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**Implementation Process of Quality  
Costs System in a Company**

Paulína Krnáčová

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## **Implementation Process of Quality Costs System in a Company**

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### **Summary:**

With growing global competition, quality management system is becoming increasingly important to the leadership and management of all organizations. The implementation, maintenance and development of the quality management system in regard to quality economics require monitoring and evaluation of the costs of quality. Each enterprise is trying to implement and develop such quality management system that is to improve the quality of its products and decrease the costs. This is also one of the key factors concerning competitiveness. The aim of this paper is to analyze knowledge and experience of quality costing and to emphasize the meaning of implementation quality costs system in an organization.

**Keywords:** quality management, quality management system, continuous improvement, costs of quality, economics of quality

## **Proces implementácie nákladov na kvalitu v podniku**

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### **Abstrakt:**

Systém manažérstva kvality sa stáva dôležitou súčasťou manažérstva každej organizácie, ktorá chce obstáť v konkurenčnom prostredí. Implementácia, udržiavanie a zlepšovanie systému manažérstva kvality v ponímaní ekonomiky kvality sa zameriava na sledovanie a vyhodnocovanie nákladov na kvalitu. Snahou každého podnikateľského subjektu je zaviesť a rozvíjať taký systém manažérstva kvality, ktorý vedie k zvyšovaniu kvality produktov pri súčasnom znižovaní nákladov, čo je zároveň kľúčovým faktorom dosahovania konkurencieschopnosti. Cieľom predloženého príspevku je analyzovať teoretické aspekty ekonomiky kvality s dôrazom na podstatu implementácie systému na sledovanie nákladov na kvalitu v organizácii.

**Kľúčové slová:** manažérstvo kvality, systém manažérstva kvality, neustále zlepšovanie, náklady na kvalitu, ekonomika kvality

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## **Content**

Introduction.....	7
1. Concept of Quality Costs.....	8
2. Process of Quality Costs System Implementation .....	14
Conclusion.....	17
References .....	18

## Introduction<sup>1</sup>

Quality is often used to signify excellence of product or service – people talk about Rolls-Royce quality or top quality. If we are to define in a way that is useful in its management, then we must recognize the need to include in the assessment of quality the true requirements of the customer – the needs and expectations. Quality then is simply meeting the customer requirements.

The ability to meet the customer requirements is vital, not only between two separate organizations, but within the same one. Throughout and beyond all organizations, there is a series of quality chains of customer and suppliers that may be broken at any point by one person or one piece of equipment not meeting the requirements of the customer, internal or external. The interesting point is that this failure usually finds its way to the interface between the organization and its outside customer, and the people who operate at that interface usually experience the ramifications. The concept of internal and external customers/suppliers forms the core of total quality.

Quality has to be managed – it will not just happen. Clearly, it must involve everyone in the process and be applied throughout the organization. Failure to meet the requirements in any part of a quality chain has a way of multiplying, and failure in one part of the system creates elsewhere, leading to yet more failure, more problems and so on. The price of quality is the continual examination of the requirements and ability to meet them. This will lead to a continuing improvement philosophy. The benefits of making sure the requirements are met at every stage, every time, are truly enormous in terms of increased competitiveness and market share, reduced costs, improved productivity and delivery performance and the elimination of waste.

Besides manufacturing a quality product, providing a quality service, or doing a quality job, the cost of achieving these goals must be carefully managed, so that the long-term effect of quality costs on the business or organization is a desirable one. These costs are true measure of the quality effort. A competitive product or service based on a balance between quality and cost factors should be the principal goal of responsible management. The objective is best accomplished with aid of competent analysis of the costs of quality.

The aim of this paper is to present knowledge and experience of quality costing and to emphasize the meaning of implementation quality costs system in an organization. Quality cost measurements provide guidance to the quality management program, much as the cost accounting system does for general

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<sup>1</sup> The paper is an output of research activity IGM No. 2316070/10 Possibilities of Continuous Improvement Tools and Methods Applying in Context of Improving Business Competitiveness

management. As J. Campanella said, “it defines and quantifies those costs that are directly affected, both positively and negatively, by the quality management program, thus allowing quality to be managed more effectively” (Campanella 1999: 4).

