

## Adoption of Cost of Quality Reporting: An Initial Survey of Manufacturing Firms in Malaysia

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**Abstract**—Cost of Quality (COQ) is an effective quality management tool which has been in existence for about four decades. This study is an initial survey to explore COQ reporting practices among manufacturing organizations in Malaysia. The findings of the survey revealed that out of 84 organizations, only 33 organizations (39.3 percent) have adopted COQ reporting as part of their quality management system. These organizations indicated that the top two reasons for adopting COQ reporting are, to reduce companies' failure rate and to increase service/product quality. The organizations that did not implement COQ reporting as part of their quality management system cited lack of understanding of COQ principles and lack of management support as the main reasons for not implementing COQ reporting.

**Keywords**—cost of quality, adoption, manufacturing, survey

### I. INTRODUCTION

“Cost reductions”, “Cost savings”, “Cost management” and “Cost benefit” are frequently used mantras along with quality, in most of the organizations that strive to remain competitive and profitable in the dynamic business environment of today.

One of the key challenges faced by business organizations is the ability to craft the right strategy to achieve quality as well as cost reduction in order to achieve customer satisfaction. According to Arvaiova, M., Aspinwall, M.E. and Walker S.D. [1], an organization must be able to provide viable products at competitive price in order obtain customer satisfaction. Here, viable means the capability to produce or provide a product/service at the required (or higher than the required) expectation while competitive price refers to the ability to sell at the best price in the market through significant cost reduction or control strategy of quality related activities. Quality related costs, called cost of quality (COQ) must be identified, measured and analyzed to ensure a product not only meets the required quality level but also satisfies customers in term of cost [2].

COQ brings numerous benefits since it can be used as a performance indicator and as cost reduction tool to prioritize quality improvement initiatives [1]. Apart from that, COQ is regarded as an indicator of quality management system effectiveness and used to identify potential areas for improvements [3].

Although COQ has been in existence for the last four decades, its adoption rate remains low in various parts of the

world. Harry and Schroeder's study found that only 33% of companies in USA adopted COQ reporting even though 82% of the companies in the USA indulge in quality programs (Harry and Schroeder, 2000 as cited by Yang, C.C., 2008)[4]. Rapley and Prickett [5] conducted a study in the UK and reported that only 34% of companies North East England calculated COQ. Meanwhile in Australia, Oliver and Qu (1999) [6] found the COQ adoption rate among Australian companies at 26%.

While COQ is not being adopted extensively in developed countries [5][6], there is a need to examine the status of COQ adoption in Malaysia, a developing country. Although the manufacturing sector contributed to 26.4 % of the nation's Gross Domestic Product (GDP) in 2009 [7], manufacturing companies in Malaysia are struggling to remain competitive due to stiff competition from neighboring countries like Thailand, Singapore and the two giants of Asia - China and India.

This study is part of an initial investigation into COQ adoption among manufacturing companies in Malaysia. The objectives of this research are:

- To determine the COQ adoption rate among manufacturing companies in Malaysia
- To determine the reasons for adoption and non adoption of COQ reporting among manufacturing companies in Malaysia

### II. REVIEW OF LITERATURE

#### A. Definitions and Classifications of COQ

A review of literature revealed the use of different terms by different authors to refer costs associated with quality activities. As shared by Kiani *et al.* (2009) in their study [8], commonly used terms are COQ, quality costs, cost of poor quality, price of non conformance, poor quality cost or economics of quality. Rodchua (2009)[9], Setijono and Dahlgard (2008) [3] and C.C Yang (2008)[4] had used the term quality costs while Arvaiova, M., Aspinwall, M.E. and Walker S.D. (2009)[1], Schiffauerova and Thomson (2006)[2] and Sower, E.V., Quarles, R. and Broussard, Eric. (2007)[10] had used COQ to refer costs associated with quality activities.

The widely accepted Feigenbaum's PAF Model classified cost of quality into three categories – Prevention cost, Appraisal cost and Failure cost [11]. Juran further

divided the failure cost into external and internal failure cost [12]. As stated by Plunket and Dale (1987) [11], the PAF model is the most commonly used COQ model in the United States and Great Britain. Sower, E.V., Quarles, R. and Broussard, Eric. (2007), [10] confirmed that American Society for Quality (ASQ) adopted the classification of COQ by four categories (where failure cost is divided into external and internal failure costs), based on PAF model. The same classification of COQ will be adopted throughout this paper.

### B. The Need for COQ Reporting

COQ reporting plays an important role in achieving customer satisfaction. COQ reporting can identify, analyze and quantify quality related costs which could be used as a performance indicator, to prioritize quality improvement initiatives and as a cost reduction tool [1].

Kiani et al., (2008) [8] stated that COQ reporting is able to identify costs of quality improvement activities as well cost benefits of those improvement activities to the organization which means COQ reporting is an important tool for managers to quantify their quality related activities and benefits in dollar values.

