

## **QUALITY COST SYSTEM AN EXCELLENT TOOL IN THE OVERALL MANAGEMENT BUSINESS**

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### **Abstract.**

*Quality cost system has the potential to become an excellent tool in the overall management of business. The objective of this research is to extend understanding of variables that impact quality and cost of quality. The Prevention-Appraisal-Failure (PAF) model is employed to evaluate the cost of quality and to determine the level of quality that minimizes the total COQ. The PAF models are developed in a company with the purpose to establish if the system of the company is proactive.*

**Keywords:** *Quality Costs , Quality Management , PAF Model, Implementation.*

**JEL classification:** *M11*

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### **1. Introduction**

In recent years organizations have been striving to increase their bottom line performance in a highly competitive environment integrate objectives and priorities, focusing much attention on quality total management. Our research focuses on the cost of quality (CoQ), even if there are many features on quality total management. Though there are various definitions, CoQ is generally recognized as the sum of costs of conformances and non-conformances. We all know that cost of conformance is the price paid for prevention of poor quality. Cost of non-conformance is the cost of poor quality caused by failure of products or services (returns and reworks).

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Companies must also remember the fact that CoQ also includes the costs involved in the design, implementation, operation and maintenance of a quality management system. This apart, CoQ comprises the cost of resources committed to continuous improvement, the cost of product, service or system failures and other activities required to achieve a quality product/service.

## **2. Literature Review**

The concept of Cost of Quality was included by Dr. Joseph M. Juran in 1951 in his *Quality Control Handbook*. In 1979 Philip B. Crosby popularized the use of CoQ because of his book *Quality is Free*. Several current quality system standards reference the use of CoQ for quality improvement and several methods that can be used to collect, categorize and measure quality costs.

Quality costs are a measure of costs specifically associated with the achievement or non-achievement of product quality, as defined by all product requirements established by the company and its contracts with customers and society (ASQC Quality Costs Committee, 1974). Juran has suggested that the cost of quality can be understood in terms of the economics of the end-product quality or in terms of the economics of the conformance quality. There is a direct correlation between quality and profitability: higher quality results in lower costs, and profitability therefore increases (Evans & Lindsay, 1992).

Most authors group the prevention and appraisal costs together and divide quality costs into two components: prevention plus appraisal cost and failure cost.

The traditional P-A-F method suggested by Juran (1951) and Feigenbaum (1956) classifies quality costs into prevention, appraisal and failure costs.

Prevention costs are the costs with the purpose of the prevention of future losses (training, quality planning, and preventive maintenance of machine). Appraisal costs are the expenditures with the intention of measurement and assessment of the process (inspection, quality check, third party audits, measuring devices, reporting systems). Internal failure costs are those costs incurred prior to the delivery of the products. These costs include the resources need to complete additional tasks and any costs involved in rework due to inadequate processes. External failure costs arise after a company supplies the product to the customer, such as customer service costs, product recall, and customer returns warranty.

To further facilitate understanding of cost of quality relationship, the cost of quality model (PAF model) are analyzed and presented in Figure 1.

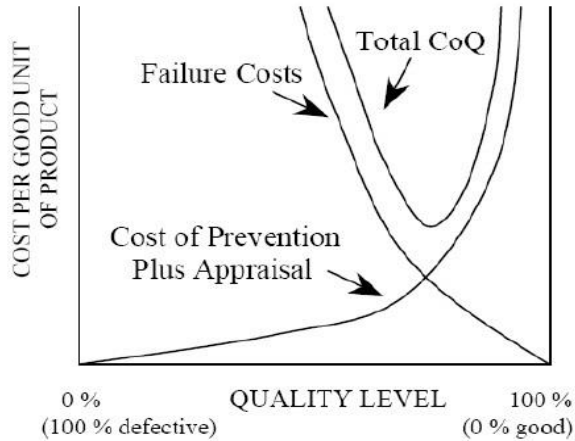


Figure1. Cost of Quality Model (PAF) (Gryna, 1999)

Quality costs are a tool that displays trends for management to act on. It is important to carry out quality cost analysis in an organization and this information can be used by management to identify quality costs, prioritize quality cost reduction activities and measure the success of such activities.

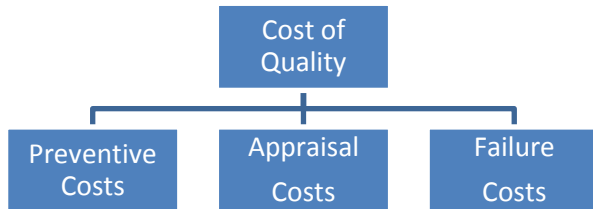
### **2.1. Components of Cost of Quality**

**Prevention costs:** These are costs incurred by an organization when they try to investigate, prevent or reduce the risks of non conformity. These costs are planned and are associated with the design, implementation and maintenance of a total quality management system.

**Appraisal costs:** These are costs associated with evaluation and verification of purchased goods, services, and processes by an organization to ensure that they are within specified requirements. Examples of these costs include production trial test costs, test and measurement costs.

Internal failure costs: These are costs that arise from failure of products to conform to customer requirements. These can be categorized into costs of scrap, rework, retest, re-inspection, modification, downtime, overtime, corrective action and redesign costs.

External failure costs: These are costs an organization incurs after delivering to the customer non conforming products. Examples of these costs include equipment failure, downtime and warranty.



