The Challenge of Measuring and Managing the Cost of Quality

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Abstract

In response to ever shorter innovation cycles, many companies strive to improve the quality of their products and services. Often, this is done through actions that are characterized as components of a quality management system; therefore quality cost considerations have been long an issue in the literature of quality management. The debate about the meaning and manner of collection of quality costs continues to this day. It is of great importance that the process parties recognize the meaning and purpose of quality costing.

The goal of this work is to beat on the quality of the bow to the cost of quality. Quality management models can be represented only in the beginning. A depression would extend the scope of this work too. There are controversial discussions conducted on quality costs in literature. Excerpts of these discussions are included to make it clear that in order to determine the quality costs, a clear path must be defined.

Introduction

If you search for a definition of the concept of quality costs, you will find a variety of different concepts to find their distribution and analysis. It is clear that neither science nor in practice, a uniform approach to their collection or assessment exists. In practice, one often finds such classic tripartite division splits the cost of quality in prevention costs, appraisal costs, and failure costs [1]. Other concepts criticize the other hand, precisely this approach and leave out the cost of appraisal and prevention costs from the cost of quality. They thus cover only those costs actually incurred by errors, e.g. caused in the production [2]. In this work first presents the different approaches to the analysis of quality costs. Here discusses the various definitions and partly diverging conceptual uses and boundaries in literature and practice received. On the other are represented by the classical and the modern approach to the classification and quantification of quality costs are the two basic approaches. The goal of this work is to beat on the quality of the bow to the cost of quality. Quality management models can be represented only in the beginning. A depression would extend the scope of this work too.

There are controversial discussions conducted on quality costs in literature. Excerpts of these discussions are included to make it clear that in order to determine the quality costs, a clear path must be defined. This is the responsibility of leadership. One must choose a course of action and sensitize employees to the issue of quality costs. If this does not happen, then it could be happen that resistance spread among employees. The investigation does not lead to the expected potential savings.

The classic quality cost concept

The classic quality cost structure is subdivided according to the main tasks of the Quality Department. The division of the cost of quality is based on the development of a qua-

lity cost system by the U.S. Company General Electric in the 1950s. This quality cost system was developed because the U.S. Defense Department prior to award of contracts reviewed the quality assurance as well as all activities related to quality. Excessively high quality cost of a product concerned the company and subsequently, the order was not issued. The company's goal was to determine by means of the cost categories in conjunction with a quality cost system data, the need for action and lack of products and processes uncovered [3].

To the prevention costs are the costs of those measures of quality management expected, which serve to prevent and preventing failures [2]. Steinbach on the other hand labeled the actions listed in the prevention costs cost elements as quality planning and quality control costs, because of the definition of prevention costs a number of other costs which do not belong to the quality costs were grouped under this heading [4].

Under the second category of costs, the costs of appraisal, the cost of activities, measures and facilities for identification of defective products or services are subsumed. "Appraisal costs are costs that are primarily caused by quality tests (…).Not belong to the appraisal costs and other costs time work quantity findings and for sorting and retests for example, complained of deliveries and wicked " [2]. The term appraisal costs include all costs that are caused by the routine detection; control and management of quality in the manufacturing process. The finding, control or controlling can use full audit (Piece by piece inspections) or sampling tests be made. Failure costs are caused by products or processes for their production do not meet the conditions laid down in drawings and specifications, quality requirements. Has proven to be useful to divide the failure costs into two major groups, namely the internal and external failure costs [2]. Bruhn and Georgi specify in detail here [7]:

1. Internal failure costs result from the consequences of failures that occur before the customer with the seller and his power comes into contact. Examples of the causes of internal failure costs are scrap, rework, re-testing, re-inspection of the materials used or the downgrading of faulty services.
2. External failure costs are generated by the consequences of failures that occur only after contact between the customer and the provider and its performance. Exemplary sources of external failure costs are the complaints handling, guarantees, product liability payments, recoveries or product recalls or churn.

