THE IMPLEMENTATION OF MS ISO 9001:2000 QUALITY MANAGEMENT SYSTEM WITHIN CONSTRUCTION INDUSTRY IN MALAYSIA

by

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CERTIFICATION OF APPROVAL

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Approved by,

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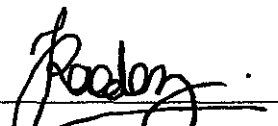
CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the originality work is my own except in the references and acknowledgement, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



MOHD. RASHDAN BIN CHE. AZMI

ABSTRACT

Construction sector is well known for its poor management system and it is mainly due to the involvement of large amount of paper works. The application of the Malaysia Standard, MS ISO 9001:2000 standard series has become a common trend among the organization in quality management issue. However, the implementation of MS ISO 9001:2000 standard series in construction industry context in Malaysia is still a small issue compared to the others issue. The objectives of this research are to examine the awareness, level of the implementation and perception towards this implementation of MS ISO 9001:2000 QMS in construction industry context in Malaysia. Survey-based methodology was applied through this study. The population sample was focused on the MS ISO certified contractor firms and non MS ISO contractor firms in the Peninsular Malaysia. The sampling method concentrated on contractor firms of Class A, B and C. A field study has been executed and surveyed using questionnaire has been carried out. In total, 39 respondents replied the questionnaire. 90% of the respondents are aware with implementation of MS ISO 9001:2000. The perception and level of practices of MS ISO 9001:2000 QMS were also identified using the Index Average. Most of the respondents agreed to the perception as given in the questionnaire and the practices of MS ISO 9001:2000 QMS are in high extend in their business routine. As for the conclusion, all the objectives of the research were achieved whereby the awareness, perception and level of practices were identified during the study. It is hoped that the study will contribute as a step towards enhancing the extension of construction work practices within MS ISO 9001:2000 QMS in Malaysia.

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ABBREVIATION AND NOMENCLATURES

Abbreviations	Description
MS	Malaysia Standard
ISO	International Organization For Standardization
MS ISO 9001:2000	Malaysia Standard for ISO 9001 series
QMS	Quality Management System
CIDB	Construction Industry Development Board
ISO/TC176	The ISO Technical Committee responsible for ISO 9000 series of standard
MBAM	Master Builders Association Malaysia
QA	Quality Assurance
QC	Quality Control
PDCA	Plan-Do-Check-Act
PKK	Pusat Khidmat Kontraktor
CONQUAS	Construction Quality Assessment System
QLASSIC	Quality Assessment System In Construction
OSHA	Occupational Safety and Health Act

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND OF STUDY

Risk involved in any project and many external factors will affect the performance of the project. Hence, it is important that built-in quality assurance system is developed to avoid any inefficiency that could result in poor quality of products and services being delivered to the customer. Systematic quality work and the standard can make quality work more efficient and one of these quality systems that could be applied is the ISO 9000 Standard. (Bubshait & Al-Atiq, 1999). ISO 9000 has become a well-known international standard for Quality Management System (QMS) that is implemented in Malaysia. Yu (2003) cited to Levinson (2000), this standard is recognized worldwide to be set of system introduced with interrelated, mutually supporting programs and activities for improvement of work quality performance. Since the standard had been introduced, there are about 191 countries in the world, this means that about 78% of all countries have, to some extent, accepted ISO 9000 Standard.

In Malaysia, SIRIM has introduced MS ISO 9001:2000 and this series of standard is widely adopted by variety of organizations since 1987, it is however more popular among the manufacturing industries. MS ISO 9001 outlines how contractors can establish an effective quality system that will demonstrate commitment to quality and ability to meet the customers or clients requirements. Adoption of MS ISO 9001 in construction sectors especially to the contractors has been slower than in manufacturing trades but it shows a growing awareness on QMS in recent years. ISO 9000 Standard is said to be an added advantage to improve working environment and increase competitiveness in the industry.

Yu (2003) referred to Business Times (Malaysia)(October 28, 1999), most of the companies certified under the ISO 9000 have reported significant improvements in their organization and increase productivity. Survey done by Malaysia International Trading and Industry conducted in 1998 found that more than 90 percent experienced better internal management and 94 percent experienced greater management control. With the implementation of MS ISO 9001:2000, the top management is able to control the works either at the office or at the site. The Standard requires the documentation of all the works carried out at the site including work procedure and work instruction and neither standard procedures nor standard checklists which is widely accepted and used in construction sectors. Therefore, this study will focus on the awareness, the perception and the level of the implementation of MS ISO 9000:2001 – Quality Management System among the contractors in Malaysia.

1.2. PROBLEM STATEMENT

In Malaysia, more and more companies in construction related industry have applied to be MS ISO certified. However the number is still yet relatively small when compared to the total amount of companies in this industry. The acceptance of the MS ISO 9001:2000 standards in the construction industries in Malaysia is not as wide as in other industries. Besides that, construction sectors are very complicated and their execution may take years to complete and it's involved the number of parties whereby requires effort from all parties. Construction project itself is a unique as compared to the manufacturing sectors in which producing typical products over and over again.

Some of the site peoples claimed that they were not really expose to this standard even the company is the MS ISO certified. On the other hands, this standard also needs to satisfy those of the clients, consultants and so on. Based on the limitation on the implementation of MS ISO 9001:2000 QMS, there is a need to study first on how well the awareness, the perception and the level of implementation of MS ISO 9001:2000.

1.3. RESEARCH OBJECTIVES

The main objectives of this research are as follows :

a) To study the awareness of the implementation of MS ISO 9001:2000 QMS in local construction industry.
b) To study the perception on this MS ISO 9001:2000 QMS
c) To examine the level of the implementation of MS ISO 9001:2000 QMS in local construction industry.

1.4. SCOPE OF RESEARCH

The project provided a detail description on the series of MS ISO 9001:2000 Quality Standard, the requirement and procedures of the system. This was done through the literature review on journal papers, conference papers, reference books, browsing through the websites and so on. Besides that, the practical application of this standard also was studied through a survey-based methodology. This MS ISO implementation survey concerned to those companies who are MS ISO 9001:2000 certified and non MS ISO certified companies, moreover this study were focused only on the local construction industry which is contractor companies in peninsular of Malaysia for contractors with Class A, Class B and Class C status. The selected contractors companies were contacted and introduced to the scope of study.

1.5. SIGNIFICANT OF THE RESEARCH

The significant of this research are aims to investigate or examine and to gather the information regarding the awareness, the perceptions and the level of the implementation of MS ISO 9001:2000 in contractors companies in Malaysia. It is hope that the result of the research is beneficial to all contractors companies, CIBD, SIRIM, MBAM and so on in order to draw up new strategies, to improve the standard for better quality and implementation, to standardizes the procedures and so on.

CHAPTER 2

LITERATURE REVIEW

2.1 INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

The International Organization of Standardization was founded in 1946 in Geneva, Switzerland and first published in 1987. The purpose of the organization was to establish the worldwide common standards for manufacturing, communication and trade. Since its inception, the organization has expanded its scope to all industries except for electrical and electronic engineering, which are sanctioned by other organizations. There are most of the countries in the world that participate in the organization. The organization then is broken down to approximately 180 subcommittees that draft the various standards with the assistance of technical advisory groups providing input to the development process. There have been over 8000 standards issued by the organization since its inception.

2.2 HISTORY OF ISO 9000 STANDARD IN MALAYSIA

The ISO 9000 family of standard first adopted and published in Malaysia as Malaysia Standard or so called MS ISO 9001 series which had been introduced in year 1991. This standard had been deliberated at the national level by the national mirror committee. In order for Malaysia to be involved in development of Quality Management Standard (QMS), the national mirror committee had been established in 1990 and started being involved at the international level in the early of 1990's. Subramaniam (2007) stated that, currently Malaysia is a P-Member of ISO/TC 176 and its three subcommittees which are SC1, SC2 and SC3. Since 1991, Malaysia has

been represented at almost every annual plenary meeting of ISO/TC 176. The first standards published in Malaysia started with MS ISO 9001:1991 but then, this standard had been revised by the committee and this revised standards called MS ISO 9002:1991. Since there were need of changes to be done to the revised standard, MS ISO 9003:1991 and MS ISO 9004:1991 had been produced by the committee.