Schiffauerova and Thomson (2006)[2] also stressed that COQ reporting enables managers to achieve the competitiveness needed in the competitive market. Reviews on the importance of COQ reporting, from some other authors are summarized below:

- Rodchua (2009) : Important tool to gain customer satisfaction and profits[9]
- Sower et al (2007) : information provider on quality system for an organization[10]
- Ramdeen et al (2007): enable root cause identification and trigger solutions to correct problems[13]

Previous research findings by Arvaiova, M.,Aspinwall, M.E. and Walker S.D., (2009), Dale and Wan (2002) and Oliver and Qu (1999) [1][14][6] showed that common objectives in implementing COQ reporting are, to increase product/service quality, to achieve significant cost reductions and to prioritize improvement actions.

Apart from that, Bamford and Land (2006) [15] and Dale and Wan (2002)[14] reported that some organizations intend to increase level of quality level awareness among their staffs through the implementation of COQ reporting.

### C. COQ Adoption

Even though COQ reporting has been regarded as an effective tool in quality management practices [1], COQ reporting is not widely adopted and implemented worldwide. Previous research findings showed that the COQ adoption rates ranged from 30 to 50 percent.

As pointed out by Schotmiller and Campanella (2007, cited by Arvaiova, M., Aspinwall, M.E., Walker, S.D., 2009), [1] COQ reporting implementation is not widespread outside USA. Even in the USA, the COQ adoption rate is only 33% (Harry and Schroeder, 2000, cited by Yang, C.C., 2008)[4]. Gupta and Campbell (1995)[16]reported two surveys that showed that only 30 – 40 percent of companies calculate cost of quality. In the UK, only 33% of companies

in North East England implemented COQ reporting [5]. Arvaiova, M.,Aspinwall, M.E. and Walker,S.D.,(2009)[1] conducted a study in the telecommunication sector in the UK and found a very low adoption rate of three percent. In Australia, Oliver and Qu (1999) found that only 26% of organizations adopted COQ reporting. However, earlier studies by Plunket and Dale (1984) [11] and Ross (1993) as cited by Oliver and Qu (1999)[6] showed higher COQ adoption rate of 50 and 47.5 percent, respectively.

One of main reasons for not implementing COQ reporting, identified in previous research findings are lack of awareness and understanding of COQ principles [1][10][17] Other reasons for not implementing COQ reporting are; lack of management support, lack of adequate accounting and computer systems and COQ does not bring any benefit [10]. Arvaiova, M.,Aspinwall, M.E. and Walker S.D. (2009) [1]also found out similar reasons such as lack of management support, perception that COQ implementation brought very low return on investment and other reasons such as existing costing system is equivalent to COQ reporting. Clearly, researchers in different parts of the world have identified lack of understanding of COQ principles and lack of management support as the two main reasons for not adopting COQ reporting in organizations.

Based on the literature reviewed, it was found that no attempt has been made to study the adoption of COQ reporting in Malaysia. It was observed that most researchers who conducted studies in the area of quality management in Malaysia focused on the implementation of quality management systems such as ISO 9000 and TQM [18][19]. There is a need to commence research on COQ implementation in Malaysia to provide useful insights on various issues of COQ reporting. This current study was conducted as part of that an initial investigation on COQ implementation.

## III. RESEARCH METHOD

A self-administered questionnaire survey was utilized to gather relevant data. The questionnaire was adopted from an earlier study conducted in UK [1], with the permission of the author. The questionnaire, which was originally developed and validated by Arvaiova, M.,Aspinwall, M.E. and Walker S.D. (2009) [1] was slightly modified, to suit the Malaysian context.

The sampling frame used was the Federation of Malaysian Manufacturers (FMM) 2009 Directory [20], which listed the manufacturing firms that are members of FMM. The list consisted of 3974 manufacturing firms from 23 different sectors. Questionnaires were sent via email to a proportionately stratified sample of 200 manufacturing firms.

The respondents were confined to quality department head, quality managers, quality Engineers or executives of each organization responsible for quality management.

Prior to the distribution of the questionnaires, a pilot study was conducted to assess the questionnaire's clarity and its suitability. Ten quality management practitioners from the manufacturing sector participated in the pilot study. Apart from them, the pilot test also saw the participation of five academics with manufacturing experience.

Taking into account the comments from the pilot test, very slight amendments were made prior to actual distribution. The response rate was only 18 percent, after six weeks (even after many follow-up telephone calls). To increase the response rate, an additional 48 questionnaires were issued directly to relevant participants who were attending training programmes conducted by FMM. A total of 84 useable responses were received, out of the 248 questionnaires issued. The final response rate was 33.9%.

