LEAN SIX SIGMA
YELLOW & ORANGE BELT

60 Exercises and Rationals

CLIMBING THE MOUNTAIN

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SECOND REVISED EDITION

Lean Six Sigma Academy©

Content

RATIONALS

How to use this book

Many excellent books have been written on Lean and Six Sigma. However, just reading the books will not give you the skills to use the techniques successfully. You can develop these skills by making exercises. This book contains 60 exercises and rationals and is therefore a valuable addition to any theoretical Lean and Six Sigma course. Even experienced Lean Six Sigma specialists can use this exercise book to improve their practical skills. Finally, this book is useful for trainers and teachers who provide training within their own organization or in education.

The structure of this exercise book is based on the 'Continuous Improvement Maturity Model' (CIMM). CIMM is an open standard which is maintained by the Lean Six Sigma Academy (LSSA). This framework describes the process of continuous improvement from the initial phase to the delivery of products and services at the level of 'World Class'. The CIMM framework connects the different methods and encompasses the most commonly applied techniques in the field of problem solving, continuous improvement and new product development.

This exercise book is a supplement to the textbook 'Climbing the Mountain' by H.C. Theisens. Together, these books form the basis for developing yourself in the beautiful field of problem solving and continuous improvement. This book contains examples from multiple sectors. However, all exercises can be made without having prior knowledge of a certain sector.

To make the exercises in this book, sometimes Excel is used. The data files required for the exercises can be downloaded from the website of the LSSA: www.lssa.eu.

If you only want to practice with Lean, it is sufficient to make the exercises in chapters 1 to 6 only. Six Sigma topics are covered in Chapter 7. The exercises that only need to be completed by Orange Belts are indicated by '(OB)'.

1   World Class

1.1 Continuous improvement

1.1.1 History of Lean and Six Sigma

Various methodologies are applied within the process of operational excellence, continuous improvement and new product development. Each of these methodologies has its own origin, principles and field of application. These different approaches are combined in the CIMM framework.

Briefly describe the origin of the following methodologies and their field of application:

    a) Kaizen.
    b) Lean.
    c) Six Sigma.
    d) Agile.

1.1.2 Lean principles

Liker describes 14 principles that are applied within Toyota. These are divided into four sections:

1. Base your strategy on a long–term philosophy.
2. The right process will produce the right results.
3. Add value to the organization by developing your people and partners.
4. Continuously solving root problems drives organizational learning.

5 of the 14 principles are summarized below:

- Base management decisions on a long–term philosophy, even at the expense of short–term financial goals.
- Create a continuous process flow to bring problems to the surface.
- Build a culture of stopping to fix problems, to get quality right the first time..
- Respect your extended network of partners and suppliers by challenging them and helping them improve.
- Go and see for yourself to thoroughly understand the situation (Genchi Genbutsu).

    a) Discuss in small groups the meaning of these principles and which of these principles are present within your own organization.

1.1.3 House of Quality

An organization's strategy can be visualized by a 'House of quality'. The roof of the house visualizes the goals of the organization. The foundation of the house describes the values and principles as well as conditions for continuous improvement. The house has two pillars. One pillar is about optimizing the process and the other pillar focuses on preventing quality. The center is about the culture in the organization.

a) Draw a House of Quality on a sheet of paper or whiteboard and name as many elements from your own organization as possible.

1.1.4 Eight types of Waste

Within Lean, identifying and eliminating waste is one of the most important activities.

a) Name the eight types of waste.
b) Name at least one example of your own department or activities per waste.

1.1.5 CIMM–framework

The Lean Six Sigma training aims to teach all employees how to recognize opportunities and how to work on improvement in a structured way. It's about the continuous, never–ending, process of eliminating waste and improving the quality of products and services to be among the best in the world.

Lean originated around 1950 within Toyota. A definition of Lean is difficult to give because, in addition to Toyota's own ideas, it is also an integration of a number of philosophies. Six Sigma was developed by Motorola in 1980 and later became known for the successes of General Electric

a) Within your group, discuss the differences between Lean, Six Sigma, Kaizen and Agile.
b) Indicate which techniques are applied in your organization at the different CIMM levels.

1.2 Customer value (VOC & CTQ)

1.2.1 CTQ – Nursing home

The residents of a nursing home complain to the director that the nursers have so little time for a simple chat. The director checks with the employees whether this is correct and gets a lot of irritated faces. They shout: "We have to keep track of all kinds of things and that means we don't have enough time for the real work. We seem to work more like an administration office than in healthcare". The director decides to do something about this and wants to reduce the administrative burden for nursers by 20%.

    a) What is the CTQ of this project?