According to survey over the last 40 years, in western companies quality costs account for between 5% and 40% of turnover. That is wide area for management to make an improvement to get more money. Therefore how to reduce the quality cost to reach a better quality level is a key point for a company success. The target of quality management is to achieve the quality standard in a minimal cost. According to Dale’s opinion, the quality cost may be regarded as a criterion of quality performance. In general, the quality costs are the total of the costs incurred for quality control process and the lost of product defect (He 2010: 102).

## 1. Concept of Quality Costs

In the scientific literature the cost of quality has been defined in a number of ways. Although, the definition of quality costs is as important as that of quality, the definitions differ from author to author (Mohanty, Tiwari 2006). The earliest writing on the concept of quality costs was found in Juran’s Quality Control Handbook (Jaju, Mohanty, Lakhe 2009: 1075). This marked the beginning of subsequent development in the field of quality costs. Juran (1989: 376) described the cost of poor quality as “the sum of all costs that would disappear if there were no quality problems” and presented the analogy that poor quality and its related costs are “gold in mine”. In Campanella’s opinion quality costs are measure of the costs specifically associated with achievement or non-achievement of product or service quality – including all product or service requirements established by the company and its contracts with customers and society. He considers quality costs as “difference between the actual cost of a product or service and what the reduced cost would be if there were no possibilities of substandard service, failure of products, or defects in their manufacture” (Campanella 1999: 4).

However, these definitions do not answer the question how much quality is enough. In theory, the answer is analogous to a principle of economics: basic marginal cost equals marginal revenue ( $MC = MR$ ). That is, spend on quality improvement until the added profit equals the cost of achieving it. It seems to be easy but it is not in practice. In economics, the MC and MR curves are difficult to define and more difficult to compute. The same is true of the cost/benefit curves of quality costs (Swift, Ross, Omachonu 1998).

The costs of quality are not different from any other costs. It means they can be budgeted, measured and analyzed. The first step to analyze them is to identify all

of their categories and subsequently their components. As definitions of quality costs differ as the opinions of their categories.

The first one, so-called P-A-F model first presented by Feigenbaum, divides quality costs into prevention, appraisal and failure costs. Failure costs can be further split into those resulting from internal and external failure.

P. B. Crosby divided quality costs into two categories as the costs of conformance (the sum of prevention and appraisal costs) and as the costs of non-conformance (the sum of internal and external failure costs) (Crosby 1983: 38–39).

As we have already mentioned, the costs of quality can be generally classified into three (four) categories (Campanella 1999: 5):

1. *Prevention costs* are associated with the design, implementation and maintenance of total quality management system. Prevention costs are planned and are incurred before actual operation. Prevention includes product or service requirements, quality planning, quality assurance, inspection equipment, training, miscellaneous (general office management activities associated with quality). Resources devoted to prevention give rise to the “costs of doing it right the first time”. They include those activities that remove and prevent defects from occurring in the production process and are incurred to ensure that poor quality is not produce.
2. *Appraisal costs* are associated with the supplier’s and customer’s evaluation of purchased materials, processes, intermediates, products and services to assure conformance with the specified requirements. Appraisal includes verification (checking of incoming material, process set-up, first-offs, running processes, intermediates and final products, including product or service performance appraisal against agreed specifications), quality audits (to check that quality system is functioning satisfactorily), inspection equipment (the calibration and maintenance of equipment used in all inspection activities), vendor rating (the assessment and approval of all suppliers, of both products and services). Appraisal costs are those costs incurred to identify poor quality products after they occur but before shipment to customers. Appraisal activities result in the “costs of checking it is right”.
3. *Internal failure costs* occur when the results of work fail to reach designed quality standards and are detected before transfer to the customer takes place. Internal failure includes the following: waste (the activities associated with doing unnecessary work or holding stocks as the result of errors, poor organization or poor communications, the wrong materials, etc.), scrap (defective product, material or stationery that cannot be repaired, used or sold), rework or rectification (the correction

of defective material or errors to meet the requirements), re-inspection (the re-examination of products or work that have been rectified), downgrading (a product that is usable but does not meet specifications may be downgraded and sold as “second quality” at a low price), failure analysis (the activity required to establish the causes of internal product or service failure).

