# 服務品質成本暨其相關文獻探討

## Cost of Services and Quality: A Literature Review

王事民　Shi-Min Alex Wang [1&*],
李淳靖　Chun-Jing Brian Lee [1],
陳俊誠　Jun-Cheng Jerry Chen [1],
鄭湘芸[1] Hsiang-Yun Lisa Cheng,
王銘宗　Ming-Tzong Wang [1&**]
1. Graduate Institute of Industrial Engineering, National Taiwan University

## 摘要

　　本文主要透過文獻回顧的方式,來探討品質成本、服務品質與其之間相關的議題。品質成本模型針對 PAF 模型做詳述;而在服務品質議題上則討論 SERVQUAL 與 RECOVSAT 兩大主題。本研究尚發展一套根據 PAF 模型的品質成本分類科目,藉此來分析服務業應用品質成本概念的相關文獻。分析結果發現大部分的案例皆投資於教育訓練上,而這些服務業公司也因為產業特性,面臨許多的外部失敗成本。最後本研究結合品質成本跟服務品質的概念,探討這兩大議題的關聯性,期望未來能發展出「服務品質成本」理論。

**關鍵字**:品質成本、服務品質、PAF 模型、SERVQUAL、RECOVSAT

## Abstract

　　This paper give a novice an overview cost of quality (COQ) and service quality (SQ) concept. We propose a review of COQ PAF model and a review of service quality issues: SERVQUAL and RECOVSAT. A COQ element category is employed to examine and analyze the COQ applications in service industry. In our review, we found out most of service companies spent prevention and appraisal cost on training and education. The paper provides a useful source of information on COQ and service quality, especially the connection between these two domains.

**Keywords**: cost of quality, service quality, PAF model, SERVQUAL, RECOVSAT

[*] First author:國立臺灣大學工業工程所博士生
(聯絡電話:0910555212,E-mail: f97546026@ntu.edu.tw)
[**]. Corresponding author: 國立臺灣大學工業工程所副教授
(聯絡電話:(02)3366-3366 ext. 69502,E-mail: mtwang@ntu.edu.tw)

## I.  Introduction

This study is basically concerned with issues relating to cost of quality (COQ) and service quality (SQ) in terms of their connection and applications. The study will analyze previous academic articles pertaining to COQ, especially target on the applications of service industry. Further we mainly focus on developing these two concepts to a new domain, which is called cost of service quality (COSQ). The results can provide for the reader a broad overview of the evolution of COQ and suggest a possible direction for further research in this field.

COQ has evolved and been redefined during the past six decades by numerous scholars and practitioners, and has existed under different names like for instance, costs related to quality, poor-quality cost, quality costs (Summers, 1997), cost of non-conformance (Crosby, 1979), cost of un-quality (Musgrove & Fox, 1991), cost of poor quality (Besterfield, 1979), quality costing ( Dale & Plunkett, 1999), etc.. With regard to its application, it was originally put into practice on a large scale in the manufacturing industry and then comprehensively extended to include other industries, like the high-tech industry, commerce, services, and healthcare, to name just a few (Williams, Van der Wiele, & Dale, 1999).

Service is highly related to customers' feeling; the essence of service is customer satisfaction. The concept of service can be better understood when it is compared with goods, concrete merchandise. Compared to goods, service has four following characteristics: intangibility, heterogeneity, inseparability, and perishable (Bogen, Hausen, & Worst, 1994; Wolak, Kalafatis, & Harris, 1998; Zeithaml, Parasuraman, & Berry, 1985).

## II.  Cost of Quality

The COQ concept was formally demonstrated with the parallelism "gold in mine" in the late 1940s. Juran (1951) indicated that there are two types of cost related to quality; they are avoidable cost and unavoidable cost. Waste, rework and failure are included in avoidable cost; and unavoidable costs are those cost associated with quality improvement measures. Now the widely accepted COQ classification was firstly presented by Feigenbaum in 1956, the Prevention-Appraisal-Failure model. Another quality guru Crosby simplified PAF classification in his bibliography *Quality in free*. He defined prevention cost and appraisal cost as the cost of conformance, and failure cost as non-conformance cost (Crosby, 1979). Ostrenga thought there is added-value in prevention cost. Companies can save cost by investing in those activities with added-value (Ostrenga, 1991). From the view of manufacturer, prevention and appraisal cost can be grouped into control cost, and the costs left are out-of-control cost (Morse, Harold, & Poston, 1987).