The basic idea of the classical quality cost concept is the idea that with the help of measures in the field of failure prevention, the number and scope of internal and external resulting failure can be affected. A close causal link between the fault prevention and control costs on the one hand and the internal and external faults on the other hand, it is assumed. In the symmetric model shown (same course of failure prevention curves and Appraisal costs curves and failure cost curves) the failure costs by increasing the cost of failure-prevention and appraisal reduced proportionally. The total quality costs are additively from the mistakes of prevention and appraisal costs and the cost of failures. The amount of the failure cost is controllable by a use of resources in the area of quality assurance and quality control measures [8]. A complete accuracy of the production is only possible with an exponential increase in the quality assurance measures. On the other hand, it is to be expected when a complete retraction of the tests and measures preventable failures with an exponential increase in the cost of failures. The upshot of these considerations is the presence of a point at which the sum of the cost of quality is minimal. The upshot of these considerations is the presence of a point at which the sum of the cost of quality is minimal [9]. The cost-optimal quality is shown in the model of the tripartite division of the point where the last unit costs incurred for failure prevention and appraisal is higher than the unit costs saved by mistake [10].

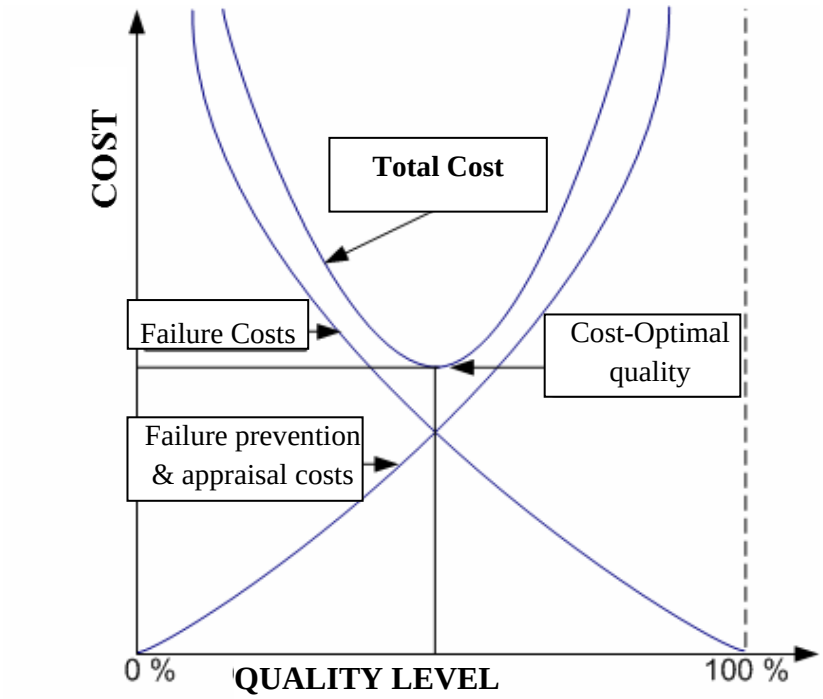

Figure 1. The classical model of quality costs optimization [9]

Criticism of the traditional tripartite division of Quality Costs

The first criticism relates to the formation of the quality cost elements. Thus, according to many authors listed on the DGQ quality cost elements represent an unstructured list of quality cost elements on different layers and phenomena in which a single classification criterion is missing [4, 11,12]. For some, the cost of education-group appraisal costs was arbitrary, since a combination of individual cost elements, such as Cost is made for quality audits and cost of sorting out faulty parts [13]. In the appraisal costs are costs of different types of tests (Entrance tests, manufacturing tests...) also listed as a separate quality cost elements, such as the cost of testing equipment. This necessarily leads to problems in appraisal costs acquisition and allocation [14].

