

Cost Of Quality Management

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Abstract *Cost of quality are part of structure a total cost of organisation. Cost of quality management is important aspect of successful organization. In this paper, models are analysed and key aspects cost of quality are given. Problem a cost of quality management particularly is investigated.*

Keywords: *Cost of quality, model, management*

1. INTRODUCTION

Quality issue, as a central one from the point of view of user, nowadays, is a critical competition factor. Each serious effort to improve quality is not only to meet the user's demands as regards quality, but also to achieve this at least costs possible. Reduction of these costs is possible only if measures are also identified. This means that real information on cost of quality (COQ) is of special importance for managers.

Costs can not be reduced without criteria, and not each single cost is negative. These mistakes are typical for a traditional way of recognizing costs in a quantitative environment. Lately, a qualitative aspect of observing costs within the context of profit has been also included.

2. COST OF QUALITY MODEL DEVELOPMENT

It is indisputable that quality costs existed in all development epochs, but the consciousness of their existence appeared only in the 30-ies of the last century. Then appeared both theory and practice of quality costs to be observed in their development continuity.

Only refuse, processing and managing quality service costs were initially considered to be cost of quality. So, even then, though there was no system for following cost of quality, its division could be noticed, into

cost of quality (cost of office quality management) and cost of non-quality (refuse, processing). As refuse and processing costs are related to production, this model points out productive concept of approaching quality costs. In the next stage, in the 50-ies of the last century, productive concept was rejected and PAF approach to cost division was developed: prevention, appraisal and failure costs. Basic division of quality costs is given in Fig. 1.

Cost of quality according to PAF approach includes:

- Prevention costs of quality (costs as the result of investing into prevention from quality deviations).
- Appraisal costs of quality (costs originated due to appraisal and control to estimate to which level the demanded quality is maintained).
- Internal costs of non-quality (costs discovered on either product or service, as quality demands before delivery are not fulfilled - e.g. repeated service, repeated production, re-investigation, refuse).
- External costs of non-quality (costs arising with products or services that have not fulfilled quality demands, and failures are discovered after delivery to a customer - e.g. servicing, guarantees and returning, product canceling costs).

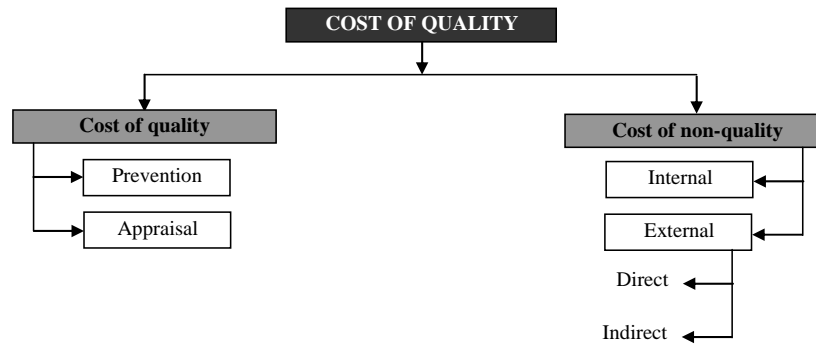


Figure 1. Cost of quality division

This means that quality cost calculation in this case is performed according to model 1.

$$COQ=P+A+IF+EF \quad (1)$$

Similarly to PAF model, Krosby's cost of quality model sees quality as "an accordance with demands" thus defining costs as:

- Cost of conformance - COC.
- Cost of non-conformance - CONC.

Cost of quality is defined according to model 2.

$$COQ=COC+CONC \quad (2)$$

COC costs include prevention and appraisal costs, whereas CONC costs correspond to non-quality costs. This means that these two models, though of different terminology, are often identical.

In further stages of theory and practice quality development there appear, as special categories, opportunity costs (OC) and invisible costs like exceeding requirements (ExR). They often express COQ as a lost income and unrealized profit. Opportunity cost are related to unrealized profit due to user's loss and income reduction because of non coordination. Exceeding requirements refer to the costs of ensuring unnecessary and unimportant information or services not being even demanded.