1. Definition of PAF

Numerous of literatures have presented models, guides and case studies with the concept of Cost of Quality. Most of the studies are based on PAF classification. This research shows a summary of PAF definition below:

Table 1 Definition of PAF costs

| Prevention costs | |
|---|---|
| Definition | The time and costs spent on training, planning, staff awareness raising, quality improvement projects, and quality management. |
| Example | The costs of new product review, quality planning, process capability evaluations, supplier capability surveys, quality education and training, quality improvement activities. |
| Appraisal costs | |
| Definition | The time and costs connected with measuring, evaluating or auditing products or services to assure conformance to quality standards and performance requirements. |
| Example | The costs of incoming and source inspection/test of purchased material; in-process and final inspection/test; explicit standard setting and monitoring ;product, process or service audits; calibration of measuring and test equipment. |
| Internal failure costs | |
| Definition | The costs associated with failure to provide the appropriate service or products to customers before they have received it. |
| Example | The costs of scrap, rework, re-inspection, re-testing, material review, and down grading. |
| External failure costs | |
| Definition | The costs occurred after delivery or shipment of the product, and during or after offering a service to customers. |
| Example | The costs of processing customer complaints, customer returns, warranty claims, and product recalls. |

Ref: (Fassoula, 2005)

2. PAF model

In 1962, J.M. Juran contrasted prevention plus appraisal costs with failure costs and then proposed the traditional tradeoff. Normally in quality textbooks, this model will be discussed and reproduced in the very beginning chapter. Many researches show that there are several difficulties in this model even thought it had a factual basis (Bajpai and Willey, 1989). No general measure of quality is the first problem in the model. Quality was defined "the totality of features and characteristics that bear upon its ability to satisfy stated or implied need" in BS 4778. However, this definition leaves room for further discussion. As a management principle, "totality" would be fine. But the rough idea may confuse people in practical use. A single

product have separate scales and different units in terms of quality if measure at all. Only in manufacturing the "de-merit ratings" are well developed to measure the totality of quality, and they can't be claimed as a universal measure. Furthermore, a good performance on the totality of quality does not represent "satisfy". The only one who decides "satisfy" is customer and this concept has been considered as a basis index in proposed literatures (Bajpai and Willey, 1989). There are so many indices for the horizontal axis in the model. But for the vertical axis, it has already been identified that the measure of quality costs are usually not kept. However, this traditional tradeoff model cannot explain the economics of quality for products in other development stages and can only be applied to finished products because the limit to quality of conformance.