1.2.2 CTQ – Implementation organization

A government organization receives many complaints from inhabitants calling for information. In particular the complaint: "I am being sent from pillar to post" is an absolute pain point. Further research shows that it is indeed common for customers to have more than one contact with this organization before the correct information is provided. The director of this organization decides to take action and starts an improvement project.

    a) You as a Belt are asked to lead this project. The director asks you to define the CTQ for this project. What is your proposal?

1.2.3 CTQ – Ball bearing on shaft

In an assembly process of a lawn mower, a ball bearing must be mounted on a shaft at some point. It turns out that many problems arise here, because sometimes the ball bearing does not fit on the shaft. It is not clear whether the problem is the diameter of the shaft or the diameter of the ball bearing.

    a) You as a Belt are asked to lead this project. The director asks you to define the CTQ for this project. What is your proposal?

1.2.4 CTQ–Flowdown – Baking pancakes

This weekend you have a children's party. You have decided to start baking pancakes for all the children. However, children have high demands that a good pancake must meet. They like a warm, tasty, baked and good looking pancake. It is up to you to work this out in a CTQ Flowdown.

The first step is to derive an external CTQ from the cumbersome text above. Subsequently, each external CTQ must be translated into one or more internal CTQs. Answer the following questions:

    a) What requirements must a good internal CTQ meet?
    b) Translate a number of external CTQs into one or more internal CTQs.
       Draw up an operational definition for a number of internal CTQs.

1.2.5 CTQ–Flowdown – Hotel room

A hotel has asked its customers what they think is important for a pleasant stay, which can in turn lead to a good rating. This resulted in the table below.

Item	Score	Element
Check In/Out	21	Speed
		Friendliness
Bar	7	Opening hours
		Offer
		Friendliness
Elevator	6	Speed
		Size
		Availability
Room	34	Dimensions
		Cleaning
		View
		Internet
Television	10	Number of channels
		Screen size
		Usability
Bed	15	Size
		Hardness
Internet	7	Speed
		Availability
		Cost
Total	100	

    a) Make a CTQ Flowdown of the two most important topics. Make up your own mind about the measuring frequency and the priority of each element.

2   Policy development and deployment

2.1 Policy development

2.1.1 Mission, vision and core values

The mission describes the reason for an organization's existence. The vision describes the objectives of the organization. Core values reflect the values within the organization.

a) Can you describe the mission, vision and core values of your own organization, without looking them up? Do you think your colleagues are able to easily identify the mission, vision and core values?

b) If you have difficulty answering the above question, please indicate why you had difficulty with this.

2.1.2 Competitive strategies

Treacy and Wiersema have described three generic competitive strategies that help organizations to develop an appropriate strategic and operational plan: Operational Excellence, Customer Intimacy and Product Leadership.

Figure 1 – Competitive strategies

a) Indicate to what extent each of the mentioned strategies are applicable within your organization.

b) Which competitive strategy is most important to your organization and why? Will this remain the case in the future or would you like to change this?

2.1.3 Cost of Poor Quality

Feigenbaum divided quality costs into visible and invisible costs. He stated that visible quality costs are easy to identify and measure, while invisible quality costs are difficult to identify and not easy to measure. The metaphor for these visible and invisible quality costs is an iceberg. Only a small portion of the cost is visible, represented by the tip of the iceberg, while the majority of the cost is invisible and hidden under the surface of the water.
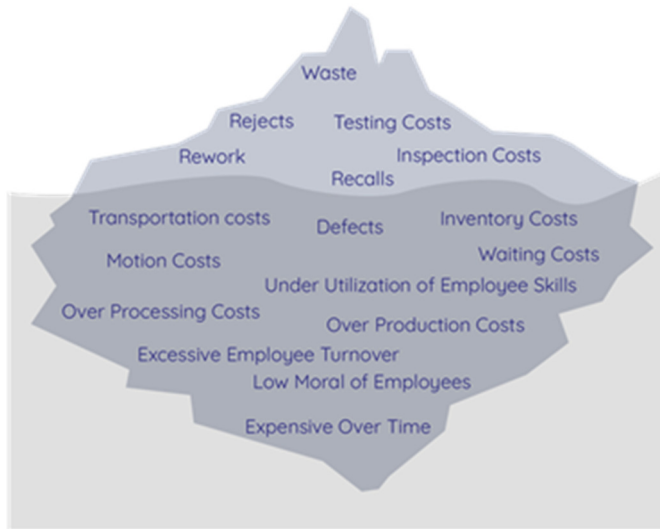

Waste

Rejects   Testing Costs

Rework   Inspection Costs

Recalls

Transportation costs   Defects   Inventory Costs

Motion Costs   Waiting Costs

Under Utilization of Employee Skills

Over Processing Costs   Over Production Costs

Excessive Employee Turnover

Low Moral of Employees

Expensive Over Time

Figure 2 – Cost Iceberg

a) Describe a number of examples of visible costs within your own department.
b) Describe a number of examples of invisible costs within your own department.