These costs are included into classical PAF approach so cost of quality is found according to model 3.

$$COQ=P+A+IF+EF+OC+ExR \quad (3)$$

Contemporary stage of quality cost development started by applying ISO

9000:2000, as well as ISO 9004:2000. This consistent pair has demands asking for the necessity of following cost of quality:

- obligation of planning and securing resource availability,
- resource management necessarily includes activities related to financial effects,
- process approach and management are not possible without cost resource investment into processes.

This enabled the development of process cost model - PCS. Process cost is a summary cost of conformance and non-conformance of the investigated process. This model is also developed for following cost of quality focused on process rather than on product or service. PCS is an appropriate method for estimating quality cost within total quality management (TQM), as modeling costs is more successful by its application than by using classical PAF approach.

The most measurable COQ model is activity - based costing - ABC. Through ABC approach, correct cost for different cost object is achieved by translating cost resources to respective activities and activity cost to object cost. This means that ABC approach is, in fact, not COQ model. It is an alternative model to be possibly of quality cost among products, thus enabling a more efficient cost of quality management.

3. KEY ASPECTS OF QUALITY COST

Cost of quality concept was practically

introduces half a century ago as an integral part of quality management. For a long time, this concept was used to identify possibilities of significant saving. On option of many zealous workers in quality field, this concept, colliding with time, should be significantly changed.

In the previous period, two key ideas were used. The first one is the idea of optimal quality level emphasizing minimization of total quality cost Fig. 2.

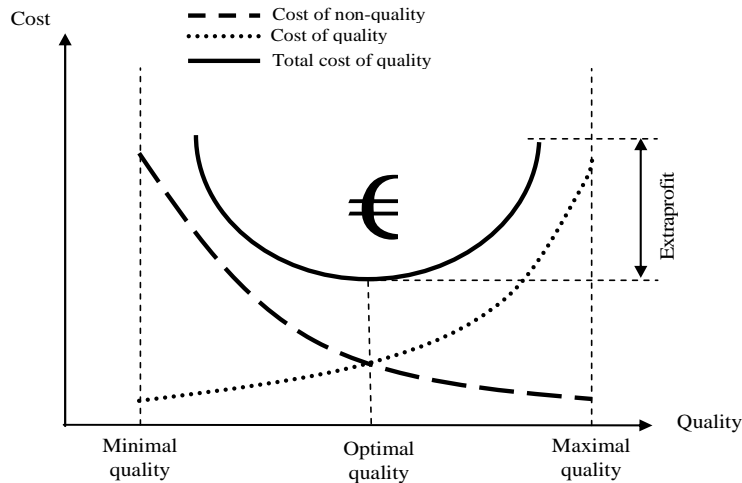


Figure 2. Cost of quality optimization

The second one is characterization of cost quality consisting of four part: prevention, investigation, internal cost of non quality and external cost of non-quality.

In the early 80-ies, the issue of optimal quality levels become very up-to-date. There were noticed many examples where, by process changing, the basic form of cost curve was radically changed and optimum significantly displaced. For example, implementing modern statistical methods of

quality control on production line and reducing cost of final control, it is possible to realize output of higher quality at lower costs.

Then, a key idea of modern quality cost theory was observed: quality cost curve shape should be changed rather than persistently seeking a very fluid minimum point. Japanese companies were first to focus themselves to finding out way to improve quality at cost reduction (Fig. 3).

