



Total Quality Management

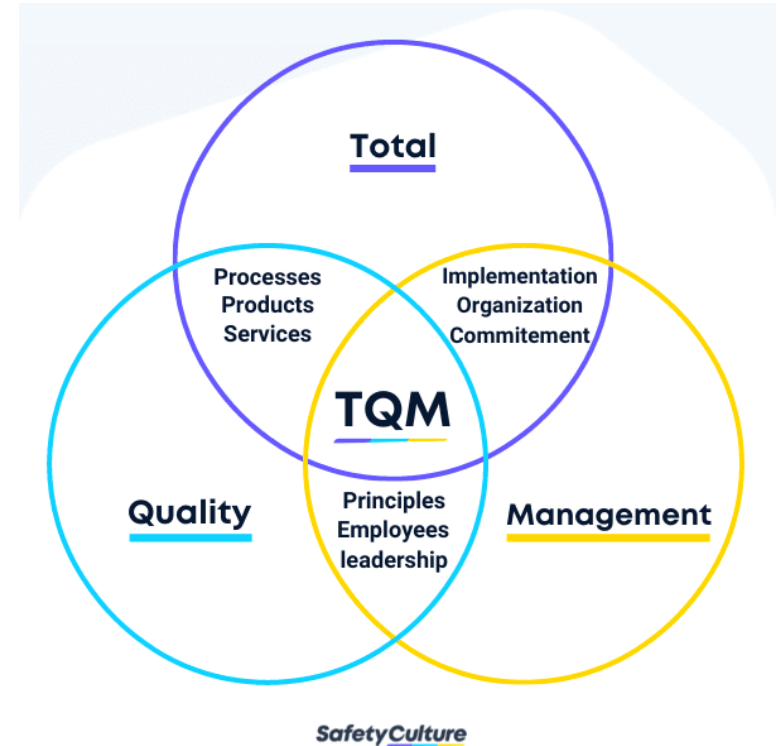
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- Concept of TQM
- Guiding principles
- Key elements of TQM
- Quality costs
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Total Quality Management:

- Management philosophy
- High degree of differentiation
- Reducing costs
- Juran (1986) - planning, organization and control
- Ishikawa (1976) - importance of training, cause-effect diagrams



Concept of TQM

- involvement of all employees in the continuous improvement of:
 - PROCESSES, SERVICES, PRODUCTS, ORGANIZATION
- **OBJECTIVE:**
 - improvement the quality of products and services provided by an organization
 - meet or exceed customer expectations
- **APPLIED:** manufacturing and services sectors
 - including healthcare, education, and finance

Guiding principles:

- **Customer focus:** The customer determines the quality level of the products and services
- **Employee involvement:** All employees must participate in the processes and system
- **Focus on process:** Processes must be continually analyzed to identify weaknesses
- **Integrated business systems:** All TQM processes should be integrated into a business process

Guiding principles:

- **Strategic and systematic approach:** Planning and management are required using a strategic plan with quality as a base component
- **Continual improvement:** A focus on continually improving quality helps an organization adapt to changing markets and achieve competitive advantages
- **Focus on data:** data collection, documented and analyzed to improve decision-making
- **Communication:** Communication between teams with information - strategies, methodologies or timeliness

Key elements of TQM:

- **Foundation:**

- Ethics, Integrity and Trust



- **Building Bricks:**

- Training, Teamwork and Leadership



- **Binding Mortar:**

- Communication



- **Roof**

- Recognition



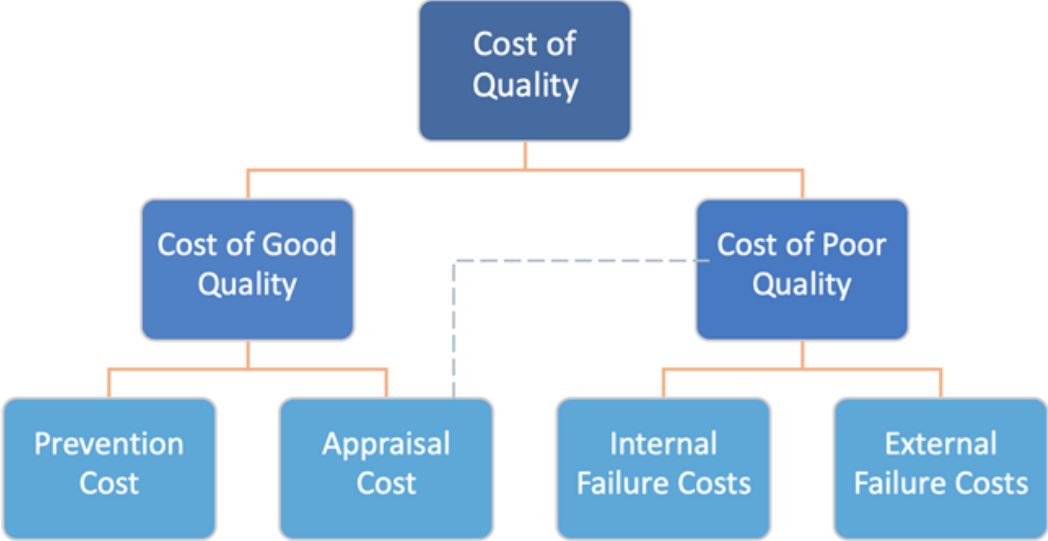
Quality Costs

- The Cost of Quality can be portrayed by the sum of two factors, the Cost of Good Quality (COGQ) and the Cost of Poor Quality (COPQ).

$$\text{CoQ} = \text{CoGQ} + \text{CoPQ}$$

- $\text{CoGQ} = (\text{PC} + \text{AC}) = (\text{Prevention Cost} + \text{Appraisal Cost})$
- $\text{CoPQ} = (\text{IFC} + \text{EFC}) = (\text{Internal Failure Cost} + \text{External Failure Cost})$

Quality costs classification



(turntechprecision.com, 2020)

Appraisal Costs

- Measuring and monitoring activities related to quality
- They could include:
 1. Verification
 2. Quality audits
 3. Supplier rating

Prevention Costs

- Incurred to prevent or avoid quality problems
- They could include:
 1. Quality planning
 2. Quality assurance
 3. Training

Internal failure costs

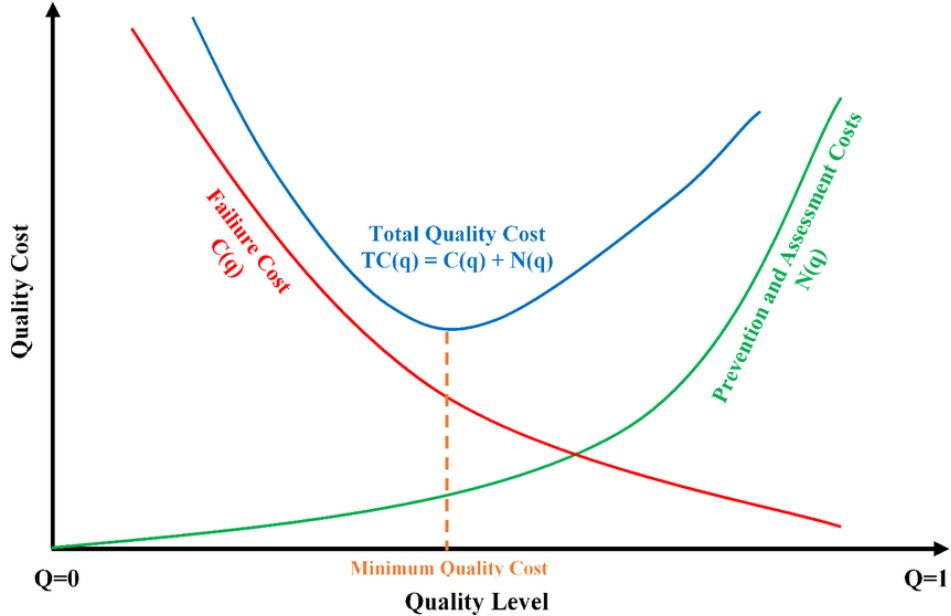
- Incurred to remedy defects discovered before the product or service is delivered to the customer
- They could include:
 1. Waste
 2. Scrap
 3. Rework or rectification
 4. Failure analysis