2.3 THE ISO 9000 SERIES

The ISO 9000 Series of Quality System Standards, published in 1987 are generic Quality Systems Standards. The standards require an organization to operate to a structure of written policies and procedures which are designed to ensure that it can consistently deliver a product or service to meet customer requirements. In short, ISO 9000 acts as a basic guidelines and requirement to set up a quality management in an organization continuously but do not provide the method and way to establish or improve the quality management.

The ISO 9000 set of standards were very heavily based on BS 5750:1979 Parts 1, 2 and 3 and followed the same sectional layout except that an additional section (ISO 9000:1987 Part 0 Section 0.1) was introduced to provide further guidance about the principal concepts and applications contained in the ISO 9000 series. The standards are not concerned with specifying final product or service quality which is only referenced by the need to meet the customer requirements but rather with setting out a framework for the systems which an organization should have in place to control its internal 'processes'.

The ISO 9000 series has been revised several times before we have ISO 9001:2000 in year 2000. The latest new version of ISO 9000:2000 standard practiced in Malaysia in which had been published on December 15, 2000 consists of MS ISO 9000:2000 QMS - Fundamental and Vocabulary and MS ISO 9001:2000 QMS-Requirements. According to the ISO 9000:2000, a good quality management should have the following characteristics:

a) Able to meet the requirement of the customer in the final stage of the end product.
b) Able to integrate the value-added concept in the quality management system to improve the quality management system in an organization.
c) Able to carry out the process without any rework or unnecessary repetition due to repetitive mistake.
d) Able to take its own initiative to improve its management system or process from time to time based on the need.
e) Able to develop a mutual beneficial supplier relationship

2.4 TERMINOLOGY AND QUALITY PARAMETER

2.4.1 Terminology Of Research

In the context of the research, the study mainly focuses on identifying the awareness, the perception and level of the implementation of MS ISO 9001:2000 QMS within construction industry in Malaysia. The awareness that emphasize by this research is meant by measuring the level of awareness of the construction personnel regarding their knowledge and understanding of the implementation of the standard.

For the second objective of the perception, the research try to emphasize the ability of the construction people about their feeling or judgment towards the implementation of MS ISO 9001:2000 QMS. The level of the implementation should be referred to the extention that connected to the assessment to some extent to the degree of specified regarding the implementation of MS ISO 9001:2000 QMS.

2.4.2 Quality Parameter

2.4.2.1 Quality

Chung (1999) stated the quality of construction is even more difficult to define. Apart from that, quality may be described based on the various angle of views to different of people's perspective. Quality to construction is basically related to the

conformance to the specification, the building is fit for intended use, longer life span, value for money and on-time completion. Quality in construction also related to satisfaction of clients. Quality from the view of MS ISO 9001:2000 (Department Of Standards Malaysia, 2000), it define as the quality as the degree to which a set of inherent characteristics (Clause 3.5.1) fulfills the requirement (as per Clause 3.1.2). In the other ways, quality is one that meets all contractual requirements including statutory regulations at optimum cost and time and satisfied by the clients, consultants and so on.

2.4.2.2 Quality Assurance (QA)

According to the Department of Standards Malaysia (2000), Clause 3.2.1.1, the Quality Assurance is defined as part of quality management focused on providing confidence that quality requirements will be fulfilled. QA is also a declaration given to inspire confidence that a product has achieved the highest standards and that its manufacture, installation, modification and/or repair has been completed in an efficient and timely manner.

In relation to the construction fields, it is obvious that defects arising in construction fields are mostly caused by poor management and communication. These mistakes may be traced back to the purchase of incorrect or incompatible materials and failure to retrieve the out-dated drawings. Consistent quality can only be achieved when such avoidable mistakes are avoided in the first instance. Preventive measures must be taken to minimize the risk of managerial and communication problems. Therefore, the quality management system is a good practice for quality assurance. Quality assurance are concerned with an agreed level of quality, a commitment within an organization, commitment from a customers and within all level to the basic principles of QA and QC. It is oriented towards prevention of quality deficiencies to minimize the risk of making mistake at the site.

2.4.2.3 Quality Control (QC)

Quality Control shall be defined as part of quality management focused on fulfilling

quality requirement in Clause 3.2.10 (Department of Standards Malaysia, 2000). This definition could be simplified as the amount of supervision that a product is subjected to, so as to be sure that the workmanship associated with that products meets the quality level required by the design. In other words, it is the control exercised by the organization to certify that all aspects of their activities during the design, production, installation and in-service stages are to the desired standards.

2.4.2.4 Quality System/Quality Management System

Chung (1999) stated that in order to maintain the consistency quality of a final product or building, the organization to ensure that every time a construction is performed, the same method is adopted and the same control is exercised. This can be achieved by establishing a quality system in the organization and maintaining it to be effective.

Quality system can be define as a framework for quality management that can be defined as a set of policies, processes and procedures required for planning and execution in their core business area of an Organization. The quality system clarifies the authorities and responsibilities of the staff and their interrelations. It standardized the administrative and the production procedures and this quality system is a management tool providing assurance that quality control activities have been planned and carried out in full and to produce building work in a cost effective way to meet the customer's requirement.

2.4.2.5 Quality Manual

According to the Department of Standards Malaysia (2000), the Quality Manual shall be defined as a document specifying the quality management system of an organization. It document the general quality policies, procedures and practices of an organization or put another way, it is an organization's written record of what they say and do to produce a quality product or deliver a quality service.

2.5 PRINCIPLE OF MS ISO 9001:2000 QMS

MS ISO 9000 series of Quality Systems Standards has become a well-known of international standard in Malaysia for the QMS in which had been introduced and published by the SIRIM in year 1987. In order to bring uniformity to MS, the series of standard had been formalized which was based on various existing national and industry standards. This standard encompasses all the quality activities that are needed to provide assurance about the quality of the finished product or services.

The MS ISO 9000 Standard promotes the adoption of a process approach when developing, implementing and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements. This process approach, according to the ISO standard, defined as the application of a system of processes within an organization, together with the identification and interactions of these processes and their management. The approach is known as 'Plan-Do-Check-Act' (PDCA) which based on eight quality management principles which reflect best management practices such as :

a) Customer focus
b) Leadership
c) Involvement of people
d) Process approach
e) System approach to management
f) Continual improvement
g) Factual approach to decision making
h) Supplier relationship

2.6 MS ISO 9001:2000 QUALITY SYSTEM REQUIREMENT

Figure 2.6 shows the Quality Management System structure according to the MS ISO 9001:2000 and however, the MS ISO 9001:2000 is mainly comprises of five main Clauses such as Clause 4 for Quality Management System, Clause 5 for Management Responsibility, Clause 6 for Resource Management, Clause 7 for Product Realization and Clause 8 for Measurement, Analysis and Improvement.