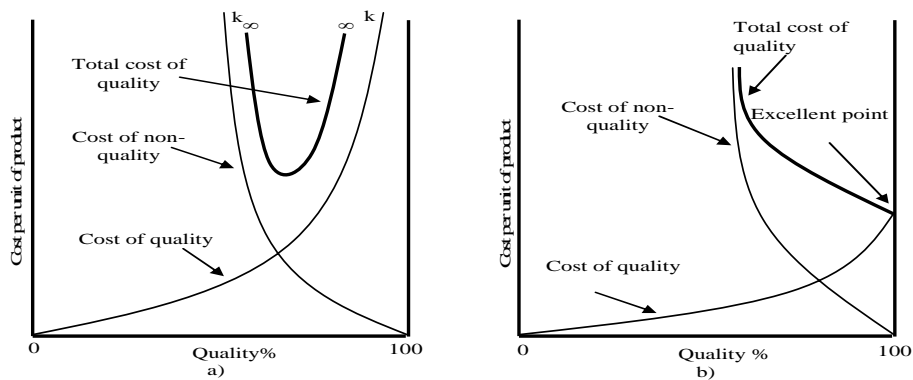


Figure 3. Classica (a) and modern (b) model of cost of quality optimization

Second key idea that contributed to changing classical approach of quality cost is the change in non-quality cost. E.g. making products easier to be maintained and repaired, non-quality cost decreased drastically (Fig. 4).

Cost of quality characterization concept beyond parts was also re-investigated in the 90-ies. The problem is the very term.

Quality is an integral term for products and services, so, how is it possible to separate and distinguish quality acquisition cost from product or service cost. A real problem is, if we try to decrease cost of quality, we often neglect ignore main exit: minimization of integral total cost of production, not a part of it.

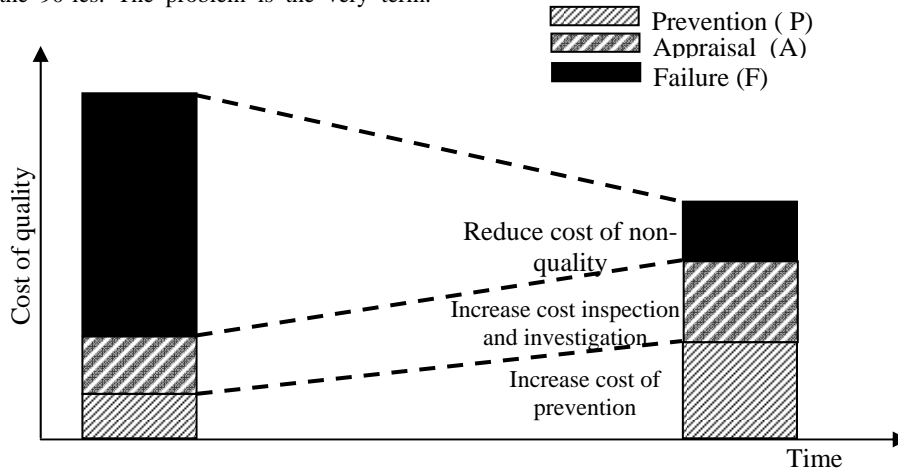


Figure 4. Technology of optimizing cost of quality through allocation resources

There is a problem in this approach: how to define cost of prevention. Each company undertakes a number of activities to prevent non-quality, starting from market research to choosing a supplier and staff training.

All these activities belong to cost of prevention causing a situating where almost all realization cost are included in cost of prevention. The only acceptable fact seems to be concentrating on cost of non-quality and allocating prevention measures for immediate problem.

Seeking a theoretical minimum and comparing it to the real cost is the best way to identify the possibilities that were not noticed

before, this leading to a more real cost realization.

4. COST OF QUALITY MANAGEMENT

Management is a basic phase when working with cost of quality. To manage cost of quality, it is necessary to: make a system of following quality cost, file document and take improvement measures.

Documentation of quality cost follow-up is highly positioned in a total quality system documentation. Hierarchy is shown in Fig. 5.

