point and interval estimation of parameters, parametric and nonparametric testing, correlation and regression techniques, design of experiments including factorial experiments, control charts, etc. A care has been taken to show every method in a simple and practical way without involving any rigorous theoretical steps involved. The SQC/SPC part of the project management is given the maximum emphasis, as they naturally become the essential tools to improve and control the phase of the philosophy. Most of the tools and techniques are explained through numerical and illustrative examples. The performance of a Six Sigma project is evaluated through its Sigma level. The understanding of DPU/DPMO and short-term and long-term variability of a process, etc., are the requirements for the Sigma-level estimation. This is carried out in Chap. 12. One can also refer to this chapter in the beginning of the actual project execution for setting up the goal and can be used to baseline the performance evaluation. This chapter will be handy for those involved with project evaluation and target setting at any time during the project.

The methods for continuous improvement is presented in Chap. 13, where the author has discussed various quality improvement programs offered by Deming, Juran, Feigenbaum, Crosby, Ishikawa, Taguchi, etc. Chapter 14 offers the importance of Six Sigma marketing, which is a growing area of research in Six Sigma philosophy. A Six Sigma marketing is a fact-based data-driven disciplined approach to growing market share by providing targeted product/markets with superior value. Various issues associated with Six Sigma marketing, like strategic, tactical, and

operational processes of marketing, are discussed in the chapter. The chapter on Green Six Sigma emphasizes the importance of Six Sigma projects from a sustainable business practices. Green Six Sigma is nothing but the qualitative and quantitative assessment of the direct and eventual environmental effects of all processes and products of an organization. The activities involve the systematic usage of infrastructure and manpower, optimum use of technology and accountability of sustainable business practices. The benefits of Green Six Sigma are also detailed in the chapter.

The pros and cons of Six Sigma are presented in Chap. 16. A detailed discussion on advantages and disadvantage; various limitations, dos and don'ts of Six Sigma are also discussed in the chapter. The concern about the future of Six Sigma is also given at the end of the chapter. Chapter 17 is allotted to the discussion of case studies.

Apart from this, a separate session on “Relevance for Managers” is also added at the end of each chapter to increase the usefulness of each tools and methods. The citations and references for each chapter are given at the end of each chapter. Although Microsoft® Excel®, Minitab® and R® software have been used in the book for preparing charts and plots, this is not a prerequisite for using this book.

Vadodara, Gujarat, India

K. Muralidharan



<http://www.springer.com/978-81-322-2324-5>

Six Sigma for Organizational Excellence

A Statistical Approach

Muralidharan, K.

2015, XXIV, 622 p. 141 illus., Hardcover

ISBN: 978-81-322-2324-5