There is criticism that impairments are expected uncritically to the internal failure-free [4]. Impairments represent deductions, such as through the sale of products under the regular price (2. selection) not incur additional costs, but is less redeemed. The reason for the recognition of impairment charges as failure lies in the fact that the opportunity should be created; the impairment undefined attributable costs than the corresponding cost centers [14]. The Impairments to be included in the cost is open to criticism, since these impairments are not consumption goods - which is a constituent part of the cost term underlying, but provide a reduction in revenues. Inadequate separation of other variables such as value sales deductions or charges related to this case is criticized [15]. Another criticism relates to the strong focus of quality cost elements on the production-related quality assurance [9]. The reason is that the quality cost analysis was originally limited to the manufacturing sector. As part of total quality management concepts, the quality cost analysis is extended within and outside the organization on quality management measures in other areas [30, 31]. Accordingly, the performance of the ranges provided in the classic threefold quality cost elements and is not therefore to expand.

In addition to the criticism of the listed quality cost elements is further determination of optimum quality costs, the traditional tripartite division of the cost of quality is based, to criticize [14]. The reason for this is that the traditional understanding of quality costs is the

assumption train-around that the optimum cost of quality is at a level of quality that may tolerate a certain level of failure [16, 17]. From fig. 2 is evident that there must be a company objective to produce this cost-optimal level of quality, as an improvement in the failure rate would result in higher quality costs. It is assumed in this quality cost optimum working to secure the product quality at minimum cost. To this end, inter alia Tomys to [3]: "(...) the best quality of the products should not be achieved at all costs, because the cost in mass production for delivery to buyer markets in the foreground". The cost-optimal quality is according to the classical approach to the point where the last unit costs incurred for failure prevention and appraisal is higher than the unit cost in saved failure.

The classic commercial cost accounting does not include the quality cost as an independent cost. For this reason, the quality costs in the corporate accounting recorded separately or not reported. Rather, this must be checked in each case, there is the proportion of quality costs in the conventional cost-type cost center and cost unit accounting. So here is, instead, a function-, income-and piece-cost-related approach, which according to the specifications of Taylorist organization structures in relation to the fault or the fault of the product cost is at the center. There is no process-oriented and quality-related quality circular acquisition costs made. In order to be hierarchical and internal or external customer and vendor interface problems ignored [15]. The above definition of quality costs shows that the quality costs are understood as an additional cost, so a good quality means additional work and better quality causes more costs. Here are positive investments to improve quality mixed with negative expenditure Troubleshooting. Finally, criticism of the classic threefold that customer satisfaction aspects are scarcely noticed and in this context also in the companies increasingly applied philosophy of Total Quality Management (TQM) is not considered.

Modern Approach: dichotomy of quality costs

Because of the problems shown to the tripartite division of the cost of quality developed in the 80s of the approach of the division of the cost of quality, which is based primarily on considerations of Crosby [18].

In the function-oriented perspective of the classic threefold curve gives the optimum of quality costs in the course of failure cost curve and failure prevention and appraisal costs. As already has been shown, this is at a cost-optimal quality grade of less than 100% (fig. 2). The process-oriented approach yields the optimal quality-related costs from the costs of compliance and the cost of the deviation. The modern approach to the division of the cost of quality is based on a different way of thinking than the traditional tripartite division. The division is based on the view: "Quality does not cost anything. It is not a given, but it costs nothing. What costs money, however, is the lack of quality (…) [18]. Compared with the traditional view is the optimal cost (minimum cost) quality level in the modern approach to the division adopted with one (or both technical and economic reasons almost) one hundred percent compliance with the requirements [9, 16, 19].

The division of the cost of quality has been taken over the years by numerous authors that cost coincidence also the costs of compliance or [12, 13, 16], of non-compliance costs and compliance costs [20] or from non-value added costs and value added costs [21] speak.

In further experiments, it is spoken because of the variety of application examples in the literature of the costs and compliance costs of the deviation. The transition from the classical tripartite division of the cost of quality prevention costs, appraisal costs and failure costs in the "new cost structure" of a division of Quality Costs, wherein between the expense of the match, and cost of the deviation is differentiated demonstrates figure 2.