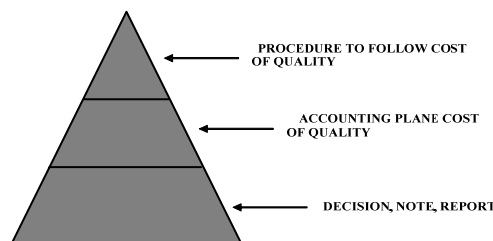


Figure 5. Hierarchy of quality cost follow-up documentation

The essence of quality cost management is a well organized system of collecting cost of quality within an organization, as well as its separation which may be based on different cost classifications (PAF model, conformance and non-conformance cost, life cycle model, etc).

Implementation of quality cost follow-up system implies a number of activities:

- Cost place determination.
- Evidence of total cost per cost places.
- Allocating cost of quality per cost places.
- Calculating cost of quality parameters.

- Making and distributing reports on cost of quality.

The most complex activity appears to be allocation of quality cost per cost places, so it is carried out according to phases - Fig. 6.

1. Evidence of all the places of total cost origin.
2. Classification of all the cost places and cost of quality.
3. Separating total cost of quality from other costs.
4. Division and categorization of quality cost according to places of cost

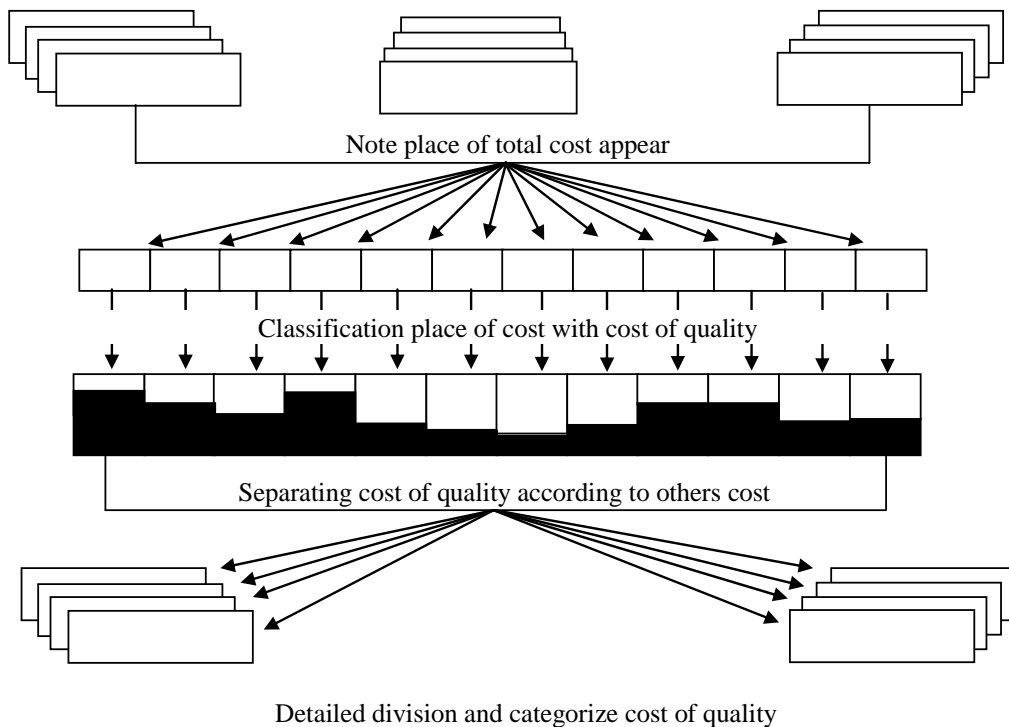


Figure 6. Separating cost of quality according to cost places

Cost of quality parameters, in conformity with the principle of continual improvement may be obtained by comparing cost of quality of an observed period of time with the quality cost of previous time. For the

case of PAF model, we suggest indexes K_{1i} (4), and K_{2i} (5) to be used as quality cost parameters:

$$K_{1i} = \frac{C_i(P) + C_i(A)}{C_1(P) + C_1(A)} \quad i = 1, 2, \dots \quad (4)$$

$$K_{2i} = \frac{C_i(IF) + C_i(EF)}{C_1(IF) + C_1(EF)} \quad i = 1, 2, \dots \quad (5)$$

where C_i $i=1,2,\dots$ are summary coefficients per years and are related to the costs of preventive, appraisal, internal and external errors.