#### IV. SURVEY RESULTS

##### A. Respondents' Characteristics

Out of the 84 respondent organizations, 17% of them produced food and beverages products, 12% fabricated metal products, 10% motor vehicles, semi trailers and trailer products, 8% chemical and chemical products and basic metal products, 7% radio, television and communication products, 6% electrical machinery and apparatus products and rubber and plastic products, 5% machinery and equipment products and furniture products, 4% paper, non metallic and printing products, 2% office, medical and precision equipment products and 1% coke, refined petroleum products.

In terms of duration of business, 47.6% (40) of the organizations have been in the business for more than 20 years, 36.9% (31) of them have been in the business between 10 to 20 years while 15.5% (13) of them have been in the business for less than 10 years.

Based on annual sales turnover, 45.2% (38) of the organizations were large companies while the other 54.8% (46) of them were small and medium organizations.

Out of 84 respondents, 97.6 % of them (82 respondents) were certified to at least one of quality management systems (ISO 9000, ISO/TS 16949, ISO 13845, ISO 22000 and ISO/IEC 27001).

##### B. Adoption of COQ Reporting

Respondent organizations were asked to specify what type of quality costs were being measured and reported, as part of their quality management system. Quality costs were categorized as prevention cost, appraisal cost, external failure cost and internal failure cost, as classified by the PAF model (Feigenbaum, 1956, cited by Yang, C.C.; Juran, 1983)[4][12]. If an organization was measuring any one type of quality costs, that particular organization was considered to have adopted COQ reporting.

If the participating organization chose 'none of the above', that particular organization was considered to have not adopted COQ reporting yet.

A total of 33 organizations (39.3%) out of the 84 organizations responded that they have adopted COQ reporting system as part of their quality management practices. The other 51 organizations (60.7%) stated that they did not implement COQ reporting as part of their quality management system.

##### C. Reasons for Not Adopting COQ Reporting

The 51 organizations (60.7%) which did not adopt COQ reporting system were provided a list of possible five reasons for not adopting COQ and were asked to rate them on a scale of 1 to 5, according to their level of agreement, where 1 is strongly agree, 2 is agree, 3 is neutral, 4 is disagree and 5 is strongly disagree. The mean values and rankings of the five reasons are depicted in Table 1.

TABLE I. REASONS FOR NOT ADOPTING COQ REPORTING

<i>Reason</i>	<i>Mean</i>	<i>Ranking</i>
Lack of interest and understanding of quality costs concept within top management	2.47	2
Our costing system is already capable of monitoring and providing accurate on quality costs	2.90	3
It is not important to deal with quality costs	3.94	5
The return on investment (the significance of benefits) of COQ reporting system is low	3.20	4
We have not yet been introduced to the principles and concept of quality costs	2.39	1

The mean scores ranged from 2.39 - 3.90. All the mean values are below 4 (not agree), which means all of the five reasons were perceived as reasons for not adopting COQ. Organizations which did not adopt COQ reporting indicated lack of awareness of principles and concepts of quality costs (2.39) as the main reason for not adopting COQ reporting system. This was followed by lack of interest and understanding of quality costs concept within the top management (2.47), availability of existing costing system in their organizations which was able to measure and track quality related costs (2.90), the return on investment of COQ reporting is low (3.20) and it is not important to deal with quality costs (3.94).

##### D. Reasons for Adopting COQ Reporting

The 33 organizations which adopted COQ reporting system were provided a list of possible eleven reasons for adopting COQ and were asked to rate them on a scale of 1 to 5, according to their level of importance, where 1 is very important, 2 is fairly important, 3 is neutral, 4 is not so important and 5 is not at all important. The mean values and rankings of the eleven reasons are shown in Table 2.

TABLE II. REASONS FOR IMPLEMENTATION COQ REPORTING

<i>Reason</i>	<i>Mean</i>	<i>Ranking</i>
To highlight the company's non-value added processes	1.85	7
To reduce the company's failure rate	1.30	1
To increase product/service quality	1.30	1
To achieve significant cost reductions	1.55	2
To create a new process performance measure in monetary terms	1.86	8
To set up a new budgeting tool	2.15	9

<i>Reason</i>	<i>Mean</i>	<i>Ranking</i>
To prioritize improvement actions with the highest potential payoff	1.85	7
To create a more comprehensive quality system	1.79	5
To increase the company's competitiveness	1.58	3
To promote product/service quality as a business parameter	1.67	4
To provide the means for planning and controlling costs	1.82	6

The mean values ranged from 1.30 – 2.15. The 33 organizations which had implemented COQ reporting as part of their quality management system indicated that the top two reasons for adopting COQ reporting are: to reduce company's failure rate (1.30) and to increase service/product quality (1.30). These reasons were followed by the objectives to achieve significant cost reductions (1.55), to enhance company competitiveness (1.58) and to promote product/service quality as a business parameter (1.67), to prioritize improvement actions with the highest potential payoff (1.85), to create a new process performance measure in monetary terms (1.86) and to set up a new budgeting tool (2.15) through COQ reporting.