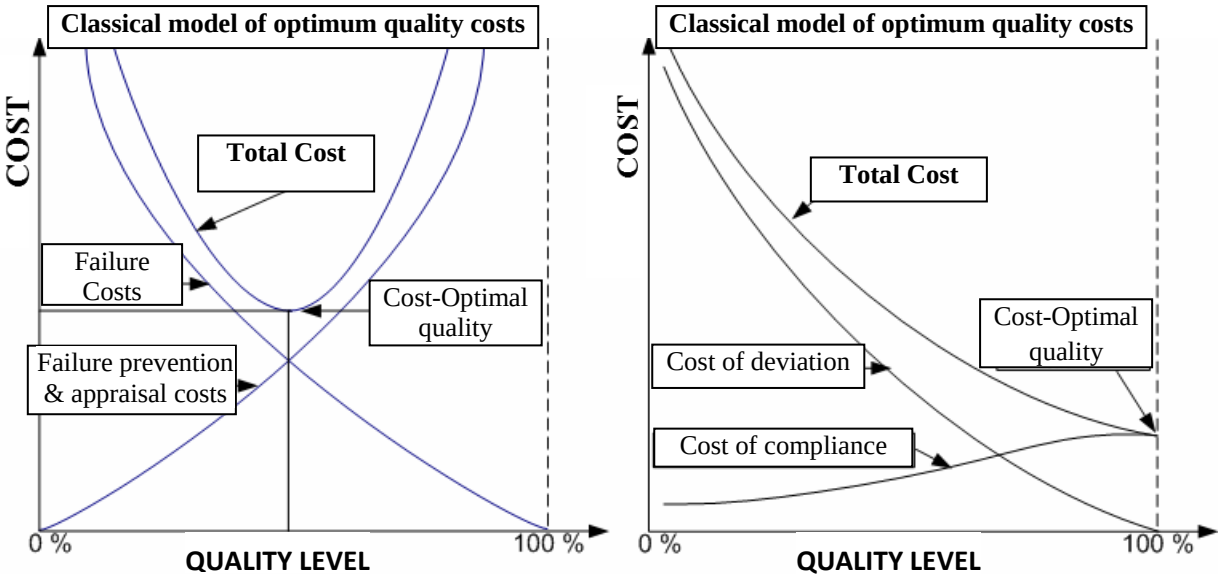

Figure 2. Comparison of modern and traditional approach of quality and cost-sharing [23]

Cost of compliance

To the cost of compliance, which have more overhead character, including costs incurred to meet the requirements and ensure that it operates correctly, e.g. preventive measures for quality or training. They are defined as costs incurred to the company to provide the ability to produce defect-free products and to obtain [15] and thus has an investment character. To the cost of compliance, the prevention costs and the planned appraisal costs [15] counted. Wildemann differs from the cost of compliance three blocks [22]: Cost of test and monitoring activities, cost of applying the techniques of quality management and techniques for quality-related training and education. Fischer added the cost of compliance by additionally taking into accounts the quality-related suppliers and customer-related expenses and hence the growing importance of value networks into account [12]. The costs of compliance represent in terms of investment represents a positive contribution to value creation. They generally have overheads character and should be seen as investments in the future, security and competitiveness of the company. The costs of compliance are known; predictable and unavoidable [15].

Cost of deviation

To the cost of the deviation are the costs, which are triggered by an failure, as well as their correction [18]. The costs of deviation include avoidable costs of inefficiency, waste, and failure costs of any kind [15]. You describe so that part of the factor inputs, beyond the power of creation and use of necessary factor caused by the lack of conformity with the requirements of the generated power is [23]. In deviation costs thus present an avoidable waste of resources and thus a reduction of the value [15]. Deviation costs are in the nature of direct costs that are clearly attributable to the products [3]. The cost of the deviation can be avoided, not only planned and estimable [15] . In the area of cost variance can, analogous to classic threefold, divisions into internal and external deviation costs are made.

