

Introduction to Six-Sigma

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Overview

- Set of tools and techniques for process improvement.
- Data driven and disciplined methodology.
- Can be used in any process: from manufacturing to transactional, from product to service.
- First imposed by Bill Smith while working in Motorola in 1986.
- This concept was further merged with the concept of process control, maximized product ability and reduced waste.

Main Principles

- Customer requirements.
- Process improvement.
- Reply on Statistical analysis to find the best possible way of working and identifying root.
- Use DMAIC (Define, measure, analyze, improvement and control), which is a step by step procedure.

Overview of Lean Manufacturing

- It is a business philosophy that was developed in the Toyota Motor company.
- Objective: to eliminate all sort of waste from the process of production.
- Different forms of waste: overproduction, waiting times for machines and operators, transport waste, poorly designed process, excessive inventory.
- Controlling the waste, a short cycle of production gives higher quality with lower costs.

Total Quality Management (TQM)

- Root: Japan's total quality control in the 1950's.
- It emphasizes teams-both ad hoc improvement team and self directed work teams with structured approach through Plan-Do-Check-Act (PDCA) circle of improvement.
- Difference with Six sigma:
 - a) **Goal:** TQM sets vague goals of customer satisfaction and highest quality at the lowest price whereas Six sigma sets a specific goal of 3.4 defects per million opportunities. Unlike TQM, project selection is of primary importance in Six sigma.
 - b) **Execution:** TQM is owned by the quality department, making it difficult to integrate throughout the business. On the other hand, six sigma is a business strategy supported by the quality improvement strategy.

Organization structure of Six Sigma

Six sigma training plans-selection criteria

- Intrinsic enthusiasm: Individuals with natural motivation.
- Organizational credibility: Respect the organization and being respected too.
- Technical competence: Superior analytical skills required for the application of six sigma.
- Goal orientation: One must have a track record of achieving organizational goals.
- Process orientation: Individuals must have understanding of how a set of task compromise a process and that effective process contribute to work efficiency.
- The training courses are named after karate learning levels such as black and green belts.

Voice of Customer (VOC)

- This is customers' expectations, preferences, comment on a product or service in discussion. It is the statement made by the customer on a particular product or service.
- Customers are classified in two broad groups:
 - a) **Internal customers:** internal to the organization, e.g.- any functional employee.
 - b) **External customer:** Not a part of the organization, e.g.- clients, shareholders.

Different categories of VOC

- **Voice of assistance:** feedback from the employees.
- **Voice of investor:** feedback from management shareholders.
- **Voice of customers:** feedback from clients and customers.
- **Voice of process:** feedback from measuring of critical to process and critical to quality.

Different methods for collecting VOC

- **Surveys:** Design a set of questionnaires which is sent out to potential or existing customers. It is cost effective though suffers from low response rate.
- **Interviews:** Individual meetings with potential or existing customers where a set of questions are asked, answered and discussed to tackle complex issues properly.
- **Focus group:** A group of people called together in one conference room and a discussion is held on specific topics that needs to be addressed. This can handle critical to quality (CTQ) but are difficult to generalize.
- **Suggestions:** The client or customer feedback is received and treated as suggestions to improve product or service. It provides good improvement opportunities but does not look at overall process.
- **Observations:** During the course of process, individuals can have observations and provide feedback to process which does not act as a voice of customers.

Critical to Quality (CTQ)

- It is the product or service characteristic that must meet to satisfy customers' specifications or requirements.
- In six sigma, it is gathered through VOC. VOC data is necessary to determine the gap between the customers' CTQ requirements and the current level of process. After analyzing the gap, the necessary action is taken to meet the requirements.
- CTQ's are not static; they change from time to time with the needs of the customers. Hence CTQ need to be analyzed continuously to meet customers' needs.