An example of a domestic firm, in Fig. 7., shows that investing in cost of quality has as its consequence a fall in cost of non-quality and total quality cost (K).

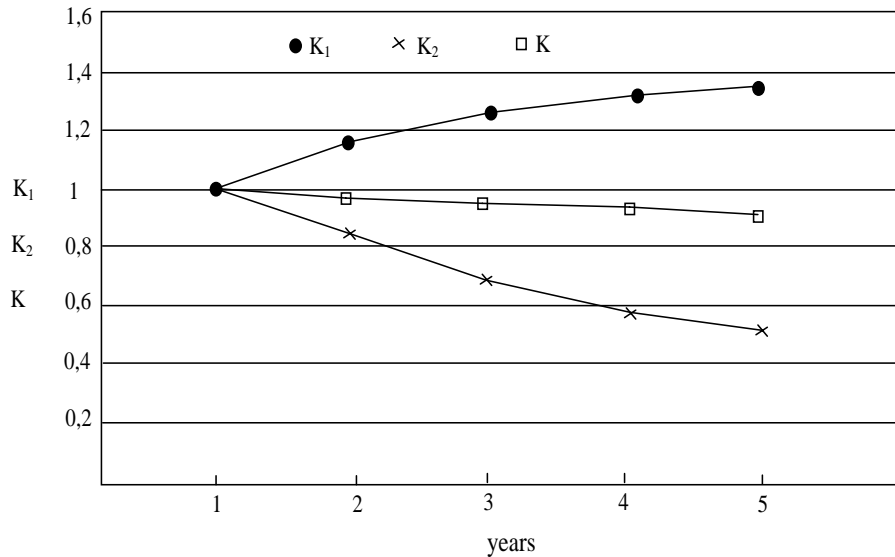


Figure 7. Example of quality index change.

5. CONCLUSIONS

In the sense of further contribution to cost of quality knowledge, for the phase being there may be expected:

- Further cost of quality classification to enable a simpler recognition and follow-up in services.
- Development of consciousness on cost of quality existence in other fields as well (sports clubs, government of a state, national economy, school, etc.)
- Reaching consensus on types of quality costs and making model for their follow-up to compare organizations according to cost of quality criteria.
- Making follow-up and evidence of quality cost model appropriate to complex systems: cost of

environment management, cost of quality security, cost of health quality and protection at work, etc.

- Treating cost of quality in relation to time point to establish a unique scale parameter through one of relations (5) or (6).

$$F = P(F/P, i\%, N) \quad (5)$$

$$P = F(P/F, i\%, N) \quad (6)$$

where:

P - immediate equivalent value

F - future equivalent value

$i\%$ - interest

N - number of interest periods

Obviously, it is necessary to make a unique, generally accepted methodology for cost of quality follow-up to quicken the development in this field.

REFERENCES

- [1] Arsovski S.: Profiting by quality, CIM centre, Mechanical Engineering Faculty, Kragujevac, 1998.
- [2] Drljaca M.: Little quality encyclopedia - cost and qualities, Oskar, Zagreb, 2004.
- [3] Feigenbaum A., Total Quality Control, Third Edition, Mc Graw Hill, 1991.
- [4] Juran J.M., Quality Control Handbook, Fifth Edition, Mc Graw Hill, 2001.
- [5] Schiffauerova A., Thomson V., A review of research on cost of quality models and best practices, International Journal of Quality and Reliability Management, Vol.23. No.4, 2006.
- [6] Mrdja V.: Cost of quality management, Concept No7, 2007.
- [7] Perovic J.M.: Management - Informatics - Quality, CIM centre, Mechanical Engineering Faculty, Kragujevac, 1999.
- [8] Arsovski S., Quality Economic Management, Faculty of Mechanical Engineering, Kragujevac, 2002.

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