## V. DISCUSSION

In this study, the highest response rate was from food and beverages industry (17%), second highest was from metal industry (12%) and the third highest was from chemicals industry (10%). Majority of the respondent organizations (47.6%) have been operating their businesses for more than 20 years while only 15.5% of the respondent firms have been operating their business for less than 10 years. The characteristic of the organizations, in terms of duration of being in business shows that the majority of the respondent firms should have gained vast experience in various quality management approaches in the past decades.

In terms of size, 45.2% of the respondent organizations were large organizations. The large size of these organizations indicates that lack of manpower would not be an obstacle to maintain the quality management system in these organizations.

In terms of quality management certification, 97.6% of the respondent organizations were certified to quality management system. This percentage is considered as much higher compared to a study conducted by Arvaiova, M.,Aspinwall, M.E. and Walker S.D. (2009) [1] where only 39% of the respondent organizations were certified to quality management system.

The findings of this research indicate that being in business for more than two decades with sufficient workforce as well as being certified to quality management system, contributed little towards adoption of COQ in Malaysia. The survey results showed that only 39.2% (33) of respondent organizations had adopted COQ reporting as part of their quality management system. When compared with previous studies, the adoption rate of 39.2% is almost

similar to Gupta and Campbell's (1995) study [16], which revealed an adoption rate of 33% to 40%. The current study's adoption is found to be higher than the studies by Oliver and Qu (1999): 26%; Roche(1981): 39%; Duncalf and Dale(1985): 32% (as cited by Oliver & Qu, 1999)[6]. However, the COQ adoption rate is found to be lower than the COQ adoption rates revealed by the studies conducted by Plunkett & Dale (1984): 50% [11] and Ross (1993): 47.5% (as cited by Oliver & Qu, 1999) [6].

The two main reasons for not adopting COQ reporting system, as indicated by the respondent organizations were lack of awareness of principles and concepts of quality costs and lack of interest and understanding of quality costs concept amongst the top management. These two reasons are similar to findings revealed by Arvaiova, M.,Aspinwall, M.E. and Walker S.D.(2009) [1]; Sower, E.V., Quarles, R. and Broussard, Eric. (2007)[10] and Pursglove and Dale (1996) [21].

Other than that, the availability of existing costing system which was able to measure and track quality related costs were cited by respondents as one of the reasons for not adopting COQ reporting. This is also similar to the research findings of Arvaiova,M., Aspinwall, and Walker S.D. (2009)[1].

The mean values were below 3 (1.30 – 2.15), for the reasons of implementing COQ reporting. This indicates that the organizations that had adopted COQ reporting expected to see improvements in all eleven areas (Table 2), through the implementation of COQ reporting. This shows that these organizations perceived that COQ reporting will bring improvements in all the eleven areas.

The top five reasons cited by firms implementing COQ reporting are, to reduce failure rate, to increase service/product quality, to achieve significant cost reductions, to enhance company competitiveness and to promote product/service quality as a business parameter. These are the common reasons identified in previous studies as well: Arvaiova, M.,Aspinwall, M.E. and Walker S.D. (2009) [1]; Bamford and Land, (2006) [15]; Dale and Wan (2002) [14] and Oliver and Qu, (1999)[6].

## VI. CONCLUSION

As discussed in this paper earlier, COQ reporting is an effective performance indicator tool to identify and assess the effectiveness of existing processes of an organization, to provide clear direction to craft the future strategies of an organization. COQ reporting can lead an organization to achieve customer satisfaction, which is the ultimate goal of any organization.

The highly competitive environment of today has forced managers to deploy cost management leadership so that non-value added activities are removed in order to remain competitive in the main stream of business. COQ reporting is a tool that can assist managers in achieving and continuously improving cost management leadership.

Despite the fact that COQ reporting has been in existence for the past four decades and its benefits are well known, Malaysian manufacturing organizations are still far behind in terms of adoption rate of COQ reporting. The findings of this

study show that manufacturing organizations in Malaysia still lack the understanding and awareness on COQ reporting even though most of them have obtained quality management system certification.

This study indicates that manufacturing organizations in Malaysia tend to rely mostly on the quality management system certification and do not completely practice cost reduction tools such as COQ reporting, to reach expected destinations (targets).

Future research can be conducted to evaluate the underlying issues involving COQ reporting in organizations. Issues in relation to training and education of COQ reporting in organizations can be studied, as lack of awareness of principles and concepts of quality costs was cited as the main reason for not adopting COQ reporting. Future studies could deploy bigger sample sizes to ensure participation from manufacturing sector as well as services sector. Apart from that, future research could compare the adoption and implementation of COQ reporting between services and manufacturing sectors to explore the differences between these two sectors.

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