

# Measuring and reporting the cost of quality



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It is well known that most of the company promote quality as the central customer value and consider it to be a key factor to achieving competitiveness. Since continuous improvement is not only to meet customers' demand, but also to do it at the lowest costs, any related to improve quality must take into account the costs associated with achieving quality. Nevertheless, this can only be happen if they identified and measures reduction on costs needed to achieving quality. Therefore, measuring and reporting the cost of quality (COQ) should be consider as an important concern for managers.

The term " Cost of quality" is widely used and also widely misunderstood. Although in the early decade, quality cost were describe as the cost of rework, inspection, scrap and the cost of running in the quality department but still people often misunderstand cost of quality as the cost of creating a quality product or service.

The earliest writing on the concept of quality costs was Juran, (1951). Juran introduced " Gold in the Mine" which represents the potential savings in quality improvement efforts. He describes the cost of poor quality as " the sum of all costs that would disappear if there were no quality problem". Cost of quality has become popular since that time.

In the 1950s, quality costs were divided into four main categories by some scientists Feigenbaum (1983); Juran and Gryna (1993); Masser (1957) as prevention, appraisal, internal failure and external failure costs. Prevention costs are the costs incurred to preclude the production of products that do not conform to specifications. Examples of the costs are new product review,

quality planning, error proofing, quality improvement projects etc. Products that not conforming to specification must be repaired, reworked, or scrapped at an additional cost to the organization, this is what we called internal failure costs. Thus, to prevent pay an additional cost, a firm will conduct appraisal cost which is to determine the degree of conformance to quality requirements. It is also refer as inspection costs which included testing, process or service audits and etc. Lastly, if the non-conformance errors remain after the product is shipped and the product breaks down at the customers' site, even greater repair costs as well as the loss of customer goodwill; this is how often the highest quality cost of all may result and we refer this as external failure costs.

As suggested by Joseph Juran in the 1950s, there are organizations which skeptical about the real strength of cost of quality. Johnson (1995) also found a number of quality practitioners who viewed COQ systems as “administrative nightmares and as impediments to quality rather than as contributors to quality”. Why would this happen? Does this skepticism still existing? Some researchers found out the reasons for not tracking quality cost are lack of management support, absence of management interest in such costs, lack of understanding of the principle of quality costing amongst the management team, lack of adequate accounting and inadequate information systems.

## **1. 2: Research Objective.**

The objective of this project is to investigate how important cost of quality system should be implementing as a management tool and does it benefit to the firms in both Singapore and Malaysia. In addition, this project also

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identify whether advanced country is more aware with cost of quality management. Besides, in this project, I also decide to conduct a study on customers' perception towards product quality. I would like to know whether there is different perception between different countries. The objective of this study is to find out customers concern more on qualities or price. By knowing this factor, a firm can be aware of prevention cost and appraisal cost.

## **Chapter 2**

### **Literature Review**

Cost of quality (COQ) and total cost of quality (TCOQ) have become the most powerful management tools to measure quality performance during the past two decades. To overcome the skepticism that still prevails, K. Kumar and J. C. Brittain (1995), conducted postal surveys over 107 companies and they conclude cost of quality program could assist to improve the reliability other than reduces costs. They indicate that there is a strong relationship between total cost of quality and reliability of quality. Many companies in British adopted ISO 9000 in order to reach the higher levels of awareness of quality issues.

The best way to enhance customers' satisfaction, reduce manufacturing costs and also increase productivity is to continuously improving quality of the products. While concentrate to improving quality, we must always remember it must be done at the lowest possible cost as well. Nevertheless, this can only happen when they are identified and measured. Andrea Schiffauerova and Vince Thomson (2006) conducted a research to investigate if companies collect, measure and monitor quality costs, which <https://assignbuster.com/measuring-and-reporting-the-cost-of-quality/>

kinds of costs were considered in the calculations and whether any formal COQ approach was used. Four companies were selected participate in this research. This research is focused on the relation between quality strategies and industrial sectors on the kinds of COQ models used and on the satisfaction with company efforts. From this research, they suggested, cost of quality (COQ) should be a part of management program as it is not complex and well documented. Managers should understand well about the COQ concept, increase their ability to implement this system as how to save money.

