Quotes on the Cost of Poor Quality

- Quality is free. It is not a gift, but it is free. What costs money are the unquality things – all the actions that involve not doing jobs right the first time. Phillip Crosby
- Defects are not free. Somebody makes them, and gets paid for making them. Edward Deming
- In the USA about a third of what we do consists of redoing work previously “done.” Joseph Juran

History of Cost of Quality

- Joseph Juran first discussed COQ analysis in 1951 edition of his book Quality Control Handbook
- Feigenbaum identified four cost categories in a 1956 article in Harvard Business Review
- ASQC established Quality Cost Committee in 1961
- ASQC included COQ as one of eight topics covered by the Certified Quality Engineer Exam in 1968
- Phillip Crosby include chapter entitled Cost of Quality in his 1979 book entitled Quality is Free

1972 ASQC CQE BoK

1. Fundamental concepts of probability, statistical quality control and design of experiments.
2. Quality planning and management.
3. Reliability and maintainability.
4. Quality cost analysis.
5. Metrology, inspection and testing.
6. Data processing.
7. Quality auditing.
8. Human factors and motivation.

Juran's 1951 text

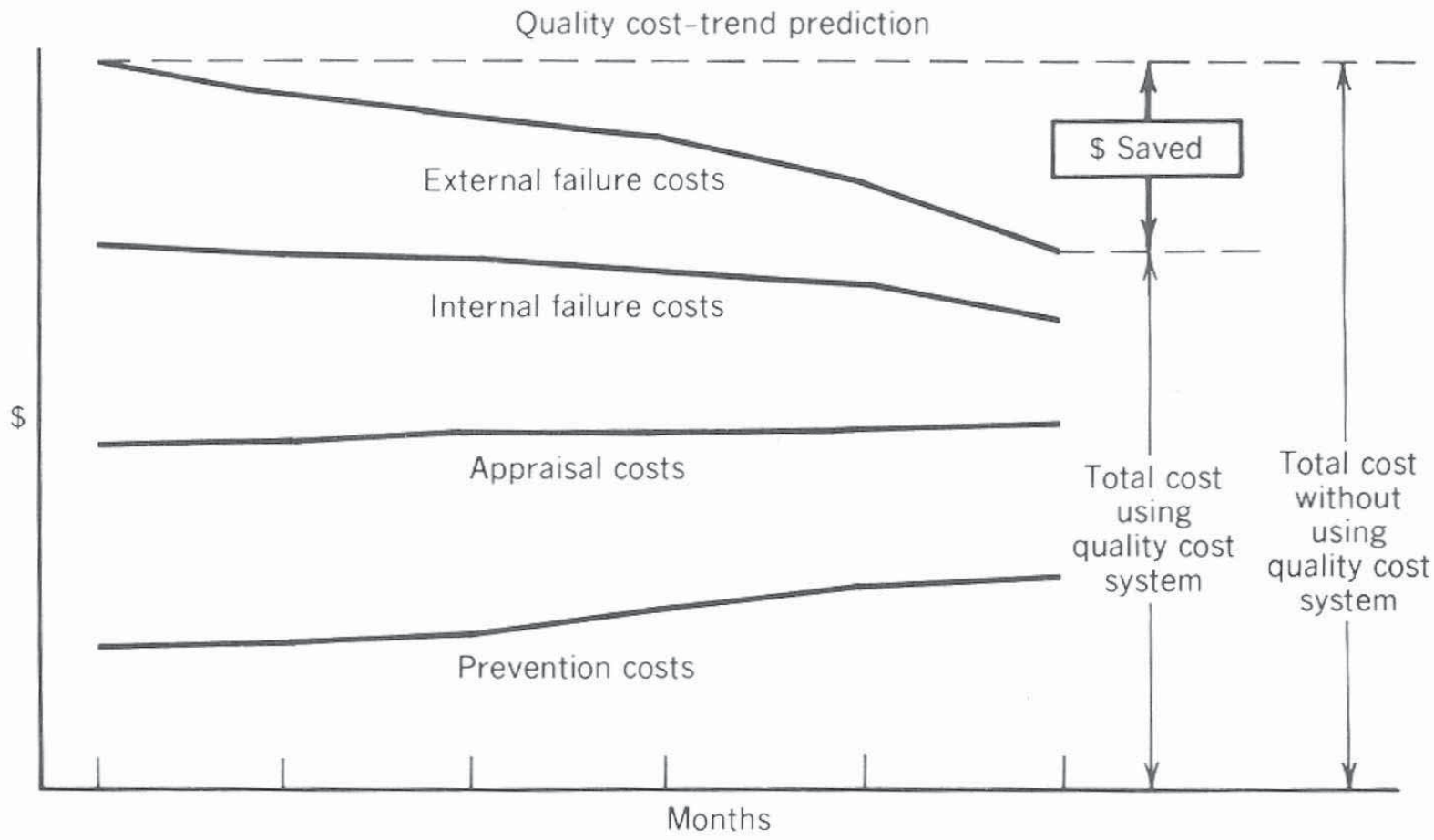


FIGURE 2-7 Graph of Quality Costs Showing Changes and Savings

The Costs of Quality (COQ)

Phil Crosby defined “Quality Costs” are those costs associated with the quality of the product or service being produced. There are four categories of Quality Costs:

- PREVENTION: costs incurred to prevent/minimize failures or minimize appraisal and rework costs.
- APPRAISAL: costs incurred in order to discover the condition of the product and all costs needed to support appraisal activities.
- INTERNAL FAILURE: costs incurred because the raw materials, in-process materials or components, or finished goods are not manufactured right the first time, and this is discovered prior to the items leaving the company.
- EXTERNAL FAILURE COSTS: costs incurred because the customer discovers a lack of conformance of the product to the requirements or expectations of the user.

