

## Quality Engineering and Management

### Lecture IV

## Quality Costs

[Costs associated with "poor" quality"]

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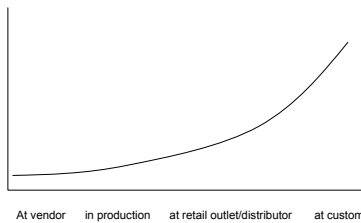
## Quality Costs

### Costs of

**Making, finding, repairing and avoiding**

### Defects

## Cost of a Defect at Different Stages of a "Process"



## Metrics for Quality Cost Analyses

### Qualitative Metrics

### Quantitative Metrics

## Measurement Bases for Quality Costs

**Direct labor hour**  
**Direct labor dollars**  
**Standard manufacturing cost dollars**  
**Value added dollars**  
**Sales dollars**  
**Product units**

## Measurement Bases for Quality Costs

### Advantages of Measurement Bases

Direct labor hour - readily available and understood  
Direct labor dollars - available and understood.  
Tends to balance inflation effects  
Standard manufacturing cost dollars - more stable than measures tied to direct labor  
Value added dollars - useful when processing costs are important  
Sales dollars - appeals to higher management  
Product units - simplicity

## Measurement Bases for Quality Costs

### Disadvantages of Measurement Bases

- Direct labor hour** - can be drastically influenced by automation
- Direct labor dollars** - can be drastically influenced by automation
- Standard manufacturing cost dollars** - includes overhead costs both fixed and variable
- Value added dollars** - problem comparing different types of operations
- Sales dollars** - can be influenced by changes in prices, marketing costs, demand, etc.
- Product units** - not appropriate when different products are made unless "equivalent" items can be defined

## Metrics for Quality Cost Analyses

### Hidden Costs of Poor Quality



## Categories of Quality Costs

### Costs "non-conformance"

### Costs of "conformance"

## Categories of Quality Costs

### Costs "of non-conformance"

#### Internal Costs

*Evaluation, dispose, correct or replace product, service prior to delivery to the customer*

#### External Costs

*Costs incurred when a nonconforming product gets to the customer*

## Categories of Quality Costs

### Costs of "conformance"

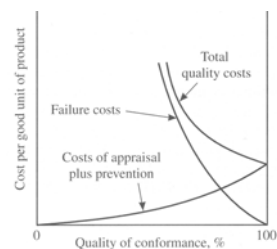
#### Prevention costs

*Costs of preventing defects before they occur*

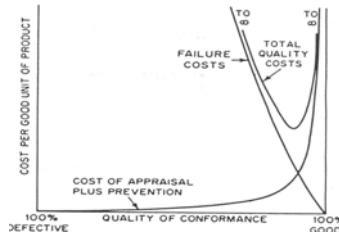
#### Appraisal

*Costs to detect problems before the delivery to the customer*

## Model for Optimum Costs



## **"Old" Model for Optimum Costs**



## **Quality Cost Categories**

### **Internal Error**

**Scrap and rework**  
**Troubleshooting and repair**  
**Retest**  
**Failure analysis**  
**Added inventory costs**  
**Downgrading**

## **Quality Cost Categories**

### **Internal Error (cont.)**

**Re-inspecting rejected supplier lots**  
**Corrective actions**  
-process changes  
-engineering changes -retraining  
-rewriting documents  
**Screening bad from good items**  
**Productivity loss**

## **Quality Cost Categories**

### **External Error**

**Product liability suits**  
**Complaint handling**  
**Field troubleshoot, repair, and retest**  
**Field repairman training**  
**Return parts handling and repairs**  
**Failure analysis**

## **Quality Cost Categories**

### **External Error (cont.)**

**Engineering changes to repair field problems**  
**Field corrective action**  
**Repair manuals**  
**Marketing errors**

## **Quality Cost Categories**

### **Appraisal**

**Quality Audits**  
**Inspection and testing**  
**Inspection of purchased items**  
**Set-ups for inspections and tests**  
**Outside endorsements**  
**Maintenance of inspection and test equipment**  
**Quality analysis**  
**Field performance testing**

## Quality Cost Categories

### Appraisal (cont.)

*In-process control charts*  
*Packaging evaluations*  
*Assurance testing before first shipment*  
*Field data systems*  
*Measurement and QA data processing*  
*Quality data collection and analysis operations*  
*Installation testing*

## Quality Cost Categories

### Prevention

*Quality planning*  
*Training of manufacturing operators*  
*Training of quality inspectors*  
*Process control planning*  
*Quality data collection and analysis system planning*  
*Quality reporting equipment costs preventive action*

## Quality Cost Categories

### Prevention (cont.)

*Procedure preparation*  
*Quality motivation programs*  
*Test equipment planning*  
*Product engineering pre-customer ship evaluation*  
*Vendor qualification*  
*Training for equipment maintenance*

## Reasons Why Quality Cost Systems Fail

### Reasons and Solutions

*The system is instituted for all products and departments at one time.*

*Try it out for one product to obtain a successful case history.*

*The Accounting Department is ignored because of their lack of cooperation.*

*Work with Accounting to the degree they are willing to participate. This will help expand their role later.*

*QC insists that certain controversial costs be included.*

*Agree to exclude or separately identify any such costs.*

*The reports fail to talk the different languages needed at various management levels.*

*Use different units as required for various levels and try out a sample report before "finalizing" the system.*

## Reasons Why Quality Cost Systems Fail

### Reasons and Solutions (cont.)

*No provision is made for investing additional funds in prevention activities.*

*Tell management the amount and type of resources needed to achieve a defined saving.*

*The role of top management in cost reduction is unclear.*

*Propose numerical goals and identify specific projects. Ask management to provide necessary resources and assign responsibility to line departments.*

*No provision is made to obtain the facts needed to diagnose causes of problems.*

*Propose some organizational mechanism that will be responsible for diagnosis of causes.*

## Reasons Why Quality Cost Systems Fail

### Reasons and Solutions (cont.)

*The cost data is presented in categories that are too broad to be useful.*

*Provide detail to the level needed.*

*A corporate QC office issues one quality cost procedure for all plants without giving each plant the opportunity to review it before issuance.*

*Allow sufficient time for plants to comment. Allow enough flexibility to care for plant differences. The real objective is cost reduction and not consistency in reports as an end in itself.*

*QC regards the system as "theirs" to maintain.*

*When possible, turn over all the data collection and issuance of reports to Accounting. QC should concentrate on the analysis and interpretation of the data.*

***Traditional Phases of a Quality Cost Program***

***Planning Phase***  
***Implementation Phase***  
***Project Phase***  
***Control Phase***