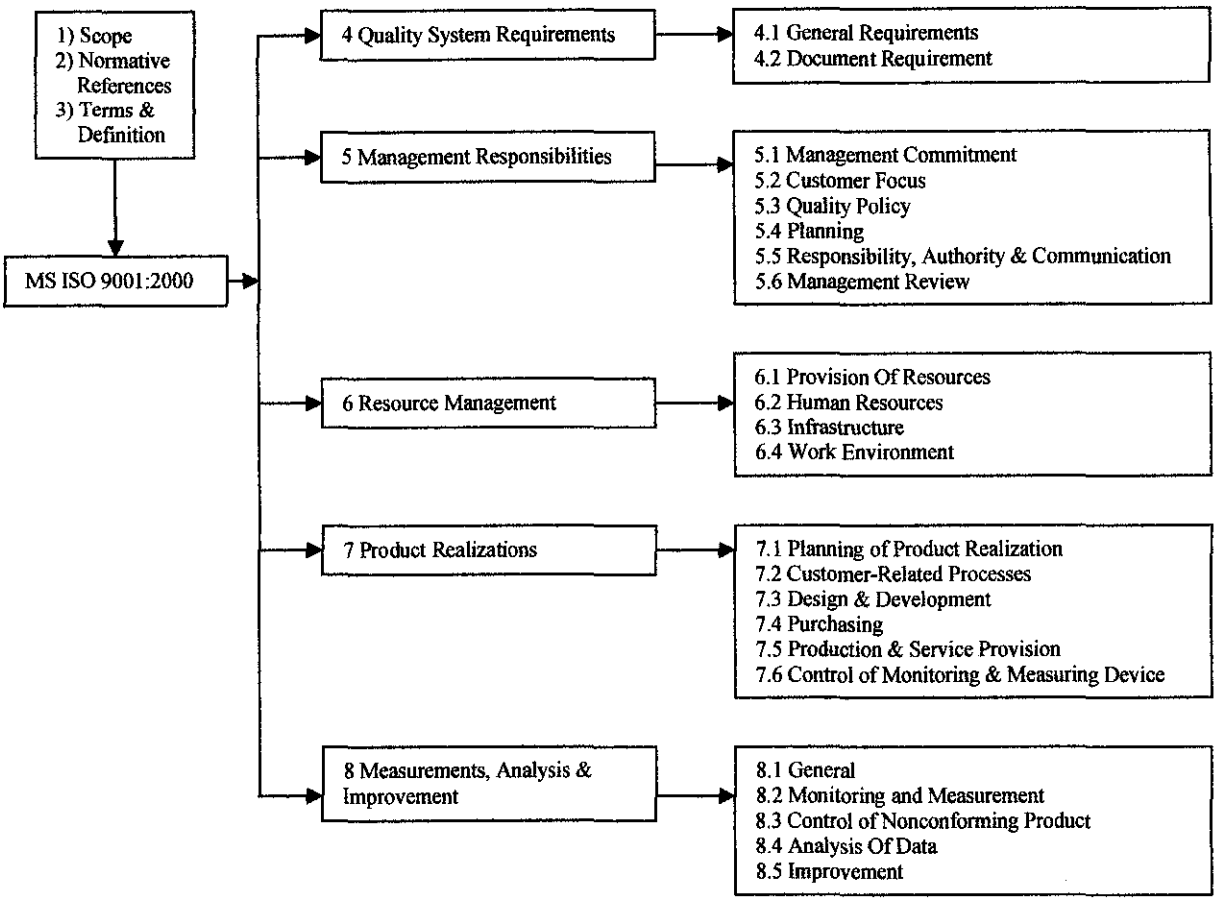


Figure 2.6 : QMS Structure According To MS ISO 9001:2000

2.7 THE STAGES OF DOCUMENTATION IN QUALITY SYSTEM

The required documentation of a quality system ties in closely with the basic function of standard. The quality system will be prepared as a coordinating document for the company's QMS which conforms to the MS ISO 9001:2000. This QMS intended to act as "window" to the company's quality management system. The manual was prepared or established by the Management Representative of the organization and the Quality Unit through discussions with top management and inputs from personnel across the various departments in the organization. The QMS documentations are comprises of four main sections and relevant appendices based on the Quality Management System Structure in which formed as Pyramid Documentation as shown in **Figure 2.7.**

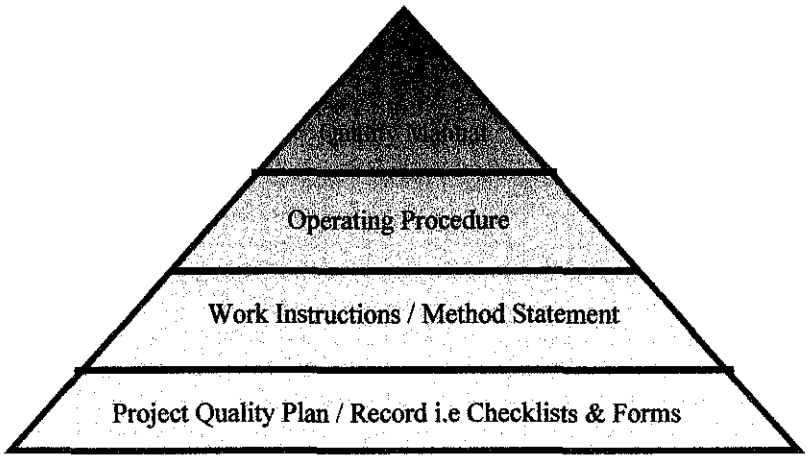


Figure 2.7 : QMS Structure – Pyramid Documentation
(Source : QMS Manual, Putra Perdana Construction Sdn. Bhd.)

2.7.1 Level 1 Quality Manual

This document is a concise description of the Quality Management System and services as a permanent reference in the implementation and maintenance of the system. The Quality Manual outlines the structure and company's scope, Quality Policy, Quality Objectives and general principles of the operation of organization's Quality Management System. This will offer confidence and good impression to the potential client with the service or product provided.

2.7.2 Level 2 Quality Procedures

Quality Procedures are more detailed second level documents. The majority of the Quality Procedures are aligned with a major element of the Quality Management System specified in MS ISO 9001:2000. The Quality Procedures are written statements which specify the purpose and scope of activities in which the respective Organizations in The Group are engaged in.

The Group prepared the necessary documented procedures to ensure the effective planning, operation and control of its processes. These procedures are held in the Quality Procedures. Usually the Quality Policy, Environmental Policy, OSHA

Policy and organizational chart, control document, non compliance report and so on will be included into this level.

2.7.3 Level 3 Method Statement / Work Instruction

Level 3 of documentation pyramid describing the Method Statement and Work Instruction in order to be implemented to the process and it should be written and presented in a simple, convincing and user friendly from.

According to the MS ISO 9001:2000 standard, the Method Statement shall be define as a document that provides the information about how to perform activities and processes consistently. These Method Statement / document provide an adequately detailed instructions and parameters to guide all those works deemed relevant across the contract.

2.7.4 Level 4 Support Document

The support documents appear in the form of detailed, project quality plans, forms, inspection records and job descriptions. They are in place to ensure effective planning, operations and control of processes. Forms and checklists is a supporting document of method statement to ensure requirements of the process or activities are met. Project Quality Plan is a documentation that describes how the QMS is applied to a specific project or contract and acts as guidelines for the overall implementation of the project.

2.8 ISO 9000 IN CONSTRUCTION

Ofari, Gang & Briffet (2002) cited to the Love & Li (2000) that, since the 1980's, most of the construction enterprises in many countries has been implemented the series of standard of ISO 9000 into their organization. By implementing this ISO 9000, it was observed that it has given an enhancement image for the contractors,

increased competitiveness and the customer's satisfaction and better coordination on projects and within the company

It was also stated there are some difficulties in understanding the concept of ISO 9000 whereby the construction nature is a fragmented that lead to the restriction of the communication among the staffs. Bureaucracy and paperwork, cost increment and stifling of innovation also contributed to the difficulties of better understanding of ISO 9000 series.

The introduction of CIDB in Singapore in the late 1980's traced the history of the construction quality development program in Singapore due to the poor quality work. Establishment of the Singapore's first quality assessment called CONQUAS in 1989 mainly for measuring the workmanship standards of a building (Ofari & Gu, 2001).

2.9 ISO 9000 CERTIFICATION IN MALAYSIA

In Malaysia, the SIRIM has introduced MS ISO 9001:2000 and the application of ISO standard or certified is made through a wholly owned subsidiary of *SIRIM Berhad*, that is *SIRIM QAS International Sdn. Bhd.* where all the certification of ISO require a systematic and through examination by representative from this auditing party.

According to the research done by *SIRIM QAS International Sdn. Bhd.* for the growth of certified companies for QMS in Malaysia from 1988 to 2006, it found that the number of growth started to increase year by year but it almost exponential growth was recorded beginning in the early 1990's. In addition to that research, the *SIRIM QAS International Sdn. Bhd.* also has come out with statement about the growth in ISO 9000 certification in Malaysia. They claimed that in the middle to late of 1990s, the general perception of ISO 9000 was that the certification is a marketing advantage and therefore in about 90% of ISO 9000 certification in Malaysia was confined to the manufacturing sector. Driven by the directive, in 1996

the ISO 9000 requiring an agencies / departments to implement and have at least one core activity certified to ISO 9000.

