

## Development of Model for Quality Costing in a Medium Scale Industry-A Case Study

Nil Mani Sahu <sup>\*1</sup>, Dr. Sridhar <sup>\*2</sup>

<sup>\*1</sup> M.Tech Scholar, Mechanical Engg. Dept Chhatrapati Sivaji Institute of Technology, Durg

<sup>\*2</sup> Professor, Mechanical Engg. Dept, Chhatrapati Sivaji Institute of Technology, Durg

---

**Abstract:** *Quality costs plays vital role in improving productivity. These costs are typically categorized into costs of prevention, appraisal, internal and external failure. Like other activities of business, quality costs can be programmed, budgeted, measured and analyzed to attain the objective of better quality at lower cost. Quality costs is the basis by which investments in quality programs may be evaluated in terms of cost improvement, profit enhancement and other benefits for plants and companies from these programs. The cost of quality is an increasingly important issue in the debates over quality. There was a mistaken notion that achievement of better quality requires higher costs. It was the myth that prevented many Indian companies to invest more on quality cost related programs. In this article the authors made an attempt to identify the different types of quality costs in a medium scale industry because the small and medium scale industries pay very little attention towards finding and developing a system for knowing & optimizing the cost of achieving quality. A model is proposed to identify the different quality costs in a medium scale industry and is further implemented. It has been found some quality costs are more critical and require greater attention.*

**Key words:** *Quality costs, Quality management, Pareto analysis, Model for optimization*

---

### I. INTRODUCTION

Globalization concept leads to greater competition among the manufacturers. To survive in the globalize market, high quality is essential. Quality Costing is an important issue in the debate over quality. Quality costs can help to quantify specific quality levels and ultimately improve productivity.[1].Traditionally, recommendations were made to management that a choice had to be made between quality and cost, the so called trade off decision, because better quality would somehow cost more and make production difficult. But experience throughout the world has shown that it is not true. [2]. Good quality leads to increase in production and reduced quality costs and eventually to increased sales, market penetration and hence higher profits. Improving quality can reduce overall cost [3]. Quality costs are categorized into costs of prevention, appraisal, internal and external failure. Internal and external failure costs are considered as part of the “loss to society“. [10]. Determination of cost of quality requires analysis beyond the use of standard accounting system.

A simulation analysis disclosed the impacts of rework and inventory levels and cycle times. Cost of Quality (COQ) is considered by the management as one of the important techniques of Total Quality Management especially when an organization changes its approach from detection to prevention as part of its exercise towards inspection and quality control. [4]. It is suggested that Quality costs allow us to identify the soft targets to which we can apply our improvement efforts [5]. One potentially critical facet of an organization's TQM is its ability to measure costs related to quality [6]. To maintain/sustain competitive edge, streamline processes, cut down costs, ability to meet customer needs and ability to reduce waste have been considered most important in their quality improvement journey [7].Relationship of quality costs is considered with the various measures of performance of the organization such as market share.

In this article, a model for optimizing quality costing in a small scale industry is developed and an organization is chosen. All types of quality costs are investigated and analyzed in that small scale organization. The distribution of the different quality costs is calculated and Pareto analysis is carried out to identify critical quality costs.

### II. SUGGESTED MODEL FOR QUALITY COSTING

The small and medium scale industries are facing a major problem of calculating and optimizing quality costs. A model is developed as shown in figure 1 to help them to solve this problem. The proposed model is explained step by step as follows:

**Step-1:** Identify various costs of quality & Segregate these quality costs under different quality heads i.e.

Prevention Costs, Appraisal costs, Internal Failure Costs and External Failure Costs.

**Step-2:** Collect data with regard to each quality cost.

**Step-3:** Apply Pareto analysis on all quality costs so as to find out Critical quality costs which are responsible for major expenses on quality related costs.

**Step-4:** Analyze these critical quality costs derived from Pareto analysis.

**Step-5:** Suggest remedial actions so as to reduce expenses on these critical quality costs in order to improve efficiency of the organization with minimum resources.

### **III. CASE STUDY**

#### **3.1 PROFILE OF THE ORGANISATION**

A case study is carried out at in a medium scale industry located at Nagpur. The Organization is an ISO 9000 certified enterprise and manufactures cylinder liners for Internal Combustion engines and supplies cylinder liners to Escorts, Swaraj Tractors, Bajaj etc. The turnover of the company is approximately 8 crores.