4. *External failure costs* occur when product or service fail to reach design quality standards but are not detected until after transfer to the customer. External failure includes repair and servicing (either of returned products or those in the field), warranty claims (failed products that are replaced or services re-performed under some form of guarantee), complaints (all work and costs associated with handling and servicing of customers’ complaints), returns (the handling and investigation of rejected and recalled products or materials, including transport costs), liability (the result of product or service liability litigation and other claims, which may include a change of contract), loss of goodwill (the impact on reputation and image, which impinges directly on future prospects for sales).

External and internal failures produce the “costs of getting it wrong”. The main difference between external and internal costs is as follows: internal costs incurred either during the production process and external after the product is shipped.

The above-mentioned P-A-F model for quality costing has a number of drawbacks. In total quality management, prevention of problems, defects, errors, waste, etc., is one of the prime functions, but it can be argued that everything a well-managed organization does is directed at preventing quality problems. This makes separation of prevention costs very difficult. There is clearly a range of prevention activities in any manufacturing or service organization that are integral to ensuring quality but may never be included in the schedule of quality related costs.

It can be probably impossible and unnecessary to categorize costs into the three categories of P-A-F. For example, a design review may be considered a prevention cost, an appraisal cost, or even a failure cost, depending on how and where it is used in the process. Another criticism of mentioned model is that it focuses attention on cost reduction and plays down, or in some cases even ignores, the positive contribution made to price and sales volume by improved quality.

The most serious criticism of the original P-A-F model presented by Feigenbaum is that it implies an acceptable “optimum” quality level above, which there is a trade-off between investment in prevention and failure costs.

The key focus is on process improvement, and a cost categorization scheme that does not consider process costs, such as the P-A-F model, has limitations.

In total quality cost system that focuses on processes rather than products or services, the operating costs of generating customer satisfaction will be of prime importance. The so-called “process cost model” sets out a method for applying quality costing to any process or service. It recognizes the importance of process ownership and measurement, and uses process modeling to simplify classification. The categories of the cost of quality have been rationalized into (Oakland, Sohal 2001):

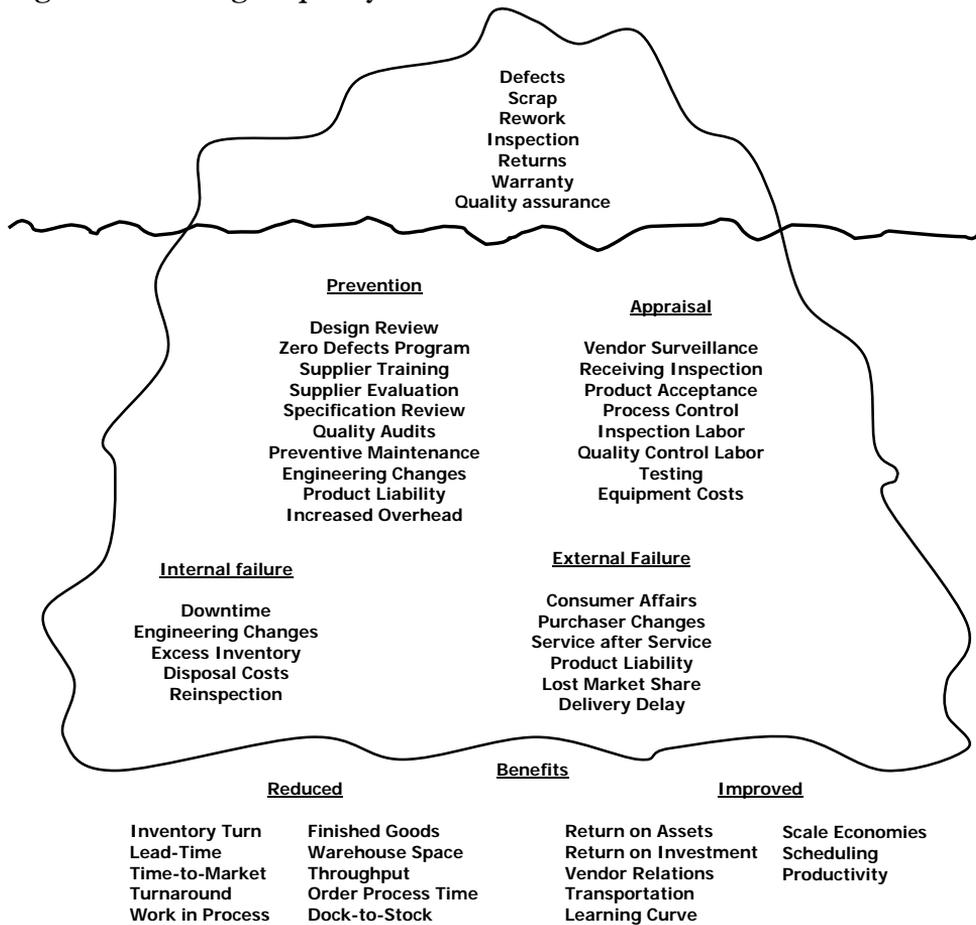
1. *The cost of conformance* is the process cost of providing products or services to the required standards, by a given specified process in the most effective manner, i.e. the cost of the ideal process where every activity is carried out according to the requirements first time, every time.
2. *The cost of non-conformance* is the failure cost associated with a process not being operated to the requirements, or the cost due to variability in the process.

