CHAPTER 3:

RESEARCH

METHODOLOGY

3.1 RESEARCH APPROACH

This study is an exploratory research. The purpose of the exploratory research process is a progressive narrowing of the scope of the research topic and a transformation of the discovered problems into defined one, incorporating specific research objectives.

It is useful preliminary step that helps ensure that a more rigorous, more conclusive future study will not begin with an inadequate understanding of the nature of the problem (William G.Zikmund). The study was based on an empirical investigation of companies adopting and non –adopting COQ reporting among manufacturing industry in Malaysia.

The survey was carried out using structured questionnaire and targeted to all manufacturing companies in Malaysia which were identified based on Directory of Federation of Malaysian Manufacturers (FMM) 2009.

The survey respondents were confined to quality department head, quality managers, Quality Engineers or executives from each organization who is responsible on quality management related matters and able to provide useful information pertaining to quality management practices in their respective organization.

3.2 RESEARCH INSTRUMENTS

A questionnaire was administered and the respondents were asked to evaluate each statement in the questionnaire via five point likert scale. The instrument was adopted from recent research (Arvaiova *et al*. (2009) in UK with the permission from the author.

The research instrument was then modified based on past few researches such as Oliver and Qu, (1999), Sower *et al*.(2007), Rodchua, (2009), Dale and Wan, (2002), Kiani *et al*. (2008) and C.C. Yang, (2008) as well as to suit Malaysian context. The survey questionnaire was designed to be quantitative rather than qualitative in nature and in order to obtain valid and reliable measures of the variables.

The survey instrument consists of five sections and was a seven pages questionnaire.

SECTION 1: GENERAL INFORMATION

The purpose of this section is to gather general information of participating organizations such as nature of business, number of employees, annual sales turn over and the period of organization indulge in the business. There are total four questions in this section

SECTION 2: ADOPTION OF COQ REPORTING SYSTEM

Second section contained items to determine whether participating organization adopts COQ reporting system and reasons for not adopting COQ reporting from those organizations which are not implementing COQ reporting system based on identified by literature as summarized by (Arvaiova *et al*., 2009; Sower et.al., 2007; Oliver and Qu, 1999).

Participating organizations were asked to indicate what type of quality costs are being measured at their organizations. In this section, quality costs were classified according to P-A-F model (Feigenbaum, 1951; Juan, 1974). The respondents are considered adopted the COQ reporting if they are measuring any one type of quality costs and will proceed to the following sections (three, four, and five).

Meanwhile, the respondents are considered not adopted to COQ reporting if they are not measuring any one type of quality costs. Then, these respondents were asked to identify the reasons for not adopting COQ reporting and will not proceed to next section in this questionnaire.

The reasons for not adopting COQ reporting contains five items with five point likert sales ranging from strongly agree (1) to strongly disagree (5).

SECTION 3: OBJECTIVES OF COQ REPORTING SYSTEM

This section contained items to measure the purpose of organizations adopting to COQ reporting system as identified in literature (Arvaiova *et al*., 2009; Ramford & Land, 2006; Dale & Wan, 2002; Oliver & Qu, 1999).

As mentioned earlier, this section is only for those organizations which are adopting COQ reporting system.

There are total of 11 items on five point likert scales with scales ranging from very important (1) to Not at all important (5).

SECTION 4: DIFFICULTIES DURING IMPLEMENTATION (COQ REPORTING)

This section designed to identify difficulties encountered by organizations during implementing of COQ reporting system as identified in literature (Arvaiova, *et al*., 2009; Rodchua, 2009; Sower et.al.,2007; Eldrige, 2006; Bamford & Land, 2006; Roden & Dale, 2001).

This sections contains eleven items with five point likert scales ranging from very difficult (1) to not all difficult (5).

SECTION 5: BENEFITS OF COQ REPORTING SYSTEM

This sections contains two sub sections (a and b) designed to measure the benefits of COQ reporting system to the organizations. The section a requires respondents to indicate benefits they had expected through COQ reporting before its implementation and section b requires respondents to indicate benefits they had achieved after implementation of COQ reporting system.

The benefits of COQ reporting outlined in this section are based on identified in the literature (Arvaiova, *et al*., 2009; Kiani, *et al*., 2009; Kim & Nakhai, 2008; Ramudhin, 2008; C.C. Yang, 2008; Ramdeen, *et al*., 2007; Roden & Dale, 2000; Johnson, 1994).

Both sections contained thirteen items with five point likert scales ranging from strong impact (1) to no impact (5).