Most quality costs are not obvious and open. These are called hidden quality costs, and they are often many times the size of the easily measured costs. The iceberg analogy is useful here. Many organizations tend to measure only the tip of the iceberg while the real costs of poor quality in operations and delivery of a product or service lie below the surface. In Figure 2 as shown below the iceberg of measured and hidden quality costs (Wood, 2007)

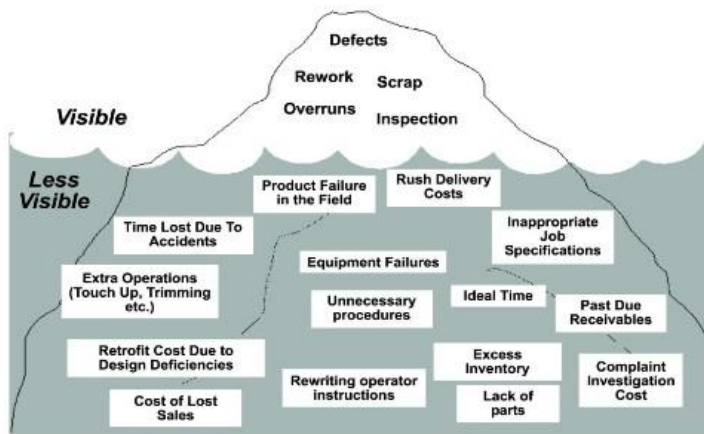


Figure 2. The iceberg of measured and hidden quality costs

The cost of quality can be analyzed in terms of two general areas of cost: proactive activities (prevention and appraisal costs) and reactive costs and results (internal and external failure costs). The classic model of quality costs, illustrated in figure 3, shows that as prevention and appraisal activities are increased failure costs decrease until some optimum in total quality costs is reached. It should be noted that in most cases this optimum is never achieved, and most organizations remain on the left side of the curve.

The concept of "quality costs" was first described by Armand V. Feigenbaum in a 1956

Harvard Business Review article as a means to quantify the total of quality-related efforts and deficiencies. His categorization of quality costs into prevention-appraisal-failure (PAF) has been almost universally accepted for quality costing. He defined the following quality cost areas:

Cost area		Description	Examples
Costs of control (costs of conformance)	Prevention costs	Arise from efforts to keep defects from occurring at all	<ul style="list-style-type: none"> <li>• Quality planning</li> <li>• Statistical process control</li> <li>• Investment in quality-related information systems</li> <li>• Quality training and workforce development</li> <li>• Product-design verification</li> <li>• Systems development and management</li> </ul>
	Appraisal costs	Arise from detecting defects via inspection, test, audit	<ul style="list-style-type: none"> <li>• Test and inspection of purchased materials</li> <li>• Acceptance testing</li> <li>• Inspection</li> <li>• Testing</li> <li>• Checking labour</li> <li>• Setup for test or inspection</li> <li>• Test and inspection equipment</li> <li>• Quality audits</li> </ul>
Costs of failure of control (Costs of non-conformance)	Internal failure costs	Arise from defects caught internally and dealt with by discarding or repairing the defective items	<ul style="list-style-type: none"> <li>• Scrap</li> <li>• Rework</li> <li>• Material procurement costs</li> </ul>
	External failure costs	Arise from defects that actually reach customers	<ul style="list-style-type: none"> <li>• Complaints in warranty</li> <li>• Complaints out of warranty</li> <li>• Product service</li> <li>• Product liability</li> <li>• Product recall</li> <li>• Loss of reputation</li> </ul>

Figure3. Quality cost areas according to Feigenbaum

## **2.2. Levels in the cost of quality implementation**

The steps to the implementation of COQ are shown in below table.

Steps

1	Project initialization and preparation
2	Assessment of current business performance
3	Project organization and assignments
4	Identification of major costs of conformance and costs of non conformance items
5	Identification and provision of additional training needs
6	Collect ,compile and process cost of quality data
7	Analyze cost of quality to identify opportunities for improvements
8	Organize and implement quality improvement and cost reduction programs
9	Establish continuous improvement of the cost of quality performance
10	Conduct quality audits regularly and initiate document changes in response to improvements made in various processes

## **3. Research Metodology**

Primary data was collected by direct observation during operation visits and during working hours; and through personal interviews with managers, superintendents, supervisors and general workers. The gathered information was used to quantify the quality cost. Secondary data from existing records, publication and historical evidence of the company from the company library and recordings was collected. The following steps were used in identifying the costs of quality at company X:

Phase 1: Identification of non conformance costs. These were categorized into internal and external failure.

Table 1 shows what was considered in this section.

**Table 1 Failure Cost**

Internal Failure	External Failure
Rework	Complaints
Scrap	Warranty Claim
Downtime	
Obsolescence	
Defect/failure analysis	
Re-inspection	
Retesting	
Downgrading	

Phase 2: Quantification of Cost of Quality

Records from Production, Operation, Accounting records were used in the gathering of information of quality costs at the company.

**4. Findings And Discussions**

Researchers summarises that preventive costs are low indicating and the system of the company is not proactive. Also, appraisal costs are not significant which illustrates again the system has a feedback system that is not effective, resulting in poor preventive methods to avert failure. Internal failure costs are huge indicating that the system at company X is not yet mature. Measures need to be put in place to minimize the failure rate hence the COQ. External failures shows that the system at the case study company needs a proactive approach so that external failures are brought to a minimum.

**3. Conclusions**

Even though quality is considered to be an important issue, the CoQ approach is not fully appreciated by organizations and only a minority of them use a formal quality costing method. Nevertheless, companies usually do have

quality systems and continuous improvement programs, but approach quality improvement and cost containment in many other ways.

Companies that use CoQ programs have been quite successful in reducing CoQ and in improving quality for the customer. The model most commonly implemented in practice is the classical PAF approach, but the individual costing systems still differ considerably from company to company.

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