#### **3.2 DATA COLLECTION**

The data related to costs incurred on quality aspects was gathered from different Records/ Files/ Statements / Reports. The data in the form of costs incurred on various sub heads is described as under:

a) Prevention costs

These are the costs occurred to prevent occurrence of defects and non conformities and include the quality expenditure to keep unsatisfactory products from coming about in the first place. The different prevention costs found in the organization are shown in table 1.

b) Appraisal costs

Appraisal costs are associated with measuring, evaluating or auditing products, components and purchased materials to assure conformance with quality standards and performance requirements. The different appraisal costs found in the organization are shown in table 2.

c) Internal failure costs

Internal failure costs occur when products, components and material fail to meet quality requirements prior to transfer of ownership. These are costs that would disappear if there were no defects in the product. The different internal failure costs found in the organization are shown in Table 3.

d) External failure costs

External failure costs occur when product does not perform satisfactorily after transfer of ownership to the customer. These costs would also disappear if there were no defects in the product. The different external failure costs found in the organization are shown in table 4.

#### **3.3 DATA ANALYSIS**

The distribution of different categories is shown in figure 2. It has been found that prevention cost is higher than the other costs and its contribution is 41%. The external failure cost was found to be 27% and internal failure cost was 24%. The lowest quality cost is appraisal cost whose contribution is just 8%. Hence it is very important to find out the critical quality costs among all these sub categories of the quality costs.

#### **3.4 PARETO ANALYSIS OF QUALITY COSTS**

Critical quality costs are found with the help of Pareto analysis and are shown in figure 3. This is based on Pareto law, which tells that there are only a few cost items or heads which are responsible for major share in the total cost of quality [8]. This gives the indication to the management to emphasis more on these quality costs rather than to all. This will save the money as well as the time. From Pareto analysis, it is evident that the following categories are found to be critical and are responsible for nearly 76 % of total quality costs: a) Salaries b) Warranty claims c) Rejections d) Returned goods.

### **IV. CONCLUSIONS**

Measuring the quality cost in a medium scale industry is very important and useful. It helps to identify the specific quality levels and ultimately improves quality. A model was suggested to identify the quality costs in a small- scale industry and was implemented in industry. It has been found that prevention cost is 41% of the total quality cost, internal failure is 24 %, external failure cost is 27% and appraisal cost is 8%. It is difficult for small-scale industries to reduce all categories of quality cost due to high cost and more time consumption. Pareto analysis of all quality costs was carried out to identify critical quality costs. It has been observed that cost of salaries to quality personnel, cost of rejection goods, cost of returned goods and warranty claims are more prominent and require attention of top management. Hence, quality

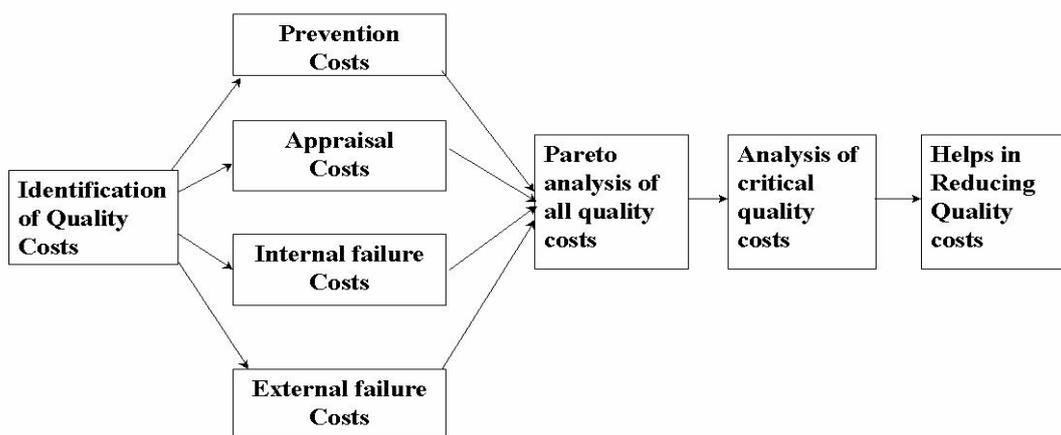
costs have an important role to play in increasing the efficiency of the organization and reducing the unfruitful expenditure to enhance profitability and to remain competitive.

### ACKNOWLEDGMENT

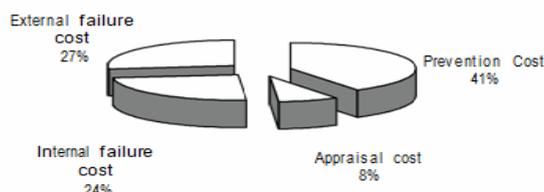
We are very grateful for Dr. L Narayana who helped us in data collection and technical assistance for this paper.