3.3 RESEARCH MODEL

To find out, to what extent manufacturing companies in Malaysia adopts, measure and analyze COQ reporting system, this study deploys most widely used COQ model, Prevention – Appraisal – Failure (P-A-F) model as identified in the literature (Kiani, *et al*., 2009; Rodchua, 2009; C.C.Yang, 2008; Sower et.al, 2007) .

The P-A-F model developed and categorized by Juran (1951) and Feigenbaum (1956).

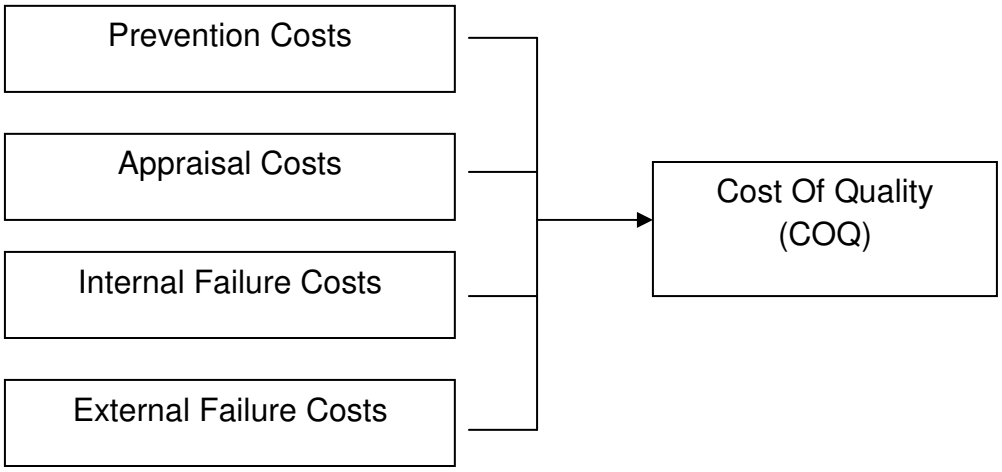

Figure 3.1: COQ Model (Kiani, *et al*., 2009; Rodchua, 2009; C.C.Yang, 2008; Sower et.al, 2007)

As identified clearly in literature review (Kiani, *et al*., 2009; C.C.Yang, 2008; Ramudhin, 2008; Kim & Nakhai, 2008; Roden & Dale, 2000), previous researches worldwide had shown that COQ reporting will bring various benefits for the organizations and improve overall performance

Therefore this study apart from identifying issues related to COQ implementations (reasons for not implementing COQ reporting, objectives of COQ reporting and difficulties encountered during implementation) will also determine to what extend manufacturing organizations in Malaysia has achieved the benefits through implementation of COQ reporting.

The model will be as follow:

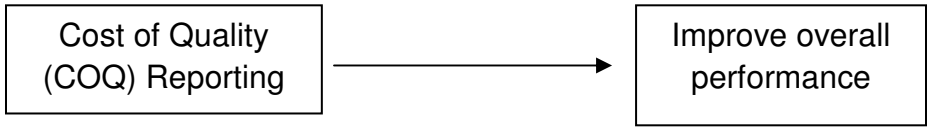

Figure 3.2: Research Model (Kiani, *et al.*, 2009; C.C.Yang, 2008; Ramudhin, 2008; Kim & Nakhai, 2008; Roden & Dale, 2000)

3.4 RESEARCH HYPOTHESIS

Regarding the benefits of COQ reporting, almost all the studies and surveys as identified in the literature review found out that COQ reporting has benefited and improve overall performance of an organization.

Since this study investigates benefits expected by organizations before COQ reporting and benefits achieved after implementation of COQ reporting, the first hypotheses will determine whether is there any significance difference on benefits expected and achieved by organizations through COQ reporting.

***H1**: There is no significant difference between benefits expected by manufacturing organizations in Malaysia through COQ reporting (before implementation) and benefits achieved after implementation.*

The second hypotheses will determine whether organizations have benefited in terms of overall performance through COQ reporting system.

***H2**: Adoption of COQ reporting system has benefited manufacturing organizations in Malaysia*

3.5 SAMPLING DESIGN

Previous studies in Malaysia have shown that the response rate varies from 30 – 40 percent (20.2 % (Sohail & Hoong, 2003), 31% (Arumugam, *et al*., 2008) and 44% (Abdullah, *et al*., 2001). However Abdullah, *et al*., (2008) has achieved response rate of about 70%.