Kume (1985) and Schneiderman (1986) disputed the validity of this traditional tradeoff. They raised a discussion on the traditional tradeoff model including some level of defectives to reach the minimum total cost. In traditional tradeoff, people may put emphasis on inspection instead of prevention by the time the model was developed. It would bring large expenditures on inspection, and the benefits of prevention in this stage had not been recognized yet. Investments in prevention are critical element nowadays in highly competitive business environment, but the static traditional construct would obstruct additional investments in prevention activities. Besides, empirical evidence was revealed against the traditional tradeoff model (Carr 1992). It refuted that each curve represents 50% of the total cost of quality. Furthermore, the shape of these curves would be varied with the corresponding shift with the optimal cost point if intangible costs were taken into consideration (Harrington 1987). A modified model was proposed which the optimum solution is at 100% of quality of conformance.
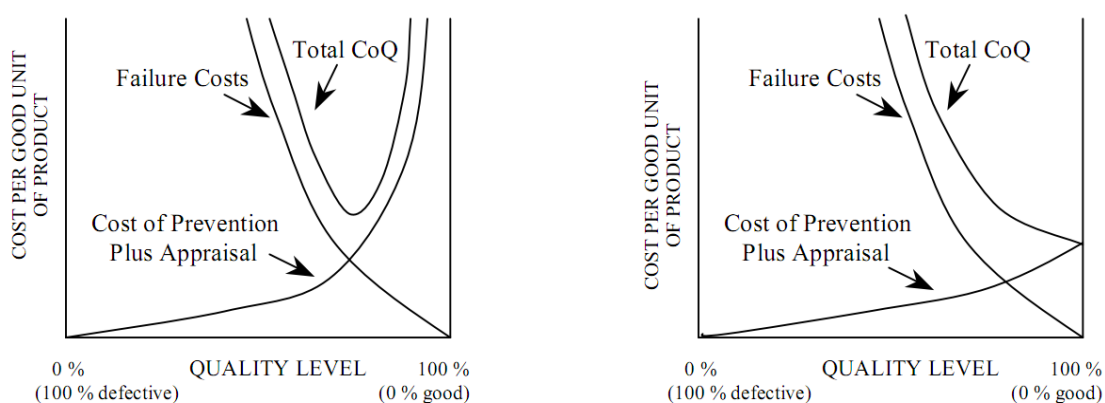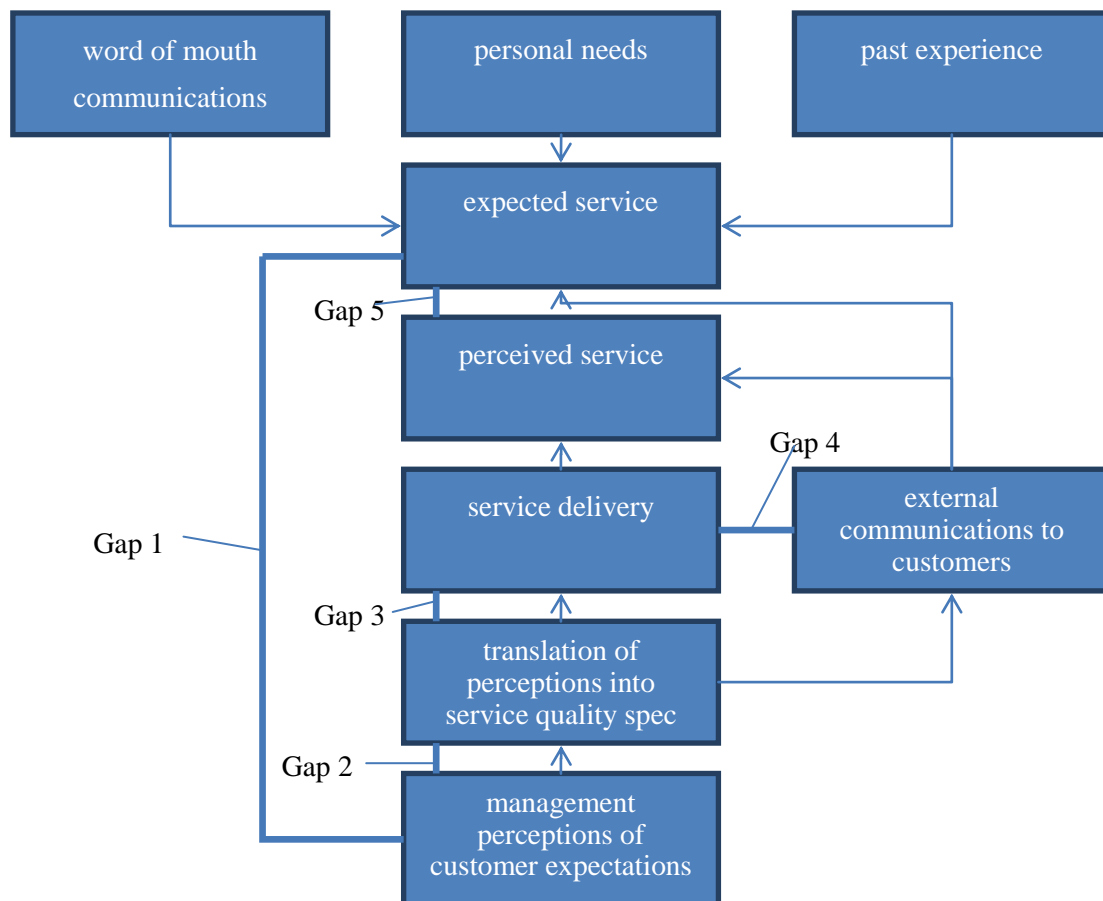