Process cost model (described in the revised British Standard 6143-1:1992 and considered as more appropriated and better method for continuous improvement of a company implementing total quality management) can be used for any process within an organization and developed for the process by flowcharting. This will identify the key process steps and parameters that are monitored in the process. The process cost elements should then be identified and recorded under categories of product/service (outputs), and people, systems, plant or equipment, materials, environment, information (inputs). The costs of conformance and costs of non-conformance for each stage of the process will comprise a list of all the parameters monitored.

#### *Relationship between Quality Cost Categories*

To analyze the change effect of the one quality cost element on another one, it is necessary to investigate the relationship between the four cost categories.

Figure 1: Iceberg of quality costs

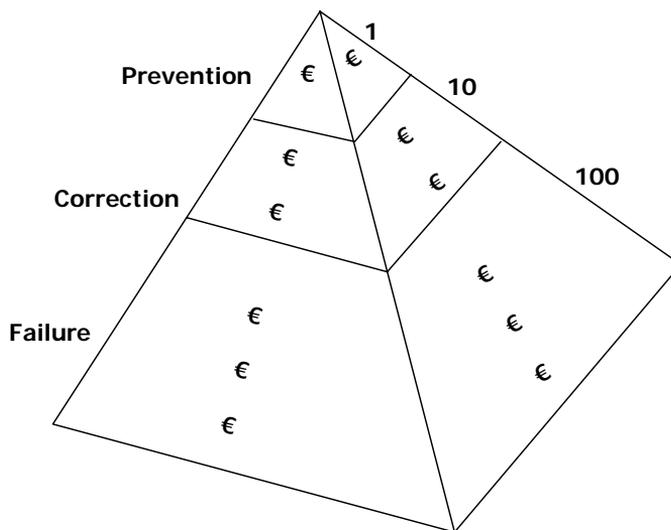


Source: Swift, Ross, Omachonu (1998: 208).

At first, the Figure 1 is an attempt to convey the idea of an iceberg, where only 10 percent of costs of quality are visible and 90 percent is hidden from view. The analogy is good one because the visible 10 percent is comprised of such items as scrap, rework, inspection, returns under warranty, and quality assurance costs, for many companies these comprise what they believe to be the total costs. When the hidden costs of quality are computed, controlled, and reduced, a firm can achieve the benefits shown at the bottom of Figure 1.

Of these types of costs, prevention costs should probably take priority because it is much less costly to prevent a defect than to correct one. The relationship between these costs is reflected in the 1-10-100 rule (see Figure 2).