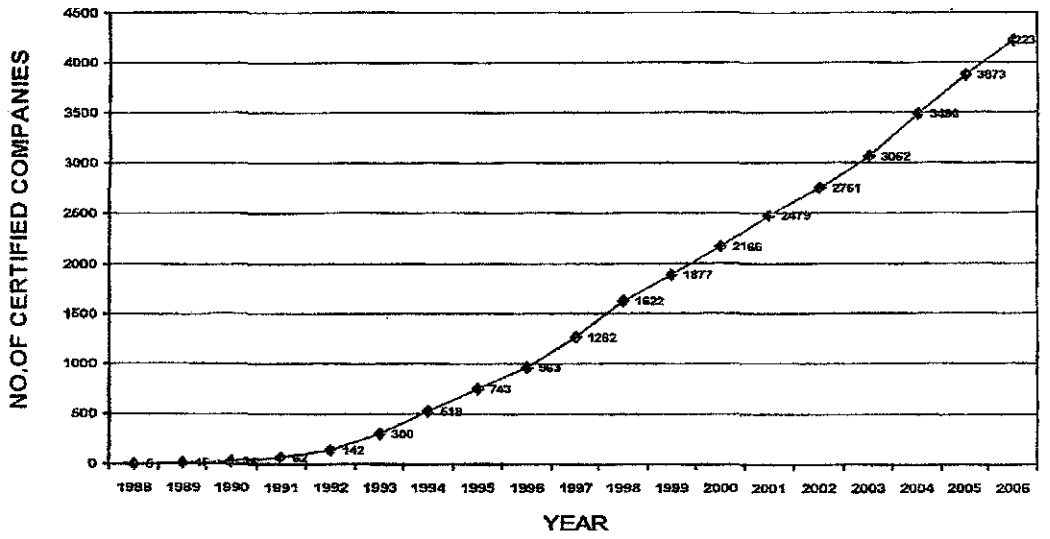


Figure 2.9 : The Number Of Certified Companies For QMS From 1988-2006 (Source : SIRIM Berhad)

During the year 1986, the same year that the standard was published by ISO, SIRIM was responsible to introduce the ISO 9000 certification in Malaysia. Senior certification personnel were trained in every aspect of standard and quality and qualified as ISO 9000 auditors. The growth of number of certified companies for Quality Management System in Malaysia was to slow and there were no specific requirement for the ISO certification. But during year 2000 and beyond, they found that the awareness of ISO 9000 and recognition of benefits of its implementation has become widespread in around Malaysia and the certification ranging is now not limited to the manufacturing sector only but to the tertiary education institutions, healthcare centers, financial services and so on.

Subramaniam (2007) claimed that for the construction sector in Malaysia, the CIDB requires for all G7 contractors to be ISO 9001 certified by January 1, 2009. According to the CIDB (2007), the percentage of contractors with the ISO 9001 certification has almost tripled from 2002 to 2004 (58 contractor firms to 145 contractor firms). However, this group of companies still represents a minority in the industry. Besides CIDB, the Ministry of Housing and Local Government also

has been increasing efforts of practicing the value of quality into the industry. ISO 9001 Do-It-Yourself scheme has been introduced by the CIDB which provides support for contractor pursuing the ISO certification.

QLASSIC also developed as a quality assessment system for Malaysia purposes and this is a mechanism used to evaluate and to compare the quality of workmanship. It covers three key components in building construction which are structural works, architectural works and external works.

2.10 PREVIOUS RESEARCH REGARDING THE IMPLEMENTATION OF ISO QMS (TOWARD TO THE RESEARCH)

Several studies have treats success factors for quality management implementation. Based on a review of the findings done by Quazi & Padibjo (1997) on a Singapore experience, they claimed that the ISO 9000 Quality Management System is the most widely recognized quality model for the purpose of certification. Based on the comparison study for 7 samples of companies, they simplify a numbers of barriers toward the ISO 9000 certification by stating the significant of benefit of implementing the ISO 9000 into the organizations.

According to the Turk (2006), based on his literature survey he claimed that ISO 9000 QMS standards have been applied in almost industries in the world since 1987. Among the basic principles of the system are that it is costumer-focused, has established an in-house leadership environment, has participation of employees, uses a process approach and a systematic management approach, seek permanent improvement of the system, desire decision-taking on factual base and suggests the establishment and maintenance of relation between the subcontractor and suppliers based on mutual benefits. From the study, it was concluded that the number of ISO 9000 QMS certified construction firms in Turkey is low rather than other countries and are not related to the size of firm and generally, it have a positive approach to ISO 9000 QMS. He also found many positive answers towards the implementation of ISO 9000.

There are also studies that also relate to the ISO 9000 implementation but in consultant firm in Hong Kong. The study were conducted by Kam & Tang (1999), they had stated also some reasons of being lacking in implementation of ISO 9000 in Hong Kong and they provided the benefit for that. From the study, they found that the consulting firms generally accepted the ISO 9000 as a norm to their QMS. Zeng, Tian and Shi (2005), in their study on Implementing Integration of ISO 9001 and ISO 14001 For Construction, they described the standard of ISO 9001 and ISO 14001 and they had performed survey methodology of 68 responded firms which were ISO 9000-certified. The survey resulting in 59% considered an integration of ISO 9001 and ISO 14001 standards. On the other hands of my study, the ISO 14001 not takes into account.

Giles (1997) in his study in ISO 9000 Perspective for Construction Industry in UK with the purpose is to take look back at how the relationship began and to try to assess what has been achieved together with the prospects for the future. He addressed the questions such as how it all began (the first meeting), industry scheme document (the courting process), where are we now? (the relationship) and the future (a life-time together). According to him, the demand of ISO 9000 certification is now strongly driven by commissioning clients, who paradoxically do not use its as major factor in selection. In supporting his statement, he stated that based on the research done by University of Salford shows that over 80% of New York comes from existing clients or recommendation rather than reliance on third party certification.

In Malaysia context, based on the findings through the website, some of the Master program's students from *'Universiti Teknologi Malaysia' (UTM)* had been carried out the study for ISO 9000:2000 application toward its implementation, effectiveness and workmanship performance but there were no further explanation regarding these thesis since it is the controlled document by UTM's library. While the Construction Industry Development Board Malaysia (CIDB) also had been carried out the study regarding quality performance of ISO 9001:2000 and all these sources were based on the ISO 9001:2000 certified contractor only.

However, the implementation of ISO based on the awareness, the perception and level of implementation has not been sufficiently studied from the perspective of Malaysia. Based on some published literature, that is, mostly of the studies have been produced based on the ISO implementation and thus, this research is an attempt to provide a data or level of the MS ISO 9001:2000 QMS being implemented in peninsular Malaysia by generating the data regarding the awareness, the perception and the extention assessment of MS ISO 9001:2000 QMS and therefore, these 3 objectives will differentiation this research from others.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 RESEARCH METHODOLOGY

The methodology that adopted through this study is survey-based methodology by which the information is collected directly from the people who are considered knowledgeable experienced in the subject of study. This survey-based methodology had been chose because the data to be collected are verbal in nature and it measured the people's opinion as well. It will also provide a simple administer and the data is reliable. The major processes included identify the problems, establish aim and objectives, literature review, pilot survey, data collection and sampling, data analysis, result interpretation and conclusion as shown in **Figure 3.1**.

