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Development of Model for Optimization of Quality Costs in a Small Scale Industry : A Case Study

Arvind Chopra* and Dixit Garg**

* *Government Polytechnic College for Girls, Patiala*

** *NIT, Kurukshetra*

INTRODUCTION

Quality costing is an increasingly important issue in the debate over quality. Quality costs can help to quantify specific quality levels and ultimately improve productivity. 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. 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 (Deming, 1982). 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" (Schmahl et al., 1997). 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 (Gurusamy, 1998). It is suggested that Quality costs allow us to identify the soft targets to which we can apply our improvement efforts (Campanella, 1999). One potentially critical facet of an organization's TQM is its ability to measure costs related to quality (Yasin et al., 1999). 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 (Wali et al., 2000). Relationship of quality costs is considered with the various measures of performance of the organization such as market share, sales, profit and return on investment (Jaju et al., 2004). Any reduction of cost, such as scrap, rework etc. will have beneficial results. Thus, quality cost directly relates to return on investment (Jaju et al., 2007).

QUALITY COSTS

The term 'quality costs' had different meanings to different people. Some equated quality costs with the costs of attaining quality. Others equated the term with the costs of running the Quality Department. However, the emerging interpretation of the quality specialists has been to equate quality costs with the cost of poor quality (mainly the costs of finding and correcting defective work). The "cost of quality" is a term that has been widely used and widely misunderstood.

The "cost of quality" isn't the price of creating a quality product or service. It's the cost of NOT creating a quality product or service. Every time work is redone, the cost of quality increases. The various types of quality cost are described below :

(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.

(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.

(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.

(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.

SUGGESTED MODEL FOR QUALITY COSTING

The small scale indusries 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.

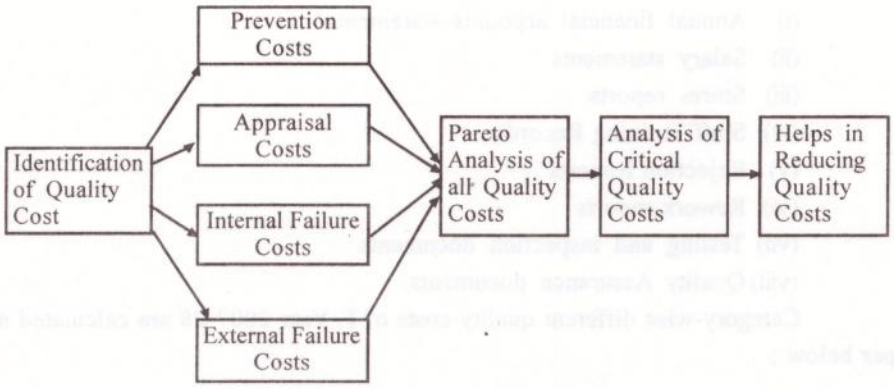

Figure 1 : Suggested Model for Optimum Quality Costing

The proposed model is explained step by step as under :

Step-1

Identify various costs of quality and 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

Analyse 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 efficency of the organisation with minimum resouces.

CASE STUDY

Profile of the Organization

A case study is carried out at small scale industry located in Punjab. The Organisation is an ISO 9000 certified enterprise and manufactures different

engineering items like Water Pump, Pulleys, Crank Shaft etc. and supplies these items to Escorts, Swaraj Tractors, Sonalika etc.

Data Collection

The data was obtained mainly from the following source documents :

(i) Annual financial accounts statements
(ii) Salary statements
(iii) Stores reports
(iv) Staff Training Records
(v) Rejection Reports
(vi) Rework reports
(vii) Testing and inspection documents
(viii) Quality Assurance documents.

Category-wise different quality costs of F. Year 2007-08 are calculated as per below :

Data Analysis

The distribution of different categories is shown in Tables 1 to 4. It has been found that prevention cost is higher than the other costs and its contribution is 43%. The external failure cost was found to be 26% and internal failure cost was 25%. The lowest quality cost is appraisal cost and its contribution is just 6%. Hence, it is very important to find out the critical quality costs among all these sub-categories of the quality costs. The quality costs are arranged in a descending order and further their cumulative percentage is also found as per Table 5.

