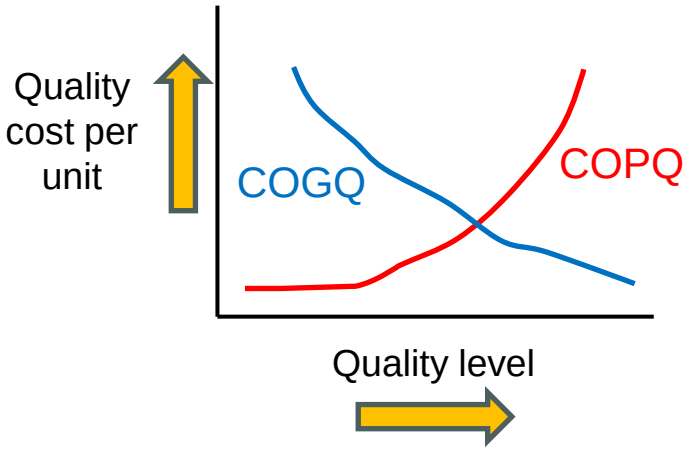
Cost of Quality (COQ)

Problem
How to minimize the cost of quality?

Difficulty
Work with an SME

- **Cost of Quality=COPQ+COGQ**
- **Cost of Poor Quality (COPQ)**
  - cost associated with poor-quality products/services
  - = Internal Failure costs + External Failure costs
- **Cost of Good Quality (COGQ)**
  - cost to prevent poor-quality products/services
  - = Appraisal costs + Preventative costs



Find 4 costs making up cost of quality

Minimize Cost of Quality

- Choose which cost to reduce
- Implement quality improvements

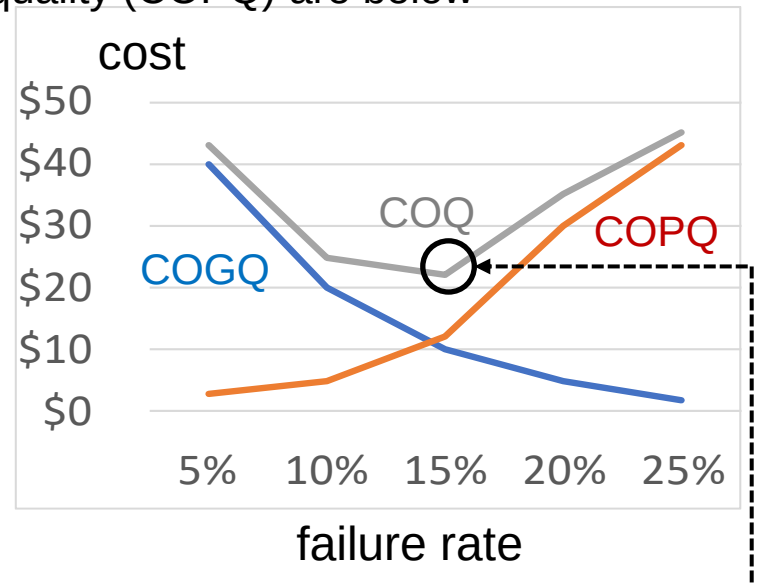
1. Define quality goals; COQ of 10–15% may be OK
2. Collect cost data: internal failure, external failure, appraisal, prevention
3. Identify which quality costs should be reduced (if any), then use appropriate methods for each:
   - For Internal Failure costs: Poka-Yoke (Mistake-Proofing), Root Cause Analysis,…
   - For External Failure costs: Customer Surveys, Warranty Programs, …
   - For Appraisal costs: Statistical Process Control (SPC), Statistical inspections, …
   - For Prevention costs: Audits, Employee Training, …
4. Implement determined quality improvements.
5. Repeat

Cost of Quality (COQ) – Example – Making widgets

Imagine we are making widgets.
The per unit costs of good quality (COGQ) and poor quality (COPQ) are below

failure rate

	5%	10%	15%	20%	25%
COGQ	$40	$20	$10	$5	$2
COPQ	$3	$5	$12	$30	$43
COQ (sum)	$43	$25	$22	$35	$45



For COGQ: it is very expensive to have a low failure rate

- For example: recalibrate machines every hour, update employee training weekly, many inspections of incoming materials, …

For COPQ: it is very expensive to have a high failure rate

- For example: recalls, replacements, customer ill-will, …

Hence, there is a value where the total cost of quality (COQ) is least.

- In the example, the COQ is minimized at $22/unit at a common failure rate of 15%

Cost of Quality (COQ)

Slide 1

1. COQ applies beyond manufacturing to nearly any product or service (e.g., code reviews for software or exit interviews for personnel management).
2. The 1-10-100 rule states that that one dollar spent on prevention will save 10 dollars on correction and 100 dollars on failure costs.
3. **Preventive costs** include: holding contract reviews, performing market research, assessing process capability, performing quality audits, performing supplier evaluations, training.
4. **Appraisal costs** include: ensuring calibration, holding inspections at multiple points in the value stream, training.
5. **Internal failure costs** include: performing failure analyses, scrap, testing, repair, rework
6. **External failure costs** include: customer engagements, investigations, loss of goodwill, financial penalties, cost to replace or repair.

Slide 2

1. There is a cost just to determine the COQ.
2. In the example, the failure rates of COGQ and COPQ are the same, this will not be true in general.

Recommended web sites for more information

- https://www.whatissixsigma.net/cost-of-poor-quality/
- https://www.compliancequest.com/cq-guide/copq-categories-prevention/