Collection of quality costs by the quality of cost accounting

As a side account makes use of the quality of the accounting data of the operating cost calculation to determine a portion of the cost and quality information is available by various

criteria. The purpose of this source of information, it must be the proportion of quality costs to total costs and expel divided demonstrate the quality cost elements whose places of origin and the causes [26].

To define the requirements for the collection of quality costs, are at first to limit the purposes of such a cost accounting system. This is necessary because the quality costing limited to the Quality Management System, designed only for that, map a part of the operational management system. Traditional cost accounting systems can provide information not generally, because their purposes are not oriented to quality concerns and therefore deterministic data quality although with capture, but not explicitly reported [26].

If these requirements are considered a quality cost accounting, so provide for the analysis of quality costs only plan cost calculations based on partial cost, because only these cost account kind enable a systematic debit and is control [25]. In recent years, concern emerging doubts about the suitability of planned cost calculations on part cost base, particularly the changed cost structures of companies and their information needs. Here it is argued that this cost accounting kind the increasingly dominant fixed and common costs to either overall (full cost accounting) or not at all or only partially (Part of cost accounting) treated [25, 27].

The activity-based costing as the basis of quality-related decisions

As a result of the listed doubts about the adequacy of existing accounting systems to measure quality costs is developed based costing. This allows source-related provision of information for quality-related decisions.

Substantial difference of process costing over traditional cost accounting systems is the use of direct reference values (benchmarks). These reference values correspond to the so-called cost drivers. Under a cost driver, the factors are understood to have the greatest impact on the cost of a process. A process can e.g. have to produce a product or provide a service to the destination. Basically, the company is seen in the activity-based costing as the sum of many processes or activities, the costs and benefits can be attributed to direct benchmarks, thus resulting in the activity-based costing, the cost of a product (or an performance) the sum of the costs of all processes that have emerged for the production of this commodity [28].
The tasks of the process costing include planning, management and control of overheads and the value-based mapping of resource consumption in the cost accounting for the purpose of providing information [27]. The main objective of the activity-based costing here is the increase in cost transparency in indirect activity areas, the improvement of product costing, the cause- appropriate allocation of overheads, and the detection of potential for efficient use of resources [32].

While traditional cost accounting systems to limit the control of the efficiency of individual deferred cost centers, the basic principle of activity-based costing is based on a cost of interdepartmental approach [25]. This approach provides a cost-based in analogy to the concept of value chain thinking. The cost of interdepartmental consideration of value-based operational service consumption also allows differentiation between value-added and non-value added processes. Despite a difficult in practice, distinguishing between the two types of processes has the guaranteed through a process costing, approximate knowledge of the amount of unwanted non-value-added processes of great importance [25].

Recognition of a cost-based quality management system

Kamiske and Tomys considered [29, 3]. First, however, they organize these into individual processes and evaluate them with regard to the effect on customer needs. As a value-increasing processes are referred to specifically bring the customer value or aspirational

nature. Value-reducing processes are spending both money and time, or loss of reputation and loss of capacity by reworking.

A clear and differentiated subdivision of processes to perform, and was of Kamiske and Tomys subdivided into four categories of benefits: net power, performance piece, reactive power and blunder. Services rendered under all planned processes are understood, which will increase the value of the product and thus contribute to an increase in benefits for the customer. The sum of all services rendered within the ideal value chain has the finished product to the output result.

Support services are also planned achievements which only require increasing the value of the product. They are used for process support. Example at this point, intermediate inspections in production of an automobile manufacturer will be counted on this activity.

Reactive powers are unplanned processes such as intermediate storage although of cost, it has no positive effect on the product. Failures are unplanned and value-reducing processes. Example of this product can be called as a result of those failures result rework or scrap.

Conclusion

Through this article, it has been rated some way to show the quality costs. However, it was shown, the opportunities for quality costing already given and what action must be taken to ensure a reliable quality costing.

The presentation and application of the theoretical aspects in the area of quality costs in this case represents an important first point. The presentation of the classical concept of quality costs, and its criticisms led to a use of modern dichotomy within this article. It was a seamless transfer of knowledge from theory can be achieved in practice.

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