Table 1
Details of Prevention Costs

Quality Cost Category	Cost (in Rs. lac)
Salaries	4.52
Training Costs	0.09
Quality Administration	0.13
Vendor Development & Rating	0.14
Quality Planning	0
Internal Quality Audits	0
Total Prevention Cost	4.88

Table 2

Details of Appraisal Costs

Quality Cost Category	Cost (in Rs. lac)
Inspection & Test Equipment	0.39
Collection & Maintenance Costs of Measuring Equipment	0.13
Outside Endorsement and Certification Charges	0.12
Internal Quality Audit	0
Inspection & Testing	0.1
Total Appraisal Cost	0.74

Table 3

Details of Internal Failure Costs

Quality Cost Category	Cost (in Rs. lac)
Rejection	1.67
Rework	0.76
Extra Operations	0
Wastage due to Faulty Castings	0.48
Total Internal Failure Cost	2.91

Table 4

Details of External Failure Costs

Quality Cost Category	Cost (in Rs. lac)
Returned Goods	0.96
Warranty Claims	1.53
Lost Sales	0
Customer Goodwill	0
Travelling Expenses	0.29
Total External Failure Cost	2.78

Table 5

Details of External Failure Costs

S. No.	Nature of Quality Cost Sub-head	Cost in Lacs	Cumulative Cost in Lacs	Cumulative %age
1.	Salaries	4.52	4.52	39.96
2.	Warranty Claims	1.53	6.05	53.49
3.	Rejection	1.67	7.72	68.26
4.	Returned Goods	0.96	8.68	76.75
5.	Rework	0.76	9.44	83.47
6.	Wastage due to Faulty Castings	0.48	9.92	87.71
7.	Inspection & Test	0.39	10.31	91.16
8.	Travelling Expenses	0.29	10.6	93.72
9.	Outside Endorsement & Certification	0.12	10.72	94.78
10.	Calibration & Maintenance Costs	0.13	10.85	95.93
11.	Vendor Development & Rating	0.14	10.99	97.17
12.	Quality Administration	0.13	11.12	98.32
13.	Quality Training	0.09	11.21	99.12
14.	Inspection & Testing	0.1	11.31	100.00
15.	Quality Planning	0	11.31	100.00
16.	Lost Sales	0	11.31	100.00
17.	Internal Quality Audit	0	11.31	100.00
18.	Extra Operations	0	11.31	100.00
19.	Customer Goodwill	0	11.31	100.00

PARETO ANALYSIS OF QUALITY COSTS

Critical quality costs are found with the help of Pareto analysis and are shown in Figure 2. This is based on Pareto law which describes that there are only a few cost items or heads which are responsible for major share in the total cost of quality. This gives an indication to the management to emphasize more on these quality costs rather than to all. This will save the money as well as the time. It is evident from Pareto analysis that the following categories are found to be critical and are responsible for nearly from 76% of total quality costs :

(a) Salaries
(b) Warranty claims
(c) Rejections
(d) Returned Goods.

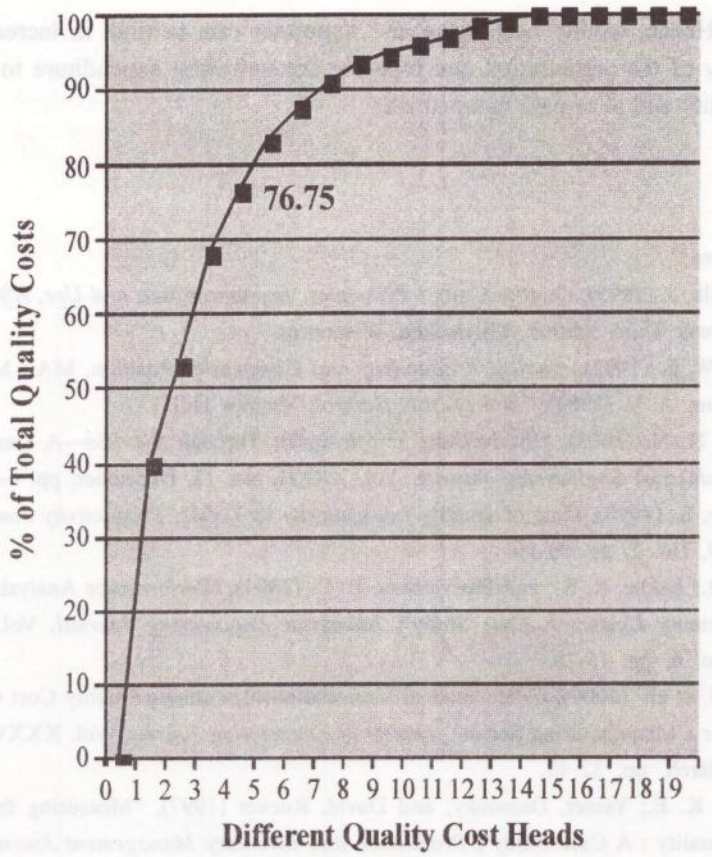

Figure 2 : Pareto Analysis of Quality Costs

CONCLUSION

Measuring the quality cost in a small-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 43% of the total quality cost, internal failure is 24%, external failure cost is 26% and appraisal cost is 6%. 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 organisation and reducing the unfruitful expenditure to enhance profitability and to remain competitive.

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