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# Continuous Improvement Toolkit

## **Cost of Quality**

## Managing Risk

PDPC

FMEA RAID Logs

Fault Tree Analysis

Risk Assessment\*

Decision Tree

Traffic Light Assessment

Lean Measures

KPIs

OEE

Capability Indices

MSA

RTY

Descriptive Statistics

**Cost of Quality**

Probability Distributions

ANOVA

*Reliability Analysis*

Graphical Analysis

Hypothesis Testing

## Understanding Performance

Run Charts

Scatter Plot

Correlation

Regression

*Bottleneck Analysis*

*Visual Management*

Control Charts

5 Whys

*Chi-Square Test*

*Multi-Vari Charts*

*Flow*

*Value Analysis*

5S

Benchmarking

Sampling

Fishbone Diagram

Relations Mapping\*

Wastes Analysis

SMED

Focus groups

Interviews

Brainstorming

*Analogy*

SCAMPER\*\*\*

Time Value Map

Process Redesign

Photography

Check Sheets

Nominal Group Technique

Mind Mapping\*

IDEF0

Value Stream Mapping

SIPOC

Measles Charts

Surveys

Affinity Diagram

Attribute Analysis

Flow Process Chart

Process Mapping

**Data**

*Critical Incident Technique*

*Lateral Thinking*

*Visioning*

Flowcharting

Service Blueprints

**Collection**

Observations

**Creating Ideas\*\***

## Deciding & Selecting

Pros and Cons

Importance-Urgency Mapping

*Break-even Analysis*

Cost -Benefit Analysis

Force Field Analysis

Pugh Matrix

Voting

SWOT

QFD

Matrix Diagram

TPN Analysis

Kano Analysis

Prioritization Matrix

Critical-to Tree

Paired Comparison

Cause & Effect Matrix

Pareto Analysis

Confidence Intervals

**Understanding Cause & Effect**

Probability Distributions

ANOVA

Graphical Analysis

Hypothesis Testing

Design of Experiments

Run Charts

Scatter Plot

Correlation

Regression

*Bottleneck Analysis*

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## Planning & Project Management\*