External failure costs

- Incurred to remedy defects discovered by customers
- They could include:
 1. Repairs and servicing
 2. Warranty claims
 3. Complaints
 4. Returns

(Duffy, 2013)

PAF model



Examples of TQM:

- Toyota Production System
- Motorola's Six Sigma
- Amazon
- Starbucks
- Apple
- Healthcare Sector

Taguchi method

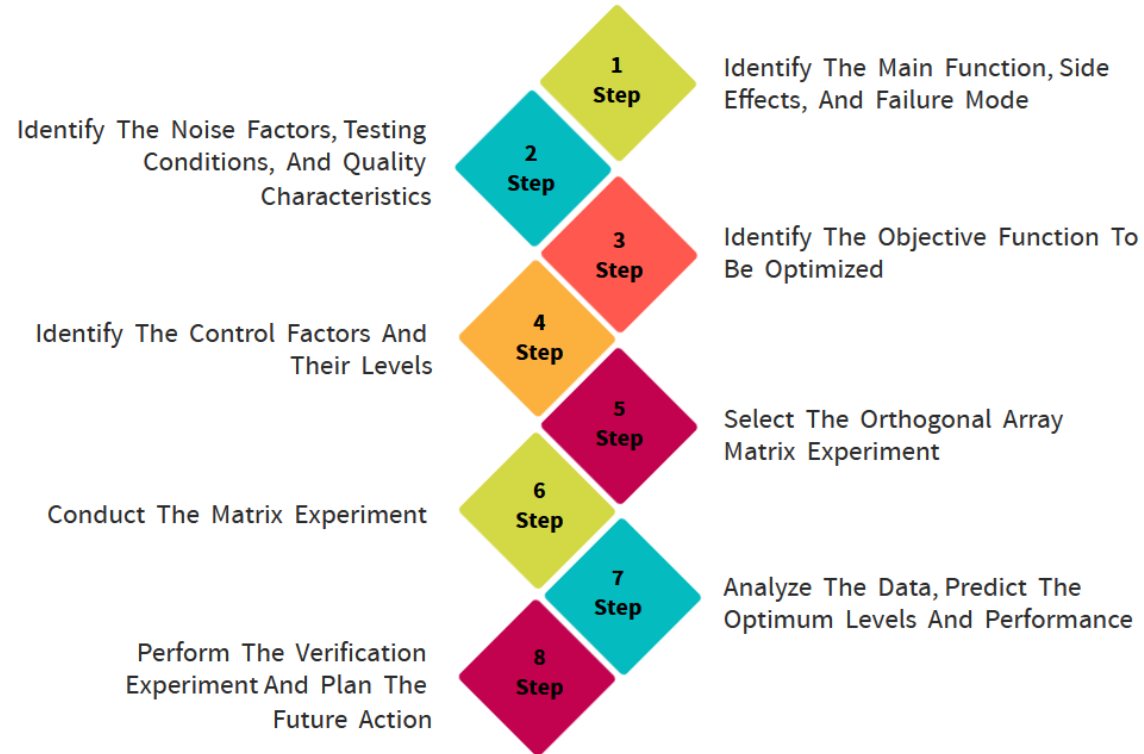
Taguchi Method

- Statistical method (ROBUST DESIGN METHODS)
- Developed by Genichi Taguchi in the 1950s
- OBJECTIVE: improvement the quality of manufactured goods
- FIELDS: engineering, biotechnology, marketing and advertising
- ADVANTAGE: user-friendly