Examples of Prevention Costs

- Quality and process control planning:
  - ✓ Developing the quality system
  - ✓ Defining requirements
  - ✓ Procedure writing
- QA program audits
- “Poka-yoke” activities (mistake-proofing)
- System implementation
- Design reviews
- All training for tasks not included in other costs of quality
- Process capability studies
- Data acquisition for quality analysis
- Quality reports
- Process improvement projects

Examples of Appraisal Costs

- Inspection / Verification and testing of incoming materials and product to assure conformance to requirements
- Product audits
- Mandatory compliance audits
- Set-up, maintenance, and calibration of test equipment
- Field testing
- Internal functional testing
- Evaluation of field stock and spares
- Inventories to determine degradation
- All materials and services needed to conduct the appraisals, including training, procedures, etc.

Examples of Internal Failure Costs

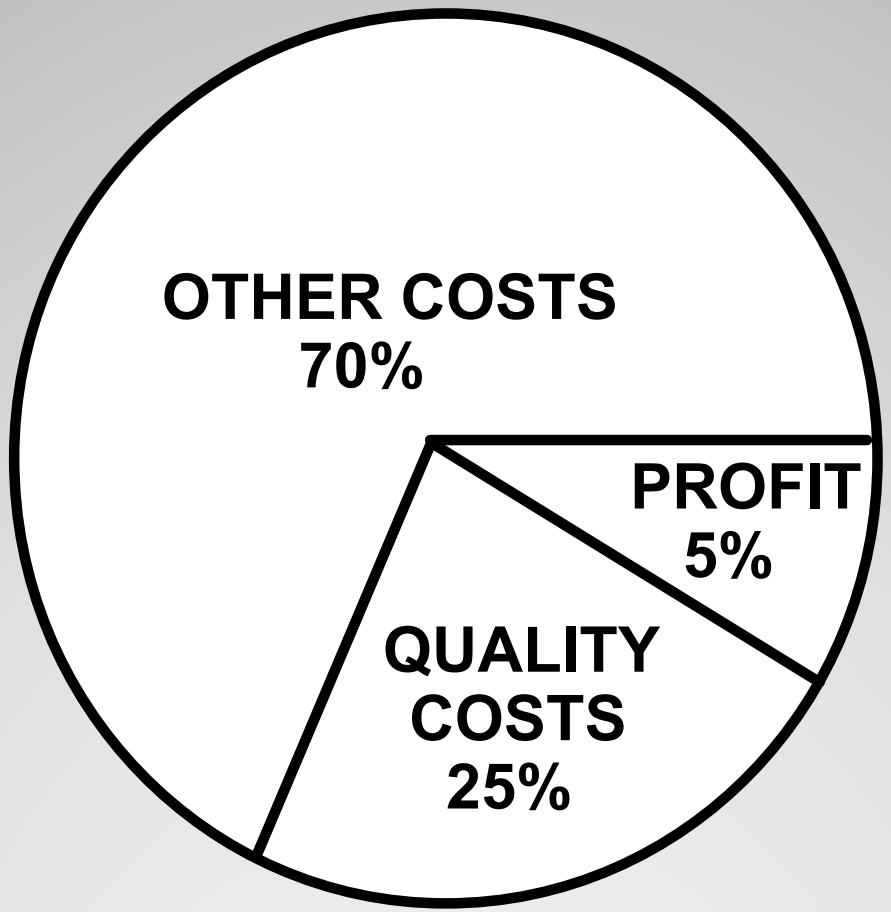
- Scrap
- Sort, Rework, and Repair
- Troubleshooting
- Re-inspection and Re-test
- Material Review Boards (MRB's)
- Downgrading
- Downtime
- Yield Loss
- Remedial engineering
- Excessive lead time and inventory costs
- Over-production
- Increased non-value-added cycle time

Examples of External Failure Costs

All Internal Failure Costs, PLUS:

- Complaint handling, investigation, and response
- Product and customer service
- Processing and repairing returned material
- Replacement and repair warranty costs
- Customer incurred costs charged back
- Concessions to customers
- Loss of sales and revenue from repeat business or potential customers

Quality Costs as a Percent of Sales



TYPICAL U.S. COMPANY

The typical U.S. company spends very little of its total quality costs on prevention, with the majority spent on appraisal and internal failures:

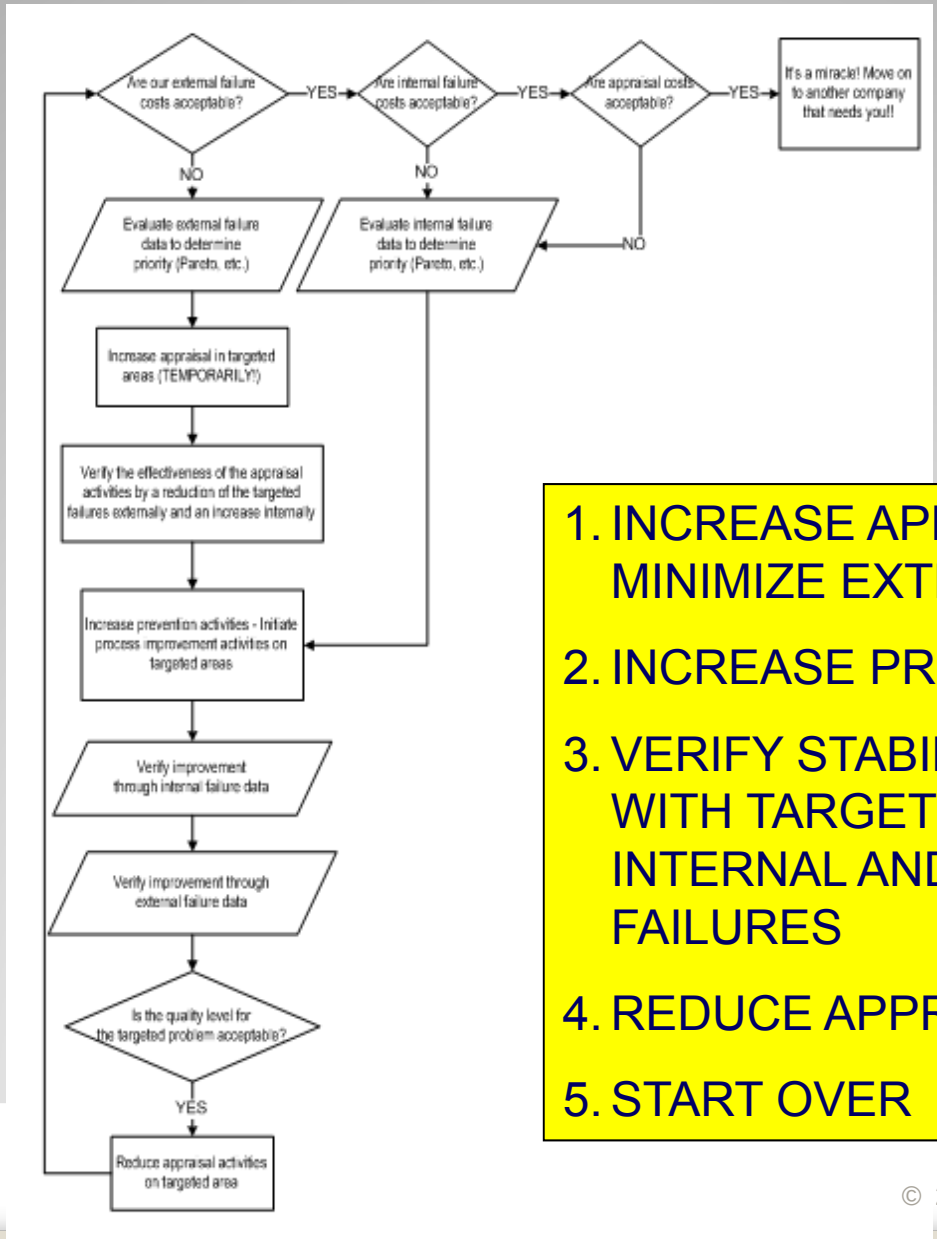
- PREVENTION 5%
- APPRAISAL 47%
- INTERNAL FAILURE 46%
- EXTERNAL FAILURE 2%

- The relatively high proportion of appraisal costs vs. the low proportion of prevention costs means that we rely on appraisal (detection) rather than prevention to protect our customers.
- The relatively high proportion of internal failures vs. external failures means that we do catch a lot of the problems before our customers sees them.
- The relatively low proportion of external failures is due to the fact that we cannot measure all of the costs of customer dissatisfaction, such as loss of future business, poor word of mouth, etc.
- All failure modes found externally should also be found internally and at a higher rate or appraisal is not effective.
- The worst COQ is external failures seen by the customer!

Current Texts on COQ

- The Executive Guide to Understanding and Implementing Quality Cost Programs by Douglas C. Wood, ASQ Press, 2007
- Principles of Quality Costs, by Douglas C. Wood, ASQ Press, 2013
- As a Six Sigma Effort
- About 20% of top 500 companies use someway
- Steps in Managing Quality Costs
- Evaluate Appraisal Costs
- Linking Prevention Activities to High Cost Appraisal and/or Failure Areas

The COQ Cycle



1. INCREASE APPRAISAL TO MINIMIZE EXTERNAL FAILURES
2. INCREASE PREVENTION
3. VERIFY STABILIZED PROCESS WITH TARGETED REDUCTION IN INTERNAL AND EXTERNAL FAILURES
4. REDUCE APPRAISAL!!
5. START OVER