RACI Matrix

Stakeholders Analysis

PEST

*PERT/CPM*

*Activity Diagram*

Roadmaps

Project Charter

Gantt Chart

*PDCA*

Control Planning

Gap Analysis

*Hoshin Kanri*

*Kaizen*

How-How Diagram

Tree Diagram\*\*

Standard work

*Simulation*

*TPM*

Mistake Proofing

*Pull Systems*

JIT

Ergonomics

*Work Balancing*

*Automation*

*Bottleneck Analysis*

*Visual Management*

*Flow*

*Value Analysis*

5S

Wastes Analysis

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Time Value Map

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Service Blueprints

**Designing & Analyzing Processes**

## - Cost of Quality

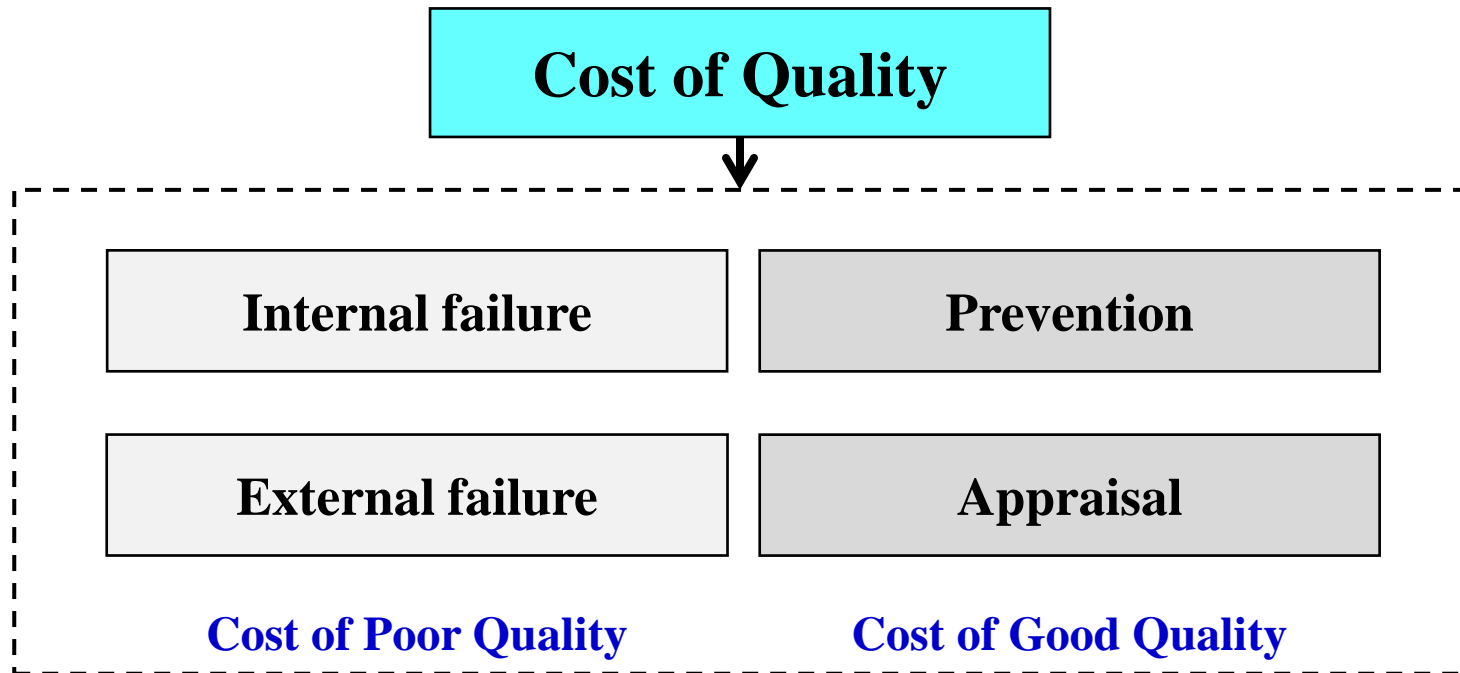
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- ❑ It's an initial financial analysis conducted for the improvement project.
- ❑ Losses due to poor performance and quality range from 20% to 30% of gross sales.
- ❑ Having such information allows an organization to determine the potential savings to be gained by implementing process improvements.



# - Cost of Quality

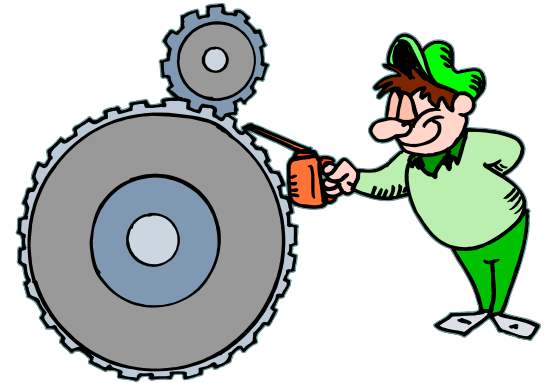
## Four Major Categories:



# - Cost of Quality

## Prevention:

- ❑ Prevention costs are associated with preventing defects before they happen.
- ❑ **They include:**
  - The cost of redesigning the process to remove the cause of poor performance.
  - Redesigning the service or product to make it simpler to produce.
  - Training employees in the methods of continuous improvement.
  - Working with suppliers to increase the quality of purchased items or contracted services.
  - Equipment to better control processes.



# - Cost of Quality

## Appraisal:

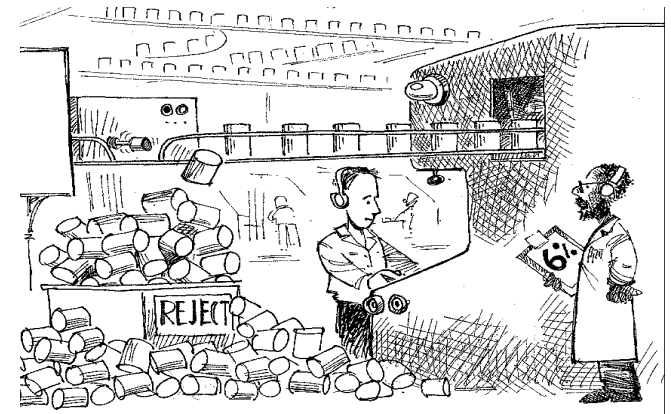
- ❑ Appraisal costs are incurred when the management assess the level of performance of the processes.
- ❑ They refers to any systems, processes or procedures that exist only to look for problems.
- ❑ **Examples:**
  - Auditing processes.
  - Testing and inspection.
  - Dealing with the suppliers' quality problems.