### REFERENCES

- [1] Ahmed Wali , Ayoob et al (2000) , “Quality Initiatives In a Manufacturing Unit : A Case Study “, *Productivity Journal*, Vol 41, No.2, pp210-216.
- [2] Campanella J. (1999) “Quality costs Principles, implementation and use” *ASQ quality press*, Third edition,
- [3] Deming,W.E.,(1982) *Quality,productivity and compititive position*”, MA: MIT press,.
- [4] Feigenbaum, A. V. (1983) “Total quality control”, McGraw Hill.
- [5] Gurursamy ,S.( 1998.) “ Cost Of Quality- A Gateway to TQM“, *Productivity Journal*, Vol 39, No.1, ,pp 91 – 96.
- [6] Garvalia ,N.N (2003),. “Productivity Improvement Through the 5S’s – A Case Study “, *Industrial Engineering Journal* Vol. XXXII No. 12, December, pp 4-6.
- [7] Jaju S.B.,R.R. Lakhe and R.L. Shrivastava, (2004) “Performance analysis through quality costs: A case study” *Industrial engineering journal*, Vol XXXIII, No. 6, pp 15-20.
- [8] M.Yasin ,Mahmoud et al (1999 ) ,“ In search of an optimal cost of quality : an integrated framework of operational efficiency and strategic effectiveness“ *Journal of Engineering and technology Management* ,
- [9] Rao J.V.Prabhaker et al (2000),“ Cost Leadership- A Strategy For 2000 “, *Productivity Journal*, Vol 41, No.2, July - September pp321-327.
- [10] Schmahl K.E., Yasser Desssouky and David Rucker (1997), “Measuring the cost of quality: A case study” *Production and Inventory Management, Journal*, fourth quarter, pp 58-63.
- [11] Raju R. et al (2003 ) An empirical Investigation and Development of Instruments for measuring the progress of total quality management implementation in Indian Industries “,*Industrial Engineering Journal* Vol. XXXII No. 12, December, pp102-111.



**Fig 1. Suggested model for optimum quality costing**



**Fig. 2 Distribution of quality costs**

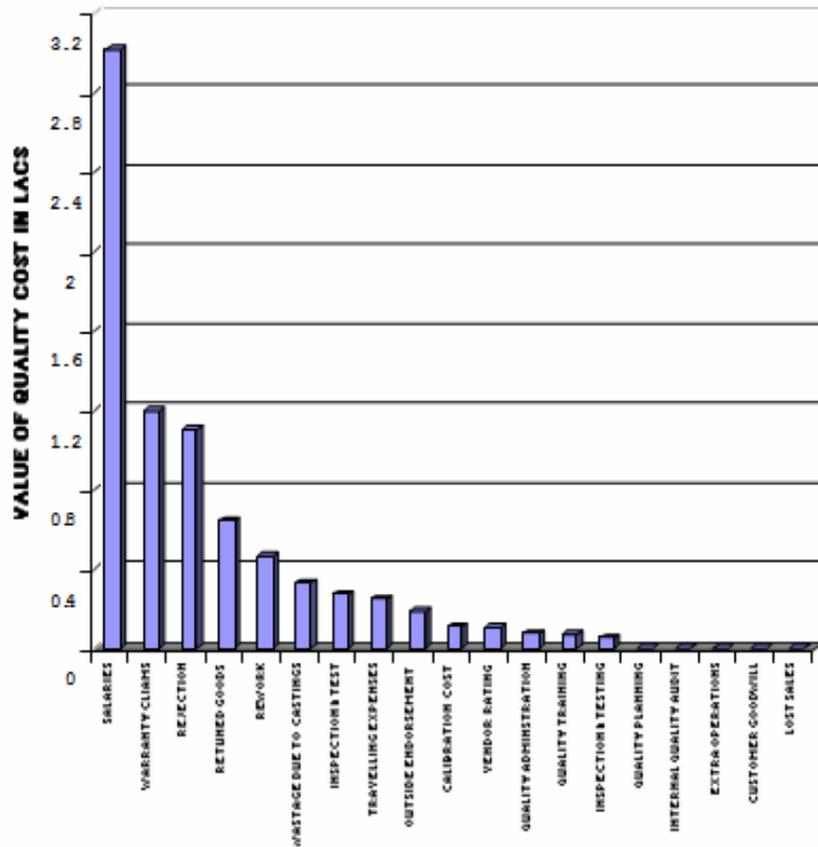


Fig. 3 Pareto analysis of quality costs

Table 1. Prevention costs

Quality Cost Category	Cost (Lakhs)
Salaries	1.51
Training costs	0.034
Quality Administration	0.0365
Internal Quality Audits	0.051
Total prevention cost	1.6315

Table 2. Appraisal costs

Quality Cost Category	Cost (Lakhs)
Inspection & Test Equipment	0.135
Calibration & Maintenance Costs Of Measuring Equipment	0.055
Out Side Endorsement And Certification Charges	0.093
Inspection & Testing	0.025
Total Appraisal cost	0.308

**Table 3. Internal failure costs**

<b>Quality Cost Category</b>	<b>Cost (Lakhs)</b>
Rejection	0.549
Rework	0.23
Wastage Due To Faulty Castings	0.165
Total Internal Failure Cost	0.944

**Table 4. External failure costs**

<b>Quality Cost Category</b>	<b>Cost (Lakhs)</b>
Returned Goods	0.0321
Warranty Claims	0.597
Traveling Expenses	0.124
Total External Failure Cost	1.042