3.2 SAMPLE SIZE AND SAMPLING

3.2.1 Sample Size

The population of the contractor firms in Peninsular Malaysia is too large in order to attempt to survey all of its members. Therefore, small samples of size are chosen that reflects the characteristics of the population from which it is drawn. Sample sizes are identified by using :

a) Formula (Bluman, 2004)

- a 95% Confident Interval for population mean

$$n = (N\sigma^2) / [(N-1)D + \sigma^2) \quad \text{.....(1)}$$

where; n = Sample size

$D = d^2/4$

N = Number of population

σ^2 = Population variance

d = desired half width of Confident Interval

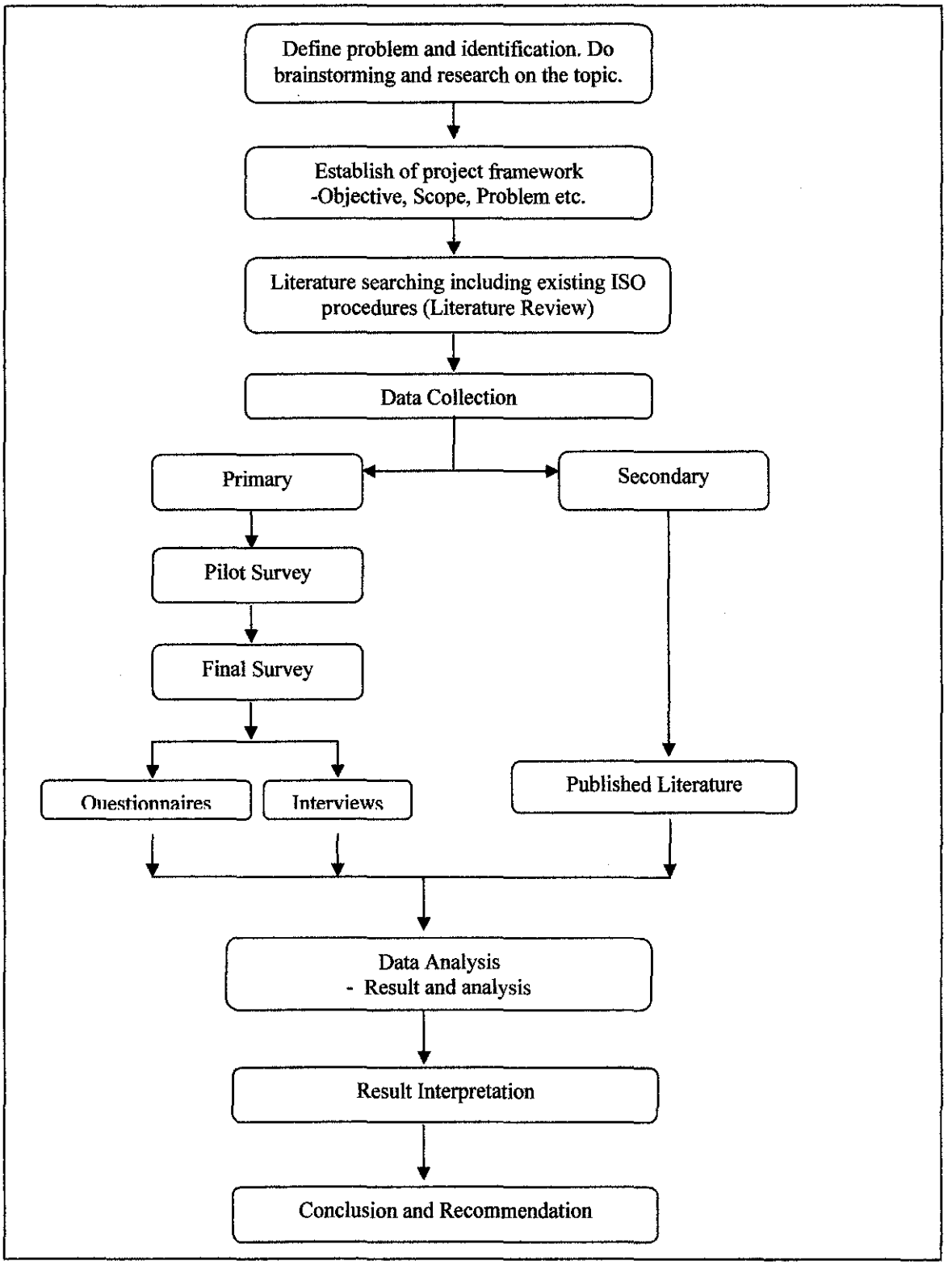


Figure 3.1: Flow Chart Of Study

- a 95% Confident Interval for population proportion

$$n = [Np\ (1-p)] / [(N-1)D + p(1-p)] \quad \text{.....(2)}$$

where;

n = Sample size

$D = d^2/4$

N = Number of population

p = Population proportion

d = desired half width of Confident Interval

An example of population and sample size is shown in **Table 3.2.1**.

Table 3.2.1 : The Sample Size Determination Based On Population (N)

N	*n*	N	*n*	N	*n*
10	10	100	80	1000	274
15	14	150	108	1200	291
20	19	200	132	1400	302
25	24	250	152	1600	310
30	28	300	169	1800	317
35	32	240	181	2000	322
40	36	400	196	2400	331
45	40	460	210	2800	338
50	44	500	217	3500	346
60	52	600	234	6000	361
70	59	700	248	10000	370
80	66	800	260	100000	384

b) Theory of Central Tendency

According to the Theory of Central Tendency, the minimum sample size is 30 in which applied to this research.

3.2.2 Sampling Method

Sampling is a technique to get sample and this survey has been designed based on the probability sampling of stratified random sampling. Stratified random sampling is used when the population has different groups (strata) and the analyst needs to ensure that those groups are fairly represented in the sample. In stratified random sampling, independent samples are drawn from each group. The size of each sample

is proportional to the relative size of the group. The population sampling for this research represented the contractor firms with MS ISO 9001:2000 QMS certified and non MS ISO 9001:2000 QMS certified in peninsular of Malaysia and the sampling method concentrated only on contractors Class A, Class B and Class C.

From the both population of MS ISO 9001:2000 QMS and non MS ISO 9001:2000 QMS, sample size of 200 contractor firms around Peninsular Malaysia were randomly selected in this study represented the population. The respondents focused to the Project Manager/Head Of Project, General Manager, QA/QC Manager, Assistant QA/QC Manager Senior Engineer and QA/QC Engineer/Site Engineer.

3.3 SURVEY DESIGN

3.3.1 Pilot Survey

Pilot survey of the approved questionnaires was conducted in order to know the response from the selected companies regarding the questionnaires. The piloting tested whether the questions are intelligible, easy to answer, unambiguous and so on and through obtaining feedback from these respondents, there will be an opportunity for improving the questionnaire, filling the gaps and determine the time required for and ease of completing the exercise. The face-to-face interview for pilot survey had been conducted to the selected companies, lecturers from Civil Engineering and student who's exposed to the MS ISO 9001:2000.

The pilot survey conducted in two different ways in which the respondents were provided with the questionnaire and they need to answer and/or to comment the questionnaire and the second part, the respondents were interviewed by asking them what about their feeling answering the questionnaire. The interview questions are:

a) How long did it take you to complete?
b) Were the instructions clear?
c) Were any of the questions unclear or ambiguous?
d) Did you object to answering any of the questions?
e) Was the layout of the questionnaire clear/attractive

f) General comments on the questionnaire

3.3.2 Questionnaire Design

This project has been conducted through the questionnaire survey method in order to get the information related to ascertain the awareness, the perceptions and level of practices on the implementation of MS ISO 9001:2000 QMS within construction industry in Peninsular Malaysia. The preparation of the questionnaire was preceded by reviewing of the literature. The pilot survey was applied to the contractor firms and lecturers and the results of a small pilot survey were used to fine-tune the final questionnaire.

The questionnaire forms then were sent to the contractors in Peninsular Malaysia in December 2007 and January 2008 along with return envelopes. The sample comprised 200 contractor firms in the top three categories which are Class A, Class B and Class C in the registration list from *Pusat Khidmat Kontraktor (PKK).*

The questionnaire consists of four sections whereby the first section (Section A) covers the question that related to the company background of the contractor firms. The second section (Section B) includes the awareness of the MS ISO 9001:2000 implementation. The third section (Section C) consists of the question related to the perception toward the implementation of MS ISO 9001:2000 QMS. The questions in the fourth section (Section D) are required to be answered only by the firms holding MS ISO 9001:2000 QMS in which related to the extention of practices of MS ISO 9001:2000 QMS.