Figure 1：Traditional (left) PAF model and modern (right) PAF model

## III. Service Quality

Service quality could be regarded as a perceived judgment to differentiate one company from others. According to different receivers, service perceptions are generally diverse. In this section, it includes service five gaps, SERVQUAL instrument, and debating issues related to SERVQUAL.

### 1. Service five gaps

Once customers' expectation with service is not equivalent to the service they perceived and received, service gaps emerges. Service gaps are defined as the service discrepancies between the customers' perception and providers' offer. Parasuraman, Zeithaml, and Berry developed a service quality model which derived from five service gaps in 1985. (Parasuraman, Zeithaml, & Berry, 1985) It was a breakthrough. The model is illustrated as following:

Upon purchase of a service, a customer expects to receive a certain level of service (this level depends on factors such as: - word of mouth - personal needs - past experience - external communication to other customers). (Brown & Swartz, 1989; Gronroos, 1984) The level of service received however rarely matches that expected, and the difference between these two levels can result in the following 5 gaps:

- Gap 1: represents the misunderstandings between executive perceptions and customer expectations

- Gap 2: represents wrong specifications

- Gap 3: represents failure to deliver the service

- Gap 4: represents over-promising

- Gap 5: represents the difference between the expected service and the service perceived and it is also a function of the 4 previous elements.

Gaps 1 to 4 occur within the organization, and should therefore be controlled to shorten gap 5 (which is the general indicator). Hence, the objective of the service quality model is to reduce gap 5 so that the other four gaps are reduced (triggered by the decrease of gap 5).

## 2. SEVRQUAL

There are more and more companies addressing on service quality in competitive marketing. Customers' perception of service quality is regarded as the probability of repurchase and influence the business in a company. For that reason, it is crucial for the marketer to understand what service quality is composed of, how to satisfy customers' needs and to find the means to measure service quality. Parasuraman et al therefore developed an instrument, SERVQUAL, to measure service quality. (Parasuraman, et al., 1985) The instrument aids service providers to realize how important their service is and how they could improve service quality.

Parasuraman et al conducted the survey in five service industries including retail banks, credit card companies, a communication company, a product repair and maintenance firm, and a securities broker, and then concluded SERVQUAL scale into ten dimensions with 100 questions (Ladhari, 2009). The dimensions are as shown in table 2:

Table 2: SERVQUAL dimensions

| PZB dimensions | |
|---|---|
| 1. tangibles | 7. competence |
| 2. reliability | 8. courtesy |
| 3. responsiveness | 9. understanding/knowing customers |
| 4. communication | 10. access |
| 5. credibility | |
| 6. security | |

These dimensions could be adopted in a variety of service industries with some appropriate modifications because of its common idea. SERVQUAL scale is also widespread use in several countries, which includes China, Australia, Honk Kong, South Africa, and so on.

## IV. Recovery Satisfaction

The rules of marketing concept are a philosophy that aids people with making decision. To implement the marketing concept properly could make a company understand what customer wants and needs. However, many companies carry out the marketing concept improperly, and then customers feel dissatisfied, even unsatisfied, which results in the impact on companies is negative.

## 1. Customer satisfaction

Service failure could harm the image of companies. Moreover, the great quality guru W. Edwards Deming stated in his book that research with consumers has found that happy customers tell eight friends about their positive experience, but angry customers tell their troubles on average to sixteen people. (Kochkin, 2000) Worse still, 13% of those unhappy former customers will tell their stories to more than 20 people. (Buttle, 1998) In recent studies, the trend of similar statistics appeared to be on the rise due to the vast popularization of internet and all other technologies that thrive on it. Therefore, customer complaints have become ever more knotty to handle and if one single problem is left unresolved, the effect of word-of-mouth will soon take on a larger scope.