Cost of quality as presently understood is the sum of the cost incurred within a firm in preventing low-quality product, the costs incurred to ensure and evaluate that the product quality requirements are being met, and any other costs incurred as a result of poor quality. There are different types of quality cost models and PAF model was developed by Feigenbaum (1956) and Masser (1957) which is the oldest of the quality costs models. Some argue that PAF is weak in identifying the causes of quality problems and consume more time when finding the quality problems ad causes compare to other models. Samir K. Srivastave (2008) was utilize the blend of quality-costing, quality-loss and process cost approaches to estimate quality costs in monetary term as per PAF model, and suggested there are still issues about capturing the full PAF costs.

Although COQ system is very popular and important for organizations to adopted, but still there are numbers of organization do not utilize it, Victor E. Sower, Ross Quarles and Eric Broussard (2007), did a research to investigate why there are still some organizations do not make use of COQ systems.

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They come out a conclusion that most frequent reasons for not tracking quality cost are lack of management support, absence of management interest in such costs, lack of understanding of the principle of quality costing amongst the management team, lack of adequate accounting and inadequate information systems

The measurement of quality costs is a good indicator of the quality and the overall performance of a firm. There have been many attempts to measure quality costs in both theoretical and empirical research. Mine Omurgonulsen (2009), did a study to measure quality cost with specific reference to the Turkish food manufacturing industry. Panel regression method has been used by him to analyze the relation between conformance costs and non-conformance costs in seven food manufacturing firms for the period between years 2000 to 2005. He concludes that there is a trade-off between conformance and non-conformance costs and the non-conformance costs can be reduced by increasing conformance expenditures. The negative relation found between conformance and non-conformance costs can rather be attributed to external failure costs than internal costs.

Amar Ramudhin, Chaher Alzaman and Akif A. Bulgak (2008) explored the challenges of introducing a model integrating the COQ into the modeling of supply chain network. They incorporate COQ in supply chain network design and conclude that it able to ensure the lowest overall cost. It is because it reduces the probability of defective and hence the probability of additional cost which might be due to corrective action. They also suggest presented a graphical demonstration of how quality costs affect the overall quality

conformance of a given system, which can observe that as the quality level rises, failure costs decline and appraisal plus prevention costs increase.

The most effective tools for evaluating the success of a quality management program are the measurement of quality costs. A systematic approach is need for measuring quality costs. S. B. Jaju, R. P. Mohanty and R. R Lakhe (2009) conducted a study to capture quality costs in a manufacturing company. Appropriate framework is proposed by S. B. Jaju, R. P. Mohanty and R. R Lakhe for capturing quality cost and various statistical analyses are carried out to characterize trends and relationships between various components. They concluded that quality cost should not be seen as solving a problem with a unique definition, as there is a whole space of reasonable concept of quality improvement rather than and these concept can be seen as actionable guiding principle to successfully implement a TQM program.

Oiang Su, Jing-Hua Shi and Sheng-Jie Lai (2009) did a real case study which is concentrates on the statistic analysis of the trade-off relationship between quality costs and the quantitative calculation of the balanced point. The statistic analysis reveals that the trade-off relationships within quality costs will not show up except when time delays are taken into account. With these time delays, the related total quality costs (RTQC) can be derived and utilized to compute the balanced point of the quality costs. Regarding to this case study, they demonstrates that the findings and approach can provide a useful assistance in the quality cost saving and management improvement.

A research was conducted by Mark A. Johnson (1995), to investigate measure of the cost of quality in engineering departments. It was to identify

existing measures of the cost of non-conformance in engineering operations, and to recommend some measures for possible use in the client engineering unit. Information was obtained from the telephone interviews with engineering quality practitioners from a variety of major US corporations. Based on Mark A. Johnson, information provided may be of some use to engineering quality practitioners who are considering implementing their own COQ program. Perhaps, they too may benefit from the information pertaining to the benchmarking of COQ elements and the organizational, behavioral and accounting processes necessary to implement a COQ measurement system successfully.

Ozgur Akkoyun and Huseyin Ankara (2009) did a study case which developed PAF quality cost model for marble processing plants. Data were collected from quarries and factories located in Diyarbakir Region (Turkey). All costs occurring in marble processing systems were examined, identified, classified and calculated. Several costs formulas were generated to define and control the system with models. A new computer program incorporating these models and other algorithms was developed to control total and quality costs in marble plants. Regarding to this study, it was found that quality costs vary depending on products types in range from 9 to 34% of total production costs for the three different stone types.