Taking into account the range of response rate for surveys in Malaysia, the sample size for this study was confined to 200 respondents with the assumption that the response rate will reach at 30 – 40 percent at this will fulfill requirement for statistical analysis.

The respondents were selected using stratification samples techniques based on Federation of Malaysian Manufacturers (FMM) Directory 2009. The FMM has classified manufacturing organizations into 23 different sectors. There are total of 3794 manufacturing organizations from different sectors registered with FMM as of 2009 directory publication.

Through stratified sampling techniques, 200 organizations from all 23 sectors were selected based on random sampling. The details of 23 different sectors and numbers of organizations in each sector as well as numbers of organizations sampled from each sectors are shown as table 3.1.

Table 3.1 Classification of Manufacturing Organizations in Malaysia according to Sector by FMM

No	Sectors	No. of Organizations	Sample size
1	Food Products and Beverages	541	28
2	Tobacco	4	1
3	Basic Metal	155	8
4	Fabricated Metal	427	23
5	Chemical and Chemical Products	543	29
6	Rubber and Plastic Products	371	20
7	Non Metallic Mineral	154	8
8	Electrical Machinery and Apparatus	239	13
9	Radio, Television and Communication	151	8
10	Wood of Products and Cork Transport	54	3
11	Textiles	52	3
12	Recycling	30	2
13	Manufacture of Furniture	81	4

“Table 3.1 Continued”

No	Sectors	No. of Organizations	Sample size
14	Motor Vehicles, Trailers and Semi Trailers	121	6
15	Office, Accounting and Computing Machinery	37	2
16	Publishing, Printing and Reproduction of Media	78	4
17	Paper and Paper Products	91	5
18	Tanming and Dressing of Leather	8	1
19	Medical, Precision and Optical Instruments	84	4
20	Transport	46	2
21	Coke, Refined Petroleum Products and Nuclear	133	7
22	Wearing Apparel, Dressing and Dyeing Fur	25	1
23	Machinery and Equipments	359	18
Total		3974	200

The respondent was confined to quality managers and executives whore are in charge of quality management related matters of the organizations.

3.6 DATA COLLECTION PROCEDURE

Prior to the full distribution of the questionnaires a pilot survey was performed to investigate the questionnaire's clarity and its suitability. Ten experienced quality personnel in from manufacturing organizations who has some experience in COQ reporting were chosen randomly. Apart from manufacturing organizations, pilot tests also involved experienced academic personnel from University Malaya with manufacturing background.

Piloting questionnaires to experts is a common approach successfully used in cases when the subject of the survey is not widely known (Arvaiova, *et al*., 2009).

Taking into account comments through pilot test, research instrument went through slight modification prior to actual distribution.

The duration of the survey was about 40 days (From 5th March 2010 to 15th April 2010). The initial survey was conducted 100% through E-Mail. The selected 200 organizations (stratified sample and then random sampling) were contacted (Quality managers/Executives) and explained on the survey.

Through phone conversation, brief explanation given on the survey and subsequently the survey form (questionnaire) was emailed directly to the respondent with two weeks dateline.

Due to slow response rate from respondents, follow up email was sent and dateline was extended to another two weeks. Meantime, in order to avoid low response rate, survey forms were distributed directly at few training centre which are running quality related programs where the attendees were quality managers/executives/engineers.

3.7 DATA ANALYSIS TECHNIQUES AND METHODS

Responses from the survey were coded in preparation for statistical analysis. Data collected were analyzed using Statistical Package for the Social Science (SPSS) computer program.

The following analysis techniques were used to analyze the data

- Descriptive Analysis

  The transformation of raw data into a form that will make them easy to understand and interpret; rearranging, ordering, manipulating data to provide descriptive information (Zikmund, 2003).In this study, descriptive analysis techniques were used to analyze data collected to summarize and describe the data. This analysis useful to make some general observations about the data collected.

- Reliability Analysis

  The degree to which measures are free from error and therefore yield consistent results (Zikmund, 2003). It is important to test the reliability of the measurements. In order to find the consistency and stability of the measurement scales, the reliability test using Cronbach Coefficient Alpha was undertaken.

- Factor Analysis

  To summarize the information contained in a large number of variables into a smaller number of factors (Zikmund, 2003). In this study, data were initially analyzed using principal components analysis to assess the psychometric properties of the instrument. The primary concern was the interpretability of the factors.

- Independent T-Test Analysis

  In this study, independent T-Test analysis used to compare means of two group of variables and test the significance to measure whether is there any difference.

The following chapter will have detailed explanation of data analysis using above techniques with research result.