# - Cost of Quality

## Internal Failure:

- ❑ Internal failure costs result from defects that are discovered during the production of a service or product.
- ❑ Two main categories, Rework and Scrap.
- ❑ **Rework incurred if:**
  - Some aspect of a services must be performed again.
  - A defective item must be rerouted to some previous operation to correct the defect.
- ❑ Scrap incurred if a defective item is unfit for further processing.



# - Cost of Quality

## External Failure:

- ❑ External Failure Costs arise when a defect is discovered after the customer receives the service or product.
- ❑ Encountering defects and correcting them in this case is costly.
- ❑ External failure costs erode market share and profits.
- ❑ Dissatisfied customers talk about bad service or products to their friends, who in turn tell others.

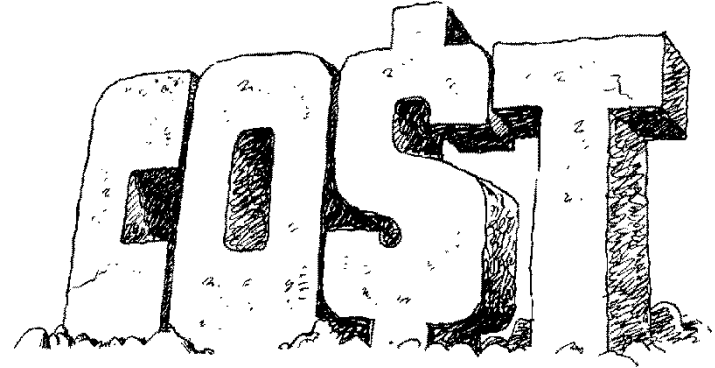




# - Cost of Quality

## What About:

- ❑ Maintenance costs.
- ❑ Downtime losses.
- ❑ Extra material used.
- ❑ Extra utility used.
- ❑ Cost of lost opportunity.
- ❑ Complaints investigation.
- ❑ Cost of extra handling.
- ❑ Cost of extra storage.
- ❑ Damage due to transport.
- ❑ Damage caused by storage.



## - Cost of Quality

### Example:

- ❑ If you have the oil changed in your car and that the oil filter is improperly installed, causing the oil to drain onto your garage floor.
- ❑ What are the COPQs that may result:

**The cost the additional oil and filter**

**The additional time spent correcting the mistake**

**Your loyalty / lost of future revenue**

**Reputation / lost of future revenue**

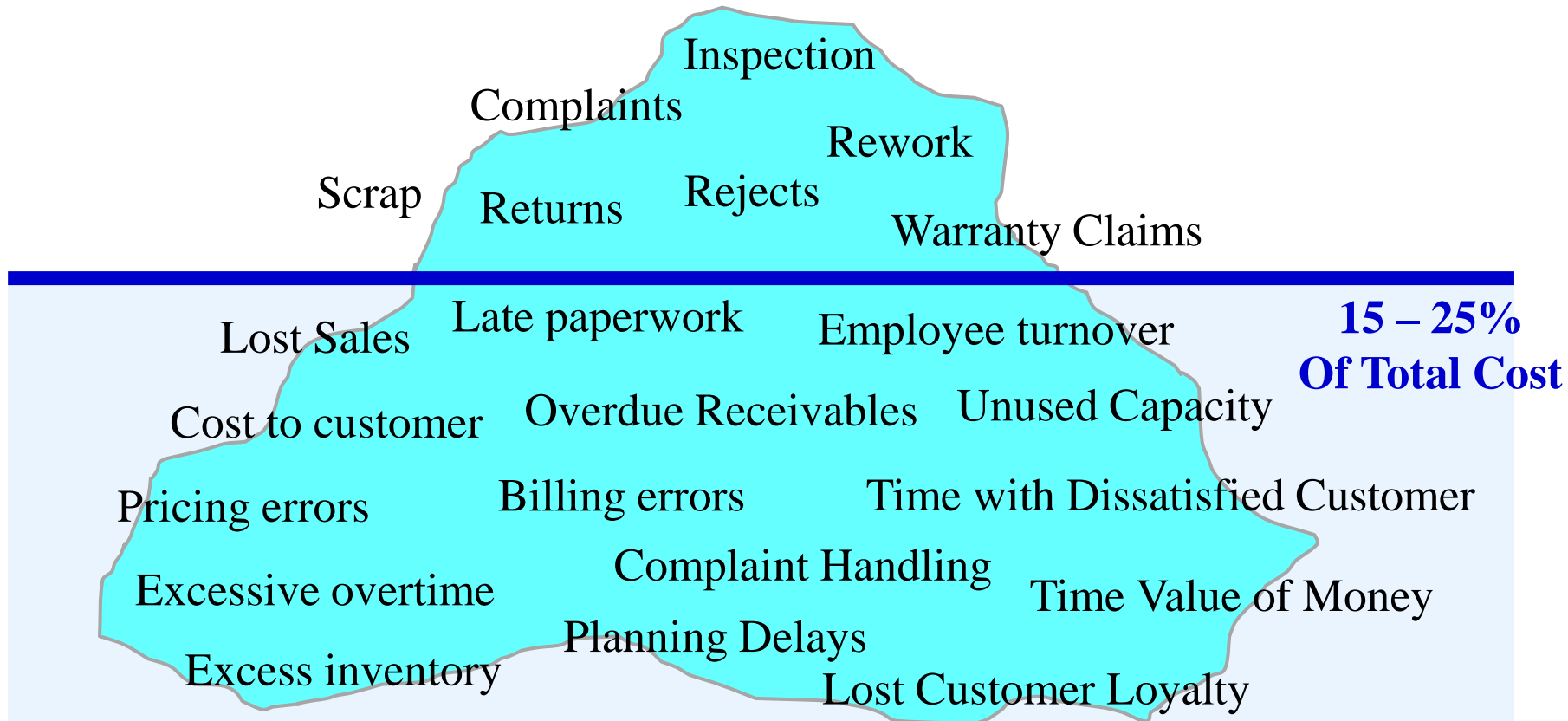


## - Cost of Quality

<b>COPQ that are Recognized Easily</b>	<b>COPQ that are Difficult to Recognize</b>
Rejects	Excessive overtime
Rework	Excess inventory
Inspection	Cost to customer
Testing	Employee turnover
Customer returns	Billing errors
Customer complaints	Pricing errors
Recalls	Late paperwork
etc.	etc.

# - Cost of Quality

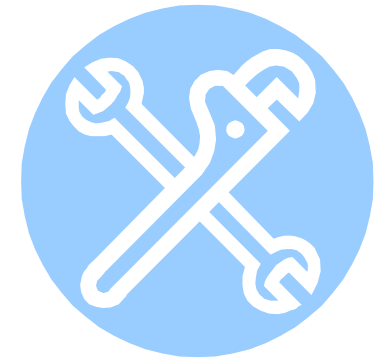
## The Iceberg Model:



# - Cost of Quality

## Approach:

- ❑ Identify all activities that exist only because of poor quality.
- ❑ Identify where the cost of each activity is experienced.
- ❑ Determine the method you will use to calculate COQ:
  - Total resources calculation.
  - Unit cost calculation.
- ❑ Collect the data and estimate the costs.
- ❑ Involve the finance department when estimating the costs.



## - Cost of Quality

### Example – Total Resources Calculation:

Activity Resulting from Quality	Cost Location	Total Cost of Resources	% of Resources to Counter Poor Quality	Total Cost for Activity
<b>Final Inspection</b>	- Wages & Benefits - Training	<b>\$127,000</b>	<b>80%</b>	<b>\$101,600</b>
<b>Rework</b>	- Wages & Benefits	<b>\$78,500</b>	<b>12%</b>	<b>\$10,500</b>
<b>Customer Complaint Resolution</b>	- Wages & Benefits - Training - System Maintenance	<b>\$63,750</b>	<b>100%</b>	<b>\$63,750</b>
<b>Total COQ</b>				<b>\$175,850</b>

## - Cost of Quality

### Example – Unit Cost Calculation:

Activity Resulting from Quality	Cost Location	Frequent of Activity Per Year	Average Cost	Total Cost for Activity
<b>Final Inspection</b>	- Wages & Benefits - Training	<b>12</b>	<b>\$8,125</b>	<b>\$ 97,500</b>
<b>Rework</b>	- Wages & Benefits	<b>7</b>	<b>\$2,600</b>	<b>\$18,200</b>
<b>Customer Complaint Resolution</b>	- Wages & Benefits - Training - System Maintenance	<b>37</b>	<b>\$2,050</b>	<b>\$75,850</b>
<b>Total COQ</b>				<b>\$191,550</b>

## - Cost of Quality

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### **Further Information:**

- ❑ It is important to involve the finance department in a review of the benefits of the project.
- ❑ Although the business case of the project will be based on the hard benefits, the softer benefits such as improved customer satisfaction shouldn't be ignored.
- ❑ It may be possible to convert them to hard benefits.
- ❑ There are usually many different COQs for each problem.