Service industries and customer-focused companies have become increasingly aware of the importance of retaining customers while attracting new ones. Therefore, measuring customer satisfaction has also become one of their endeavors as it serves as one of company's performance index. However, customer satisfaction is an ambiguous term because satisfaction is a psychological state mixed of subjective emotions and feelings, which are rather difficult to be translated into scales and even harder to be put in words. As a result, innumerable studies and researches have been dedicated to scientific standards and methodologies on measuring customer satisfaction. In reality, oftentimes it is much easier for service department to track dissatisfactions than satisfaction, because those dissatisfactions are usually expressed in forms of surveys or complaints. However, for every complaint heard, the average company has 26 other customers with the same problem (Gates, 2005). It is apparent that most of the unsatisfied customers tend to be reserved about their negative opinions; in fact, according to Bill Cates, the average business never hears from 96% of its unsatisfied customers. A similar study further indicated that a survey on "Why customers quit?" revealed a fact that 68 percent quit because of an attitude of indifference toward the customer by the owner, manager, or some employee. (LeBoeuf, 2000) The same study also concluded that the average business spends six times more to attract new customers than it does to keep old ones. Yet customer loyalty is in most cases worth ten times the price of a single purchase. (LeBoeuf, 2000) Hence, it is evident that it is equally important for a business to attract new customers and to keep old ones, because ultimately customer loyalty will have a huge impact on how well the business performs.

## 2. RECOVSAT instrument

The objective of service recovery is to compensate customer satisfaction. Hence, developing an instrument to assess post-recovery is indispensable. The instrument, RECOVSAT, could be shown with six dimensions, which are communication, empowerment, feedback, atonement, explanation, and tangibles. (Boshoff, 1999, 2005)

- Communication: service providers communicate with service receivers (customers) clearly, and identify the problem, then understand the further problem. Finally, service providers show their reliability and competency to solve the problem.

- Empowerment: the provider who first gets the complaint could deal with the complaint immediately without asking for authorization.

- Feedback: after service providers solve the problem, they write the report to take down how to handle, solve the similar problem.

- Atonement: whenever service failure occurs, the service providers would take some action to make it up so that service receivers are more likely to remain their loyalty.

- Explanation: service providers give an explanation of why the problem occurs, what goes wrong.

- Tangibles: service providers must dress up, or well-dressed to show their professional knowledge and attitude in working environment.

## V. Widespread use of COQ in Service Industry

This study investigates the cost items in different companies and industries based on the PAF Model and the PAF constituent components revised from the book, Quality (D. C. S. Summers, 1997). Originally, Summers (1997) categorized cost of quality into prevention costs, appraisal costs, internal failure costs, external failure costs, and intangible costs. However, most companies do not look into intangible items due to the fact that it is hard to calculate those items, for example, customer dissatisfaction, company image, loss sales, and loss of customer goodwill. The COQ parameters (Table 3) are summarised as follows (Wang & Chen, 2009):

Table 3 COQ parameters of PAF model

| Prevention Costs | -Quality Planning/Quality Meeting<br>-Quality Program Administration<br>-Supplier-rating Program Administration/Purchasing/Vendor Quality<br>-Customer Requirements/Expectations Market Research<br>-Product Design/Development Reviews/Process Improvement<br>-Quality Education Programs/Training<br>-Equipment and Preventive Maintenance |
|---|---|
| Appraisal Costs | -In-process Inspection<br>-Incoming Inspection<br>-Testing/Inspection Equipment<br>-Audits<br>-Product Evaluation |
| Internal Failure Costs | -Reworking<br>-Scrape/Waste<br>-Repair<br>-Material-failure Review/Re-inspection<br>-Design Changes to Meet Customer Expectations<br>-Corrective Actions/Trouble Shooting |
| External Failure Costs | -Returned Goods<br>-Corrective Actions<br>-Warranty Costs<br>-Customer Complaints<br>-Liability Costs/Litigation<br>-Penalties |

錯誤! 找不到參照來源。 summaries and analyzes abundant of COQ model implications by employing the COQ parameters above.