The questionnaires are inclusive of open-ended, close-ended and likert-scale questions. On the most questions, the respondents were requested to express their views on a five-point scale. Section C required the respondents to rate their perception from *"Strongly Disagree"* to the *"Strongly Agree"* while in Section D, the respondents were required to rate the level of practices from *"Very Small Extent"* to the *"Very High Extent"*.

Until end of February 2008, 27 respondents had returned and responded the questionnaires. In order to increase the number of replies, phone conversations were made at the beginning of March, 2008 with personnel of the construction firms that had not returned the questionnaire. By end of March 2008, a total of 39 questionnaires were completed.

3.4 RESEARCH TOOLS

The main tools that will be used in this study are consists of :

- Questionnaire for the data collection
- Statistical tools for the data analyzing

3.5 DATA COLLECTION

The data collection is divided into two types. The first type is primary data collection while the second type is secondary data collection. Both of these stages are discussed by looking into the methods and purposes of collecting the data.

3.5.1 Primary Data Collection

The primary data collection uses three methods and these methods are discussed as below:

a) Questionnaires Design

The questionnaires were designed to determine the awareness, the perception and the level of the implementation of MS ISO 9001:2000 within the construction industry in peninsular of Malaysia. The questionnaires then were sent through mailing along with return envelopes and directly distribute to the selected company. The response of the pilot survey used as a trial to know their response / comments before proceeding with the real ones. The questionnaires were prepared based on the fully

structured questions and close-ended questions so that it easy for the respondent to give their feedback. An additional section were also provided in the questionnaires for the respondent's comments (open-ended questions) regarding the awareness, perception and the level of the implementation of MS ISO 9001:2000 QMS.

These selections were obtained through the study of documents and the literature review of MS ISO 9001:2000 QMS and other relevant references. Besides, the response of the questionnaires from the sample will be used as an overview of the awareness, perception and the level of implementation in MS ISO 9001:2000 QMS. The flow of questionnaire design is shown in **Figure 3.5.1.**

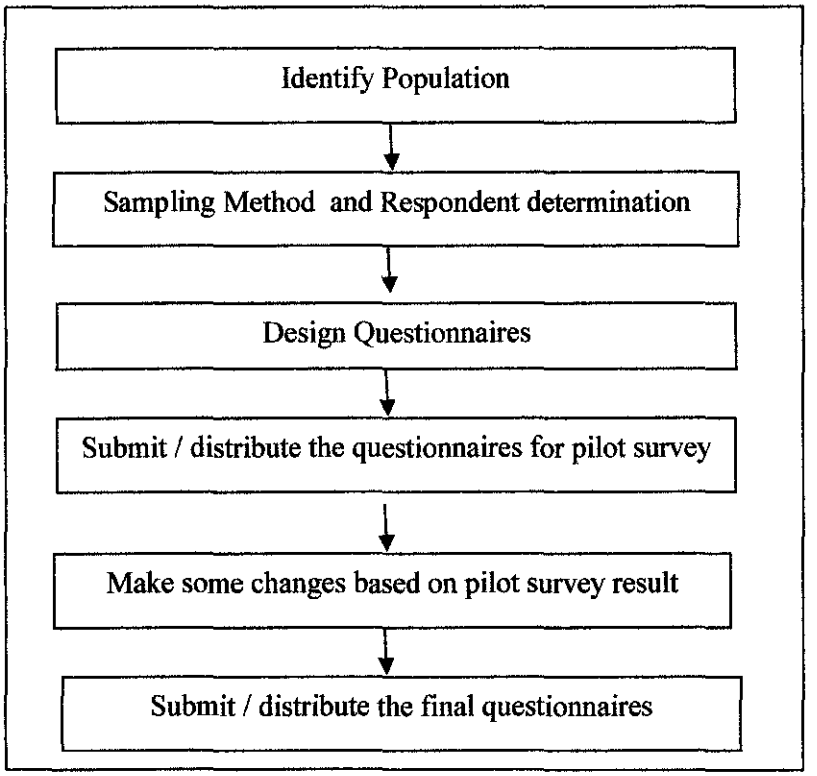


Figure 3.5.1 : The Flow Chart Of Questionnaires Design

b) Interview Design

The face-to-face interviews session also was conducted with the related organization such as SIRIM and contactors themselves to comment about the awareness, perception and the level of the implementation of MS ISO 9001:2000. This interview session were carried out before the distribution of the questionnaires. The purpose of this method is to check the validity and functional of the questionnaires.

It was focused mostly from the management level and QA / Engineering Department. For the pilot survey, the interview session also were conducted after completing the questionnaire by asking them with some questions as per discussed in sub topic 3.3.1 Survey Design.

3.5.2 Secondary Data Collection

Secondary data collection was done by using the method of literature review. Journals, reference books, and other relevant materials are important sourced of secondary data. The secondary data provides an overview of the related research which has been done before and gives information in designing better questionnaires.

Documents obtained from the research sample with their permission (UTP-IRC OPAC). The study of literature gives an overall view of the process flow and information regarding the MS ISO 9001:2000 QMS. The data provides an overview of the related research which has been done before and gives information in designing better questionnaires and interviews questions.

3.6 DATA ANALYSIS

Based on the information and data extracted from completed questionnaire, the data from the respondents was analyzed using the statistical analysis. The primary purpose of data analysis was to summarize the data gathered form the survey and to compare the outcomes which suit the objectives and scope of study. Tables, graphs and charts will be presented to give a clear view of the survey conducted.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 METHOD OF ANALYSIS

4.1.1 Average Index

The data that obtained from the respondents were analyzed by using a descriptive method. Descriptive statistical analysis presents data that have been retrieved into tabular and figure form. Data will be analyzed using the Index Average Method (Memon, Madyd & Mustaffar, 2006) as well as mean and variance. The method of calculation for index average as follows:

$$\text{Average Index} = \left[\sum_{i=1}^{5} a_i . x_i\right] / \left[5 \sum_{i=1}^{5} x_i\right] \quad \text{.....(3)}$$

Where; a_i = constant expressing the weight given to i

x_i = variable expressing the frequency of the response for ;

i = 1,2,3,4,5 and illustrate as follow ;

x_1 = frequency of the 'very rare' response and corresponding to $a_1 = 1$

x_2 = frequency of the 'rare' response and corresponding to $a_2 = 2$

x_3 = frequency of the 'slightly frequently' response and corresponding to $a_3 = 3$

x_4 = frequency of the 'frequently' response and corresponding to $a_4 = 4$

x_5 = frequency of the 'very frequently' response and corresponding to $a_5 = 5$

These average index could be further interpreted back to reflect the respondent rating. Abd.Majid & McCaffer (1997) used a discrete scale converted to continuous index

(average index) which then can be split into discrete categories, so in this case discrete categories could be classified as follows :

- *0 ≥ index value ≤ 1.5 ~ for Strongly Disagree / Very Small Extend*
- *1.5 ≥ index value ≤ 2.5 ~ for Disagree / Small Extend*
- *2.5 ≥ index value ≤ 3.5 ~ for Moderate*
- *3.5 ≥index value ≤ 4.5 ~ for Agree / High Extend*
- *Index value ≥ 4.5 ~ Strongly Agree / Very High Extend*

4.1.2 Severity Index

Severity index was calculated based on the response of the survey to reflect the level of severity effect of the level of practices of MS ISO 9001:2000 QMS. This index was calculated as follow (Al-Hammad, 2000) :

$$\text{Severity Index (I)} = [\sum_{i=0}^{4} a_i . x_i] / [4 \sum x_i] \times 100\% \quad \text{.....(4)}$$

Where;

a_i = constant expressing the weight given to i

x_i = variable expressing the frequency of the response for i ;

i = 0,1,2,3,4 and illustrate as follow ;

x_0 = frequency of the 'very high extend' response and corresponding to $a_0 = 4$

x_1 = frequency of the 'high extend' response and corresponding to $a_1 = 3$

x_2 = frequency of the 'moderate' response and corresponding to $a_2 = 2$

x_3 = frequency of the 'small extend' response and corresponding to $a_3 = 1$

x_4 = frequency of the 'very small extend' response and corresponding to $a_4 = 0$

The percentage of the severity index then categorized as below in order to reflect the scale of the answer of the respondents to the questionnaire.