**Figure 2: 1-10-100 Rule**

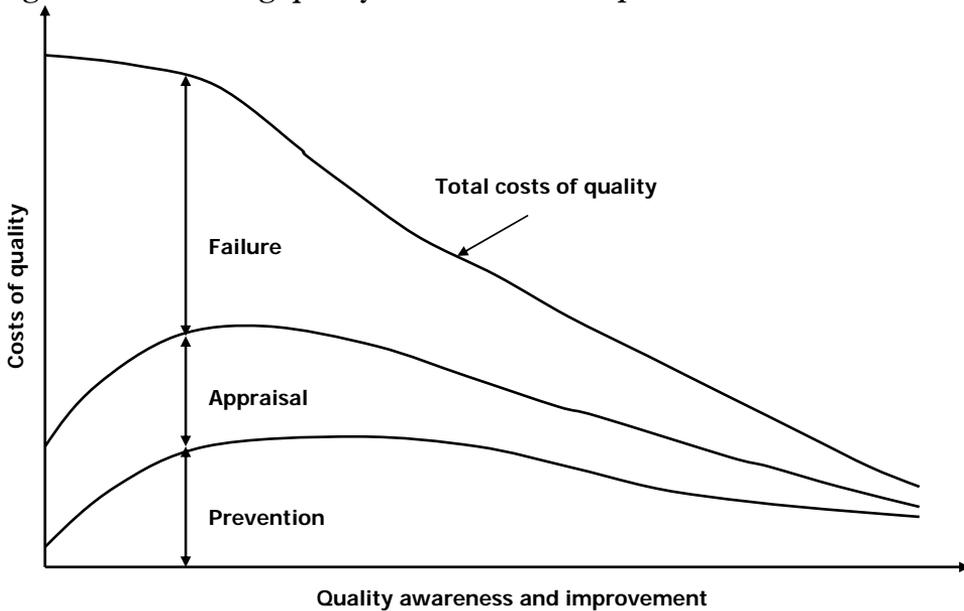


Source: Swift, Ross, Omachonu (1998: 208).

Clearly, this classification of costs elements may be used to interrogate any internal transformation process. Using the internal customer requirements concept as the standard for failure, these cost assessments can be made wherever information, data, materials, service or artifacts are transferred from one person or one department to another. It is the “internal” costs of lack of quality that lead to the claim that approximately one-third of all our efforts are wasted.

The relationship between the quality related costs of prevention, appraisal, and failure and increasing quality awareness and improvement in the organization is depicted in Figure 3. Where the quality awareness is low the total costs of quality are high, the failure costs predominating. As awareness of the cost to the organization of failure gets off the ground, through initial investment in training, an increase in appraisal costs usually results. As the increased appraisal leads to investigations and further awareness, further investment in prevention is made to improve design features, processes and systems. As the preventive action takes affect, the failure and appraisal costs fall and total costs reduce (Oakland, Sohal 2001: 117–119).

**Figure 3: Increasing quality awareness and improvement activities**



Source: Oakland, Sohal (2001: 118).

## **2. Process of Quality Costs System Implementation**

Process of quality costs system implementation has to be well prepared to bring advantages for organization. Like many good things in life a quality cost system will not occur by itself. Its implementation requires responsible person (not just quality manager). It can be anyone with knowledge of quality cost systems, a clear view and belief in their application and value to company, a desire and willingness to be advocate and leader, and the position and opportunity to meet the imposed challenges.

The first step of implementation process is to verify that a quality cost system can be beneficial to the company. This is important to attract management's attention and interest. At first, a review and analysis of financial data must be conducted in detail to determine the general level of quality costs as they exist in the present. Much of the data required is presently and readily available. If not, some of these costs may be estimated. It is necessary to pay attention to this step that should be relatively easy and does not have to account for all quality costs. These easily estimated costs (including and representing the major costs of quality) should be presented to management. It causes justifying the management effort and interest in participating in the quality cost system.

The next step is to determine whether management is truly open-minded to accept and support a quality cost system. Unfortunately, a quality cost system cannot succeed from the bottom or the middle of the organization upward.

After these steps it is necessary to develop overall plan and schedule for quality cost system implementation which should include (Campanella 1999: 45–55):

1. The management presentation, designed to identify the overall opportunity, to show how the system will achieve its benefits, and to accomplish management acceptance and support for implementation plan and schedule.
2. Conduct of the planned pilot program which is recommended, because it can prove the ability of the system to produce cost-saving results, resell management on the continued need for system, limit the initial scope of implementation and allow system debugging prior to full implementation. Because of success of implementation process the pilot program needs a full-time leader – one who knows quality management and the company and who is willing to learn about accounting (a co-leader from accounting division would be ideal). Pilot program should be prepared for the selected pilot area (it can be product line, typical office in a multifacility company or an entire division) which should have following characteristics:
  - be as typical of the company's operation as possible,
  - contain costs in all categories of quality cost measurement,
  - present obvious improvement opportunities,
  - have a cooperative local management.