Table 4 Cross-Examination Table of Different Industries and COQ Categories

| Year | 1988 | 1991 | 1992 | 1993 | 2004 | 2005 | 2007 |
|---|---|---|---|---|---|---|---|
| Author | (Asher, 1988) | (Koch & Higgs, 1991) | (Blades, 1992) | (Navaratnam, 1993) | (Wu, 2004) | (Fassoula, 2005) | (Ramdeen, Santos, & Chatfield, 2007) |
| Industry | Service | Service | Service | Service | Service | Service | Service |
| Category | -- | Healthcare | Healthcare | Public Service | Healthcare | -- | Restaurant |
| **Failure Costs — External Failure Costs** | | | | | | | |
| Penalties | | | | | | | |
| Liability Costs/Litigation | | | x | x | | | x |
| Customer Complaints | x | | x | x x | x | x | x x |
| Warranty Costs | | | | | | | x x |
| Corrective Actions | | | | | | x x | |
| Returned Goods | x | | | x | | x x | x |
| **Failure Costs — Internal Failure Costs** | | | | | | | |
| Shooting | x | | | | | | |
| Customer Expectations | | | | | | | x |
| Review/Re-inspection | | | | x | x | | |
| Repair | | | | | | x x | |
| Scrap/waste | | | | x | x | x | x |
| Reworking | x | | | x x | | | x |
| **Appraisal Costs** | | | | | | | |
| Product Evaluation | x | | | x | | x | x |
| Audits | | x | x | | | | x |
| Testing/Inspection Equipment | | | | | | | |
| Incoming Inspection | x | x | | | | x | x |
| In-process Inspection | | x | | | | x | x |
| **Prevention Costs** | | | | | | | |
| Maintenance | | | | | | | x |
| Programs/Training | x | x | x | | | x | x |
| Reviews/Process Improvement | | | x | | x | x | x |
| Requirements/Expectations Market Research | | | x | | | x | x |
| Administration/Purchasing/Vendor Quality | | x | | x | x | x | |
| Administration | | | x | | x | | |
| Meeting | x | x | x | x | x | | |

## VI. Conclusion

Cost of quality was previously utilized solely in manufacturing industry and later further reach out to many other sectors. In this study, we focus on the service industries. Service industry includes educational institutions, hotels, restaurants, healthcare, and banks, to name just a few. However, there are some companies claiming to act as both a high-tech and a service companies. It is hard to make a clear distinction so these kinds of cases have drawn up a lot of debate.

In the content above, we present the background of COQ, SERVQUAL, and RECOVSAT. Traditional COQ model, which is PAF model, consists four types of cost: prevention cost, appraisal cost, internal failure cost, and external failure cost. In order to reach a high standard of service quality, the concept of SERVQUAL provides ten instruments for measurement. And the concept of RECOVSAT gives six instruments for companies to compensate customer satisfaction. To see the connection between COQ and SQ, we integrate the concepts of these three domains and show the result below:

Table 5 Connection between COQ and SQ dimensions

| SQ \ COQ | Prevention | Appraisal | Failure |
|---|---|---|---|
| SERVQUAL | - angibles<br>- eliability<br>- esponsiveness<br>- ommunication<br>- redibility<br>- ecurity<br>- ompetence<br>- ourtesy<br>- nderstanding<br>- ccess | - eliability<br>- redibility | N/A |
| RECOVSAT | - eedback<br>- angible | N/A | - ommunication<br>- mpowerment<br>- tonement<br>- xplanation |

For the concept of SERVQUAL, the cost of instruments is like training costs. The purpose of investments is to enhance service providers the awareness of quality service and their capability, to exam if their services appropriate or to prevent them to give inappropriate services to customers. For RECOVSAT, logically, the cost of instruments here should be all failure costs. Because the concept of RECOVSAT is the compensate customers dissatisfaction after the

inappropriate service was delivered. However, the feature of "Feedback" is learning lessons from failure of this time, and developing a mechanism to prevent things happened again; "Tangible" means service providers must dress up, or well-dressed to show their professional knowledge and attitude in working environment. These two instruments include the idea of prevention, so they are classified to prevention cost in the study.