- 0% - 20% ~ 'non-severe'
- 20% - 40% ~ 'somewhat non-severe'

- 40% - 60% ~ 'moderately severe'
- 60% - 80% ~ 'severe'
- 80% - 100% ~ 'must severe'

4.2 DATA ANALYSIS AND RESULT

4.2.1 Data Collection

4.2.1.1 Data Retrieval Of Questionnaire

The respondents were given the option of returning the questionnaire forms either by mail or fax. A total of 39 respondents returned the questionnaire. As shown in **Figure 4.2.1.1**, in total of 39 respondents, 29 respondents or 74.4% were from contractor firms with Class A & G7 status while 3 respondents or 7.6% were from Class B contractor firms and 7 respondents or 18% were from Class C contractor firms.

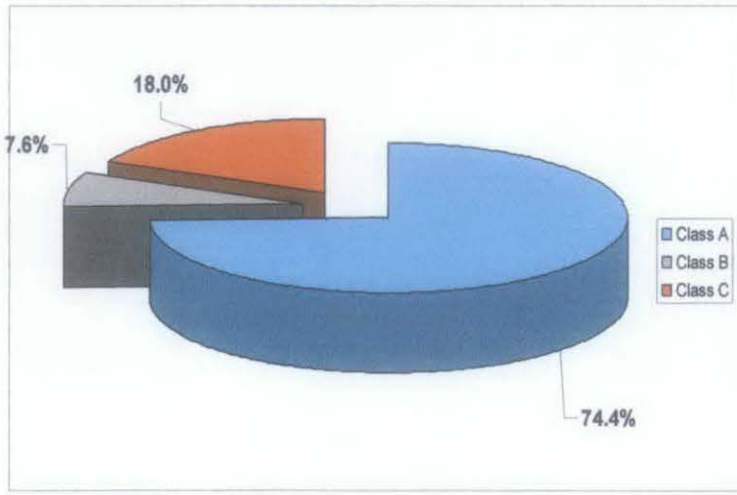


Figure 4.2.1.1 : The Percentage Of Respondents According To Class Of Contractor

4.2.1.2 Profile Of Respondents

Out of 39 completed forms, 17.9% of the respondents were from Project Manager designation and followed by General Manager and Assistant QA/QC, QA Coordinator,

QA/QC Executive & Quality Management Representative in which 15.4% respectively. 12.8% of the respondents were Director / Managing Director and Project Engineer / Site Engineer while QA/QC Manager for 10.3%. **Table 4.2.1.2** and **Figure 4.2.1.2** explained the details of the number and percentage of the respondents according to their designation.

Table 4.2.1.2: The Number and Percentage of Respondent

Designation		No. Of Respondent	Percentage Of Respondent
Director / Managing Director		5	12.8%
General Manger		6	15.4%
QA/QC Manager		4	10.3%
Asst. QA/QC Manager / QA Coordinator / QA/QC Exec./ Quality Management Rep.		6	15.4%
Project Manager		7	17.9%
Project Engineer / Site Engineer		5	12.8%
Other	Contract Manager	1	2.6%
	Doc. Controller Exec.	1	2.6%
	HR Manager	1	2.6%
	Site Clerk	2	5.1%
	Other	1	2.6%

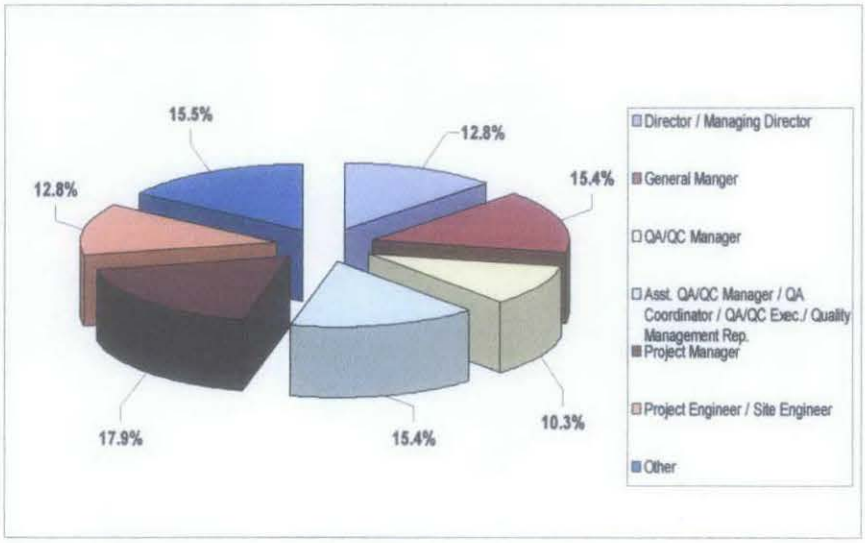


Figure 4.2.1.2 : The Percentage Of Respondents Designation

4.2.1.3 MS ISO 9001:2000 QMS Certification

Based on the data analysis as shown in **Figure 4.2.1.3 (a)**, it has been found that 51.3% (20 respondents) of the contractor firms were MS ISO 9001:2000 QMS certified either by *SIRIM QAS International, Moody International, Det Norske Veritas, CI Certification* and so on. None of the respondents for Class B and C contractor firms has the certification of MS ISO 9001:2000 QMS.

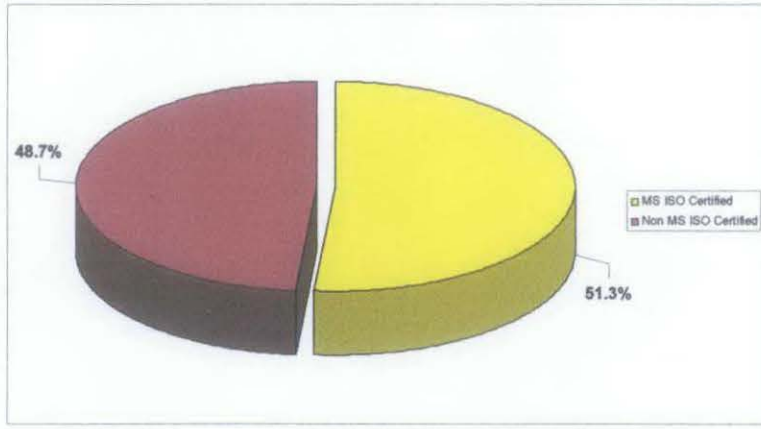


Figure 4.2.1.3 (a) : The Percentage Of MS ISO 9001:2000 QMS Certification

From the observation through the data analysis, the large contractor firms (Class A and G7) appear more interest in implementing the standard of quality management system, perhaps due to the company's resource, tender purposes, client requirement and so on.

On the other hand, some of the non ISO certified companies commented that the standard is not suitable and practical for small company with jobless than 6 million at one time. Costly, takes time in implementing the standard and lack of information and knowledge regarding the MS ISO 9001:2000 QMS lead the company not to implement the standard in their business practices.

It is expected that all the contractor firms for Class A and G7 were ISO certified but then, based on the survey conducted, 31% (9 respondents) of contractors firm in Class A

and G7 still not implement the standard. 6.9% out of Class A respondent still in the process of implementing the standard. **Figure 4.2.1.3 (b)** explained the detail of the MS ISO 9001:200 QMS certification within Class A & G7 contractors. However, it is something that can be proud of that one of respondent from Class C is in the process of implementing the MS ISO 9001:2000 QMS into their business practices.