Quality in construction is directly related to time and cost, and vice-versa. A poor quality managed project can consequence in extra cost and time extensions. A poor manage in time and cost can affect the conformance of requirement. Hamzah Abdul-Rahman (1997) conducted a pilot survey on construction professionals. There were six question asked and the sample <https://assignbuster.com/measuring-and-reporting-the-cost-of-quality/>



was consisted of engineers, project engineers, project manager technical manager, quantity surveyor and estate manager. The survey was to identify the steps taken by firms to ensure quality and how professionals would react to the issue of cost of failure. Every participant agreed that it is important to collect failure cost. The results of the survey confirm that the construction industry is much concerned with the quality management.

A study conducted by Muhsin Halis and Ahmet Oztas (2002) to determine the quality costs in business organizations having ISO 9000 certificate, deriving from the application of the standards. The objectives are determine both the reasons for implementing ISO 9000 and the factors affecting costs during this implementation process, to show that quality costs provides a method that determine problems which otherwise may not be recognized. A questionnaire was prepared and sent to 1100 companies in manufacturing and service sectors that have ISO 9000 certificate. Collected quality costs data were then analyzed using a number of analysis methods. From the analysis, the direct and indirect factors affecting the quality costs were determined and have been categorized into four groups. Muhsin Halis and Ahmet Oztas (2002) suggested that the importance of quality costs is increasing especially during the decision making process and the firm which have not enough knowledge about quality costs, consideration to the quality costs and documentation could be given within the ISO 9000 standards.

Judy Oliver and Wen Qu (1999) did a study which to examine the quality management practices of Australian manufacturing firms certified to AS/NZS ISO 9000 specifically focusing on COQ reporting. Few questionnaires were proposed and it was based on an earlier Australian survey conducted by Ross  
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(1993). Slight modifications were made to the structure of the questionnaire, specifically in relation to the ordering of questions. Questionnaires were sent to 400 Australian manufacturing firms which has certified to AS/NZS ISO 9000. They analyze the result from questionnaires and conclude that, quality is widely acknowledged as a key competitive weapon to enable firm to survive in global marketplace. Majority of respondents from the survey stated that the adoption of quality management practices was driven by the desire to gain a competitive advantage in the marketplace.

A research did by Ali Uyar (2008), to evaluate how company performance has changed after COQ system implementation, and to identify the objectives behind COQ measuring and reporting. A postal questionnaire survey was sent to the top 500 Turkish manufacturing firms. He concludes that companies implementing quality initiatives are also COQ system implementers. This is a significant sign that the companies are measuring the cost of quality-related activities. After COQ system adoption, customer complaints has decrease, rework and scrap does decreased, warranty expenditures and failure costs decreased too, and the important point is sales volume has increased. The finding indicated that the ultimate objectives behind COQ measuring and reporting in descending importance are overall quality improvement, setting cost reduction targets and so on.

Recently studies on quality management, certification and supply chain management emphasize that ISO 9000 certification is becoming a must for many companies to compete. Thus, Pietro Romano (2002) did a research to examine whether the diffused adoption or confidence in ISO 9000 quality system requirements by diverse supply chain members can really influence

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quality management practice. This research was examined through analysis of data gathered by means of a survey based on a sample of 100 Italian certified manufacturing companies. It was found that those firms with the most advanced internal quality system tend to buy extensively from certified suppliers and to be reliant on the quality level of their deliveries. From a supplier's point of view, customers are more sensitive to certification, thus, certification can be represent a good "visiting card".

Collin Ramdeen, Jocelina Santos and Hyun Kyung Chatfield (2007) did a research which applies the cost of quality concept by using PAF model in a hotel restaurant environment. Data was collected from percentage of sales approach and it had been used in order to evaluate the significance of the cost of quality measures in the PAF model. The analysis of the COQ measures in the PAF model was accomplished through the process of interview and secondary data collection. Through this study, they concluded that the COQ measures used in the PAF model can improve the quality of food and services provided to the customers and result that it could lead improvement in overall profitability.