## References

Bajpai, A. K. and P. C. T. Willey, 1989. Questions about Quality Costs. *International Journal of Quality & Reliability Management*, 6(6).

Besterfield, D., 1979. *Quality control: a practical approach*: Prentice Hall.

Bogen, M. A., H.-L. Hausen, et al., 1994. Handling of QoS characteristics. *Computer Networks and ISDN Systems*, 26(Supplement 2): S107-S118.

Boshoff, C., 1999. Recovsat: An Instrument to Measure Satisfaction with Transaction-Specific Service Recovery. *Journal of Service Research*, 1(3): 236-249.

Boshoff, C., 2005. A re-assessment and refinement of RECOVSAT: An instrument to measure satisfaction with transaction-specific service recovery. *Managing Service Quality*, 15(5): 410 - 425.

Brown, S. W. and T. A. Swartz, 1989. A Gap Analysis of Professional Service Quality. *The Journal of Marketing*, 53(2): 92-98.

Buttle, F., 1998. Word of mouth: understanding and managing referral marketing. *Journal of Strategic Marketing*, 6(3): 241-254.

Carr, L., 1992. Applying cost of quality to a service business. *Sloan Management Review*, 33(4): 72-7.

Crosby, P., 1980. *Quality is free*. Signet Book

Crosby, P., 1983. Don't be defensive about the cost of quality. *Quality Progress*, 16(4): 39.

Dale, B., & Plunkett, J., 1999. *Quality costing*: Gower Publishing, Ltd.

Fassoula, E., 2005. Reverse logistics as a means of reducing the cost of quality. *Total Quality Management & Business Excellence, 16*(5), 631-643.

Gates, B., 2005.Turn Complaining Customers into Loyal Customers. from http://www.referralcoach.com/members/articles/Turn_Complaining_Customers_into_Loyal_Customers.php.

Gronroos, C., 1984. A service quality model and its marketing implications. *European journal of marketing*, 18(4): 36-44.

Harrington, H. J., 1987. *Poor-quality cost*. CRC

Kochkin, S., 2000. MarkeTrak V. *The Hearing Journal*, 53(2): 34.

Kume, H., 1985. Business Management and Quality Costs: the Japanese View. *Quality Progress*, May: 13-18.

LeBoeuf, M., 2000. *How to Win Customers and Keep Them for Life*. Tomlinson and Associates.

Musgrove, C., & Fox, M., 1991. *Quality costs: their impact on company strategy and profitability*: Stanley Thornes.

Parasuraman, A., V. Zeithaml, et al., 1985. A conceptual model of service quality and its implications for future research. *The Journal of Marketing*, 49(4): 41-50.

Schneiderman, A., 1986. Optimum quality costs and zero defects: are they contradictory concepts? *Quality Progress,* 19(11): 28-31.

Summers, D. C. S., 1997. *Quality*. Upper Saddle River, NJ: Prentice Hall, c1997.

Wang, M.-T. and J. C. Chen (2009). *A Literature Review on Cost of Quality: Applications, Advancement, and Trends.* Taiwan, Taipei.

Williams, A., Van der Wiele, A., & Dale, B., 1999. Quality costing: a management review. *International Journal of Management Reviews, 1*(4), 441-460.

Wolak, R., S. Kalafatis, et al., 1998. An investigation into four characteristics of services. *Journal of Empirical Generalisations in Marketing Science,* 3(2).

Zeithaml, V., A. Parasuraman, et al., 1985. Problems and strategies in services marketing. *The Journal of Marketing*, 49(2): 33-46.