DMAIC Phases

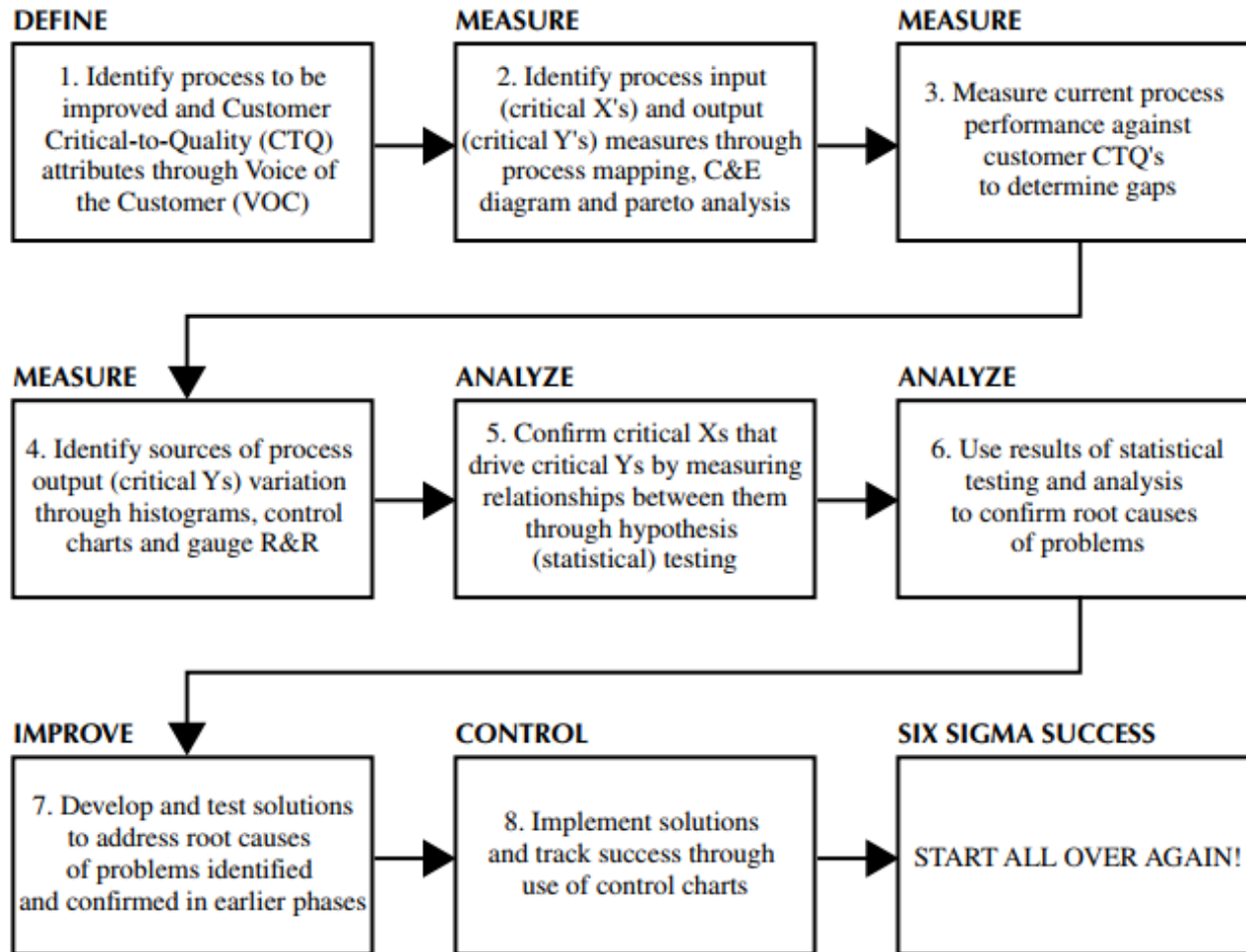


FIGURE 6.1 Eight steps to transactional Six Sigma success.

Acknowledgement

- Sougata Das, 6th Semester student, 2021, Department of Statistics, Bidhannagar College.
- Ehrlich, B. Harris (2002): Transactional Six Sigma and Lean Servicing, 2nd Edition, St. Lucie Press.