## **Chapter 3**

### **Data and Methodology**

#### **3.1 Data set and scope**

Two hundred sets copies of the survey (hard and electronic copies) of the survey were distributed to various users. Surveys are divided into two categories; one of them is to test whether every company has implement total quality management system in their internal control department. The

other survey is to test the customers' perception towards product quality. Respondents come from two different countries; Malaysia and Singapore. The period of data in this survey was conducted from 17th October 2010 to 27th October 2010.

## **3. 2 Research Question**

### **3. 2. 1: Research Question 1**

Does cost of quality important to use as a management tool?

This question is trying to draw on the fact that how important is cost of quality system important for a firm to use as management tool.

To overcome the skepticism that still prevails, K. Kumar and J. C. Brittain (1995) conducted an investigation on this issue and concluded that, cost of quality program could assist to improve the reliability other than reduces costs. However, to determine why some organization still do not utilize cost of quality system, Victor E. Sower, Ross Quarles and Eric Broussard (2007) has did a research. Most frequent reasons for organizations not utilize quality cost been highlight by them which are lack of management and understanding COQ systems.

Furthermore, in order to enhance customer satisfaction, improving quality is considered to be the best way. Besides focus on quality improvement, product must also be done at the lowest possible cost as well to meet quality requirements. To achieving these, cost of quality must be measure. Andrea Schiffauerova and Vince Thomson (2006) did a research to determine whether any formal COQ approach could be use. Result was COQ systems should be a part of management program.

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Due to various comments on cost of quality systems, I am here would like to test the importance of COQ systems. Below are the hypotheses according to the research question.

Hypothesis0: Cost of quality is important to use as a management a management tool in both Singapore and Malaysia.

Hypothesis1: Cost of quality is not important to use as a management a management tool in both Singapore and Malaysia.

The statement above will be tested as hypotheses in order to get an answer to the research question one “ Does cost of quality important to use as a management tool?” This is trying to draw the fact that cost of quality system is same important to both Singapore and Malaysia to implement. Cost of quality system could have an effect towards company internal performances, especially for those manufacturing and servicing organization.

As we know that, a firm always spent a huge amount of money on inspection and reworking. COQ is divided into four perspectives; prevention costs, appraisal costs, internal failure and external failure, thus by implement COQ system, it could help to reduce on cost of production. By using the above hypotheses, if the hypothesis null is being accepted, it is prove that COQ system does bring an effort towards organization. This would be the best persuasive reason for those firms which have not implement COQ system.

### **3. 2. 2: Research Question 2**

Does quality affect customer purchasing decision?

In general, quality costs fall into two major categories: the cost of achieving good quality which also known as cost of conformance, and the cost associated with poor quality products which is referred to as the cost of non-conformance, Russell & Taylor (1995)

Mine Omurgonulsen (2009) also conducted a study and concluded that non-conformance costs can be reduces by increasing conformance expenditures. Besides, negative relation found between conformance and non-conformance costs can rather be attributing to external failure costs than internal costs. This indicate that if product does not conforming to specifications and these error still remain after the product is arrive at customer's site, it may causes loss of customer goodwill. Thus, in order to ensure product's quality can achieve customer satisfaction, organization must pay more attention on cost of conformance.

Moreover, S. B Jaju, R. P. Mohanty and R. R. Lakhe (2009) did a case study to capture quality costs in a manufacturing company. They demonstrated that quality costs should not be seen as solving a problem with a unique definition, but a whole space of reasonable notions of quality improvement. To succeed in this high competitive market, firms should set goals and understand customer expectations. In order to meet the desires of customers, companies should continue their migration towards a holistic quality cost management approach.

Inspired by above studies, I would like to test the impact of product's towards customer purchase decision making.

Hypothesis0: Quality affects customer purchasing decision.

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Hypothesis1: Quality does not affect customer purchasing decision.

This statement would be tested as a hypothesis in order to get an answer to research question two of this project. “ Does quality affect customer purchasing decision?” This question is trying to draw on the fact that product quality could affect a person’s purchasing power. Thus, in order to increase customer’s satisfactions on its product, a firm should also first understand customer’s demand on product quality.

Customer’s demand is a key factor for a firm to knowing how they should continuously improve their product or service quality. A firm can track customer satisfaction on product quality through market research and their preferences on a specific product. By having this information, a firm can accord it and improving their product or service quality in a strategic way.