Total Quality Management

8 Steps of Taguchi Method



Simple example

- **OBJECTIVE:** design a new golf ball to maximize ball flight distance
- **4 CONTROL FACTORS**
 - Core material
 - Core diameter
 - Number of dimples
 - Cover thickness
- **1 NOISE FACTOR** = type of golf club
- Each control factor has 2 levels, noise factor is two types of golf clubs (driver, 5 iron)
- Measurements of flight distance for each club type
 - the data in two noise factor columns in the worksheet



Taguchi method calculation

Signal-to-noise ratio

- Measure of robustness, which can be used to identify the control factor settings
- Different types of control factor levels in design you can chose (depending on goal of measure):
 - Larger is better

$$S/N = -10 \cdot \log(\Sigma(1/Y_2)/n)$$

- Smaller is better

$$S/N = -10 \cdot \log(\Sigma(Y_2)/n)$$

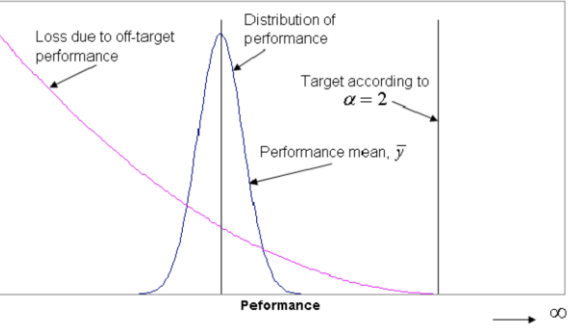
- Nominal is best

(I) $S/N = -10 \cdot \log(s_2)$

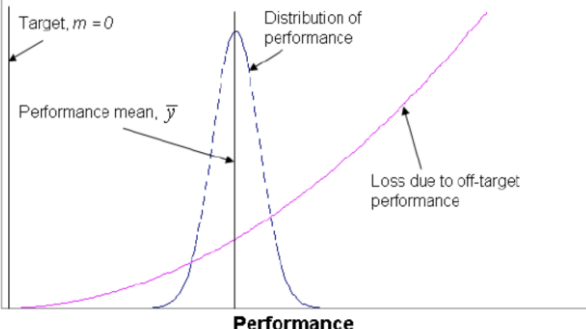
(I) $\frac{S}{N} = 10 \cdot \log\left(\frac{\bar{Y}^2}{s^2}\right)$

Taguchi method graphs

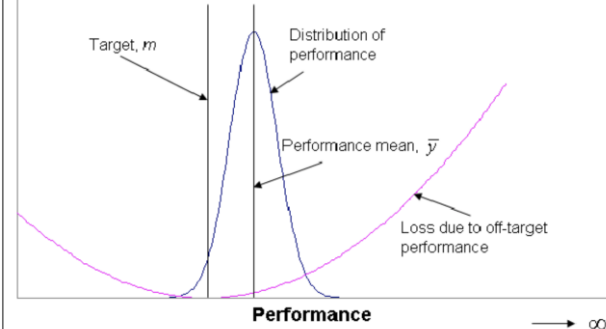
Larger-the-better



Smaller-the-better



Nominal-the-best



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- 1. TQM is a shortcut of ...**
- 2. TQM is known for ... degree of differentiation**
- 3. One of the Guiding principles is ... focus**
- 4. Another Guiding principle is ... involvement**
- 5. One of the key elements of TQM**
- 6. TAGUCHI is a ...**

1. **—** — — — —

2. **—** — — —

3. — — — — — — **—** —

4. — — — — — — **—** —

5. — — — **—** — — — — — — —

6. — — — — — **—**

1. 0 _ 4

2. 0 _ 3

3. 6 _ 1

4. 6 _ 1

5. 3 _ 6

6. 5 _ 0



Thank you for your
attention!