Actual steps of the pilot program involve:

- measurement of quality costs and appropriate bases,
  - tie-in with basic quality measurements,
  - establishment of key trend analysis charts,
  - identification of improvement opportunities and goals,
  - leadership and support of problem identification, analysis, and solution,
  - strict enforcement of necessary corrective actions,
  - summary reporting of progress.
3. Education of all functions to develop awareness and interest in participation in the quality cost system. Key members of each department should be educated in the concepts of a quality cost system and the detailed program plan for implementation. The objective of this education is agreement on the benefits of the system and a commitment to participation as required. Departments should be given the opportunity to review the entire system as planned and see exactly where they fit. It is very important that all department representatives be encouraged to make system suggestions from their expert viewpoints

and to prepare list of those tasks or functions performed by their department that can be considered quality costs.

4. Development of the internal quality cost accounting procedure is necessary because many of the needed quality cost data are not readily available from the cost accounting system, for example many appraisal and internal failure costs are considered a normal part of operations. As such, these costs are not segregated and available for use or costs accounted in the accounting books may not be the same as the quality cost definition. Internal quality cost procedure is necessary to describe and identification each element of every single quality cost category. To assure acceptance of quality costs by all who may be affected by the data, the internal quality cost accounting procedure should be authorized by the controller or chief accountant. It can be prepared with the help of quality cost manager, but it should be implemented through accounting.
5. Quality cost collection and analysis. Preparing and officially publishing the internal quality cost procedure is a key point to the implementation and use of a quality cost system. A various type of charts and tables can be constructed for analysing the unit costs of quality. The same format could be used for both budgeting and reporting. Costs can be tabulated by organization unit, by time, by cost of quality categories, or by product. Quality costs can also be normalized for volume by using one or more of the following measures: per direct labor hour, per direct labor cost, per unit of standard manufacturing cost, per unit of sales, or per equivalent unit of product.
6. Quality cost reporting and uses (integration with the quality management system and quality improvement program). The measurement and reporting quality costs to facilitate strategic demands need to be provided to users of the information in a form that aids in decision making. Thus, the measurement and reporting of costs of quality should meet the three-part need to:
  - report quality costs,
  - identify activities where involvement is suggested, and
  - indicate interlinking activities.

The most elusive category for reporting is the cost of lost opportunities, which is an external failure cost. This represents the impact on profit from lost revenues resulting from purchase of competitive products and services or from order cancellations due to customer requirements not being met. It is also elusive and difficult to compile the relationship among two or more costs that affect quality costs (Swift, Ross, Omachonu 1998).

An effective quality costs system should be directed toward the basic reason for quality improvement, that could be, support of a differentiation strategy. Of course, if a company has not developed a strategy, it becomes difficult to identify those costs of quality that support differentiation of satisfaction in the minds of the customers. The cost differentiation reflects the cost drivers of the value activities on which uniqueness is based. Differentiation can also result from the coordination of linked value activities that may not add much cost but nevertheless provide a cost savings and a competitive edge when integrated.

## **Conclusion**

When total customer satisfaction becomes the definition of a quality product or service, it creates a need to develop measures which integrate the customer perspective into measurement system. This need leads to a search for quality, and hence quality costs, in activities not usually recognized as incurring these costs. This will change as more companies realize that all activities can contribute to total customer satisfaction.

Furthermore, for an organization to be truly effective, each part of it must work properly together. Each part, each activity, each person in the organization affects and is in turn affected by others. Errors have a way multiplying, and failure to meet the requirements in one part or area creates problems elsewhere, leading to yet more errors, yet more problems, and so on. The benefits of getting it right first time everywhere are enormous.

A competitive product or service based on a balance between quality and cost factors should be the principle goal of responsible management. Besides manufacturing a quality product or providing a quality service each organization should pay attention to manage the cost of achieving these goals. The analysis of quality costs provides a method of assessing the effectiveness of the management of quality and of determining problem areas, opportunities, savings, and action priorities. Total quality costs may be categorized into prevention, appraisal, internal failure and external failure, the P-A-F model. Quality costs include those factors which lie behind the obvious production processes. Moreover, it becomes necessary to identify the hidden quality costs associated with foregone opportunities.

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