Nowadays, customers demand a “ right price” for the “ right quality” product. If the price is too high, regardless of quality, people will not buy it. Thus, a product which is not achieving proper quality will cause a firm losing its customers. It is a well-known accepted principal which is of one satisfied customer will bring in many more customers.

### **3. 2. 3: Research Question 3**

Does ISO 9000 certification enhance customers’ reliability towards the company and influence the company’s sales turnover?

Since the end of 1980s, ISO 9000 norms have been increasingly recognized and accepted as a reference model for quality assurance.

Recent studies on quality management emphasize that ISO 9000 certificate is becoming a must for many companies to compete. Regarding these studies, Pietro Romano (2002) did a research and found that those firms with the most advanced internal quality system tend to buy extensively from certified suppliers and to be reliant on the quality level of their deliveries. From a supplier's point of view, customers are more sensitive to certification, thus, certification can be represent a good "visiting card".

Inspired by above study, I would like to test the impact of ISO 9000 towards the customers reliability and company's sales turnover.

Hypothesis0: ISO 9000 certification does enhance customers' reliability towards the company and influence the company's sales turnover.

Hypothesis1: ISO 9000 certification does not enhance customer's reliability towards the company and influence the company's sales turnover.

This statement would be tested as a hypothesis in order to get an answer to research question three of this project. "Does ISO 9000 certification enhance customers' reliability towards the company and influence the company's sales turnover?" This question is trying to draw on the fact that by having ISO 9000 certification, it can increase customers' reliability and also influencing company's sales turnover.

Company which has applied ISO 9000 certification is kind of providing customers with the assurance that their product quality has been meet with the quality standards established. Such efforts have brought higher levels of



customers' satisfaction and thus it becomes a company people want to do long term business with.

By having ISO 9000 certification, it can help a firm increase to access into international markets. Besides, there are some histories indicate that ISO 9000 leads to following improvement: increase market share, on-time deliveries, production backlog, return on investment and overall margin.

### **3. 3 Methodology**

There are three methods I use to describe the relationship between variables; Two-Sample t-Test, Pearson correlation coefficient model and

#### **3. 3. 1 Two-Sample t-Test: Comparing Two Means**

This is using to test two populations which distributing two different means;  $\mu_1$  is means for population one, while  $\mu_2$  is means for population two. In this project, I am using this Two-Sample t-Test to test my research question one. Below are the steps that how I will do the test.

#### **Step 1: Hypothesis for RQ1**

Hypothesis0: Cost of quality is important to use as a management a management tool in both Singapore and Malaysia.

Hypothesis1: Cost of quality is not important to use as a management a management tool in both Singapore and Malaysia.

$$H_0: \hat{\mu}_1 = \hat{\mu}_2$$

$$H_1: \hat{\mu}_1 \neq \hat{\mu}_2$$

## Step 2: Pool-variance t test

Where  $S12$  and  $S22$  are sample variance of sample 1 and 2,  $n1$  and  $n2$  are the sample size of population 1 and 2.

Step 3: Critical Values

The critical value is search from statistical table.

## Step 4: Test Statistic

Where  $x_{i, 1} - x_{i, 2}$  is the differences between samples means,  $d_0$  is hypothesized difference between means.

## Step 5: Conclusion

If the t-Test is  $>$  the critical value, hypothesis null will be reject. In contrast, if the t-Test is  $<$  the critical value, hypothesis null will not be rejected.

### 3. 3. 2: Pearson correlation coefficient model

This is using to measure RQ2 by calculating the coefficient of correlation, which measures the strength of the relationship. The following are the steps of doing it.

#### Step 1: Hypotheses

Hypothesis0: Quality affects customer purchasing decision.

Hypothesis1: Quality does not affect customer purchasing decision.

$H_0: \rho = 0$

$H_1: \rho \neq 0$

**Step 2: Coefficient of correlation**

Where,  $r$  is the sample coefficient of correlation,  $X$  = values of the explanatory variable,  $Y$  = values of the dependent variable.

**Step 3: Critical Value**

It would come out with both positive and negative critical value.

**Step 4: Test Statistic**

Where  $\rho_0$  is hypothesized value of the population coefficient of correlation.

**Step 5: Conclusion**

If the t-Test is  $< -$  critical value or t-Test is  $> +$  critical value, hypothesis null will be reject.

**Chapter 4****Findings and Analysis**