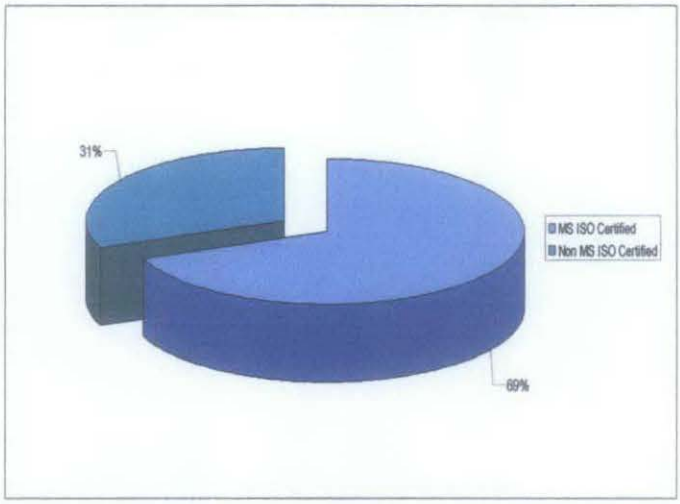


Figure 4.2.1.3 (b) : The Percentage Of MS ISO 9001:2000 QMS Certification Within Class A & G7 Contractors

4.2.1.4 Quality Department

Quality Department normally will be setup by the company for purposes of controlling, monitoring, maintaining and implementing the standard and system within the office work and business practices as per MS ISO 9001:2000 QMS Requirement.

Based on the survey analysis and as shown in **Figure 4.2.1.4**, it was found that 15% (3 respondents) of the MS ISO 9001:2000 QMS certified companies still does not have the Quality Department in their business organization. According to the some of the respondents, the Executives such as Site Engineer, Project Manager and so on will control the quality and assure the works by themselves rather than pass it to the Quality members, and due to this factor, it may lead not to having a Quality Department in order

to control the quality matter. Lacking of staffs and resource limitation may lead the company not to have a Quality Department.

Out of 19 respondents for the non MS ISO 9001:2000 QMS certified, 6 of the respondents (32%) already setup their own Quality Department in their business organization in order to control and monitor issue pertaining the quality matter.

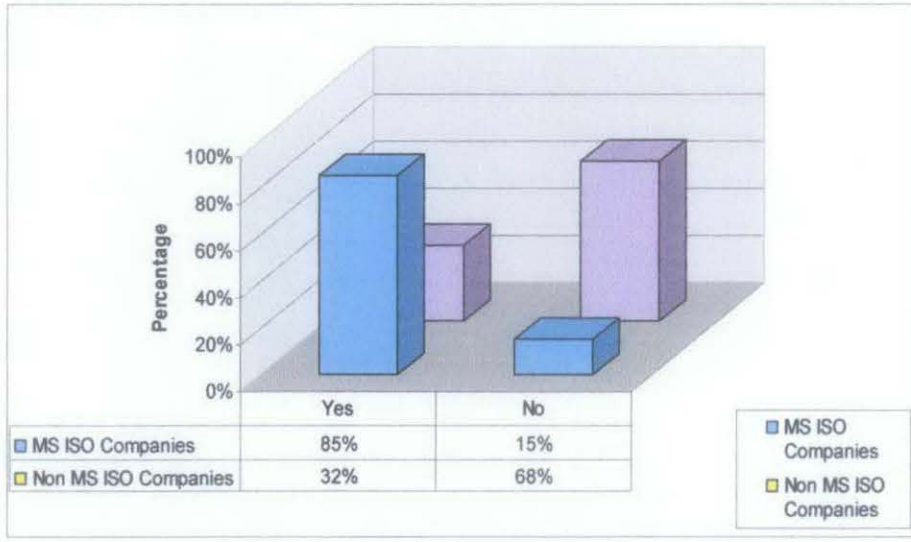


Figure 4.2.1.4 : The Percentage Of Possess Quality Department

4.2.1.5 Awareness On The Implementation Of MS ISO 9001:2000 QMS

For Section B of the awareness on the implementation of MS ISO 9001:2000 QMS, 90% of the surveyed construction firms are aware on the implementation of MS ISO 9001:2000 QMS in construction industry since the CIDB also in the process of promoting the scheme called *'ISO 9001 D-I-Y Scheme'* especially for contractor firms in Malaysia.

The higher percentage of the awareness indicates that most of the surveyed contractors are knowledgeable and understand of the MS ISO 9001:2000 QMS implementations in construction industry. **Figure 4.2.1.5 (a)** showed the detail of the percentage of the awareness for overall of respondents for Class A, Class B and Class C.

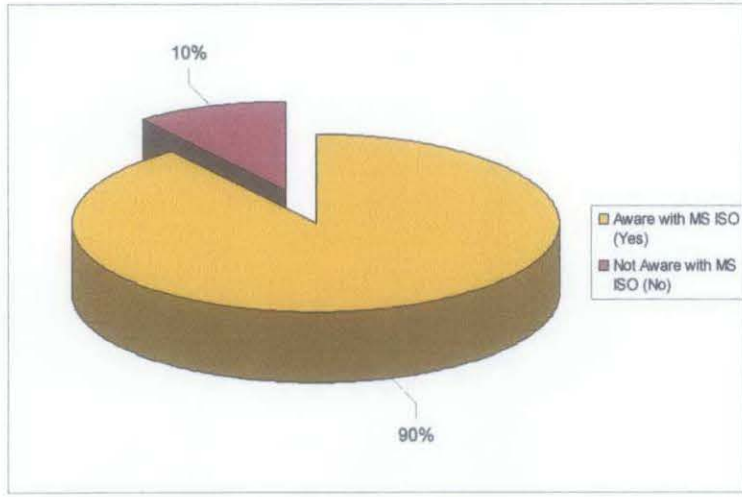


Figure 4.2.1.5 (a) : The Percentage On The Awareness Of The Implementation Of MS ISO 9001:2000 QMS

Based on the analysis of the replied questionnaire, all the 20 respondent from Class A/G7 contractor firms are aware regarding the implementation of MS ISO 9001:2000 QMS in construction and this is may be due to the requirement issued by the CIDB whereby all the G7 contractors need to be MS ISO 9001:2000 QMS certified by January 1, 2009. **Figure 4.2.1.5 (b)** explained the detail of the percentage on the awareness for contractor firms of Class A, B and C.

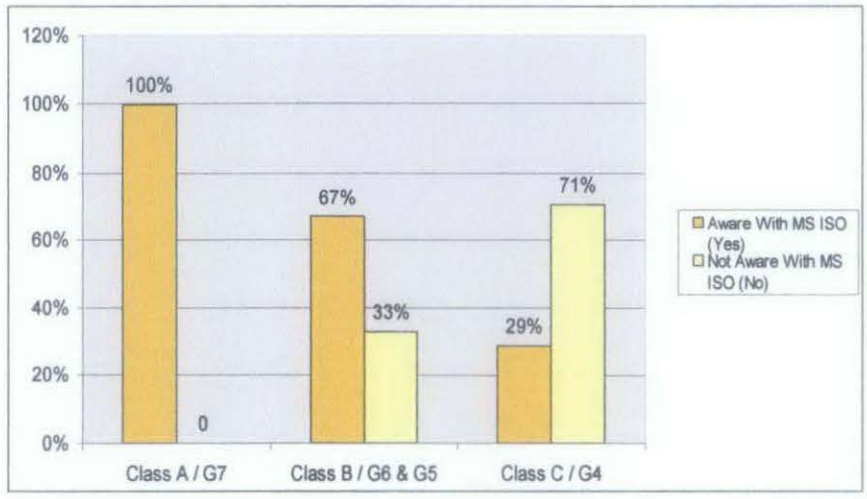


Figure 4.2.1.5 (b) : The percentage On The Awareness Of The Implementation Of MS ISO 9001:2000 QMS (PKK Class & CIDB Grade)

The percentage of the awareness regarding the implementation of the standard showed the decrement when it's come to Class B and Class C. Lack of information and knowledge in MS ISO 9001:2000 QMS could be one of the reasons why percentage is lower.

Besides that, the respondents were asked regarding the courses attended by them and as shown in **Figure 4.2.1.5 (c),** 48.7% (19 respondents) of the respondents replied that they used to attend the courses that relates to the MS ISO 9001:2000 QMS for 1 to 3 times per year. On the other hand, 38.5% (15 respondents) of the respondents never attend any courses. Most of the respondents that never attend any courses related to MS ISO 9001:2000 QMS may be due to some circumstance such as spending more time on work either at the site or office, costly and perhaps the course conducted far from the office and so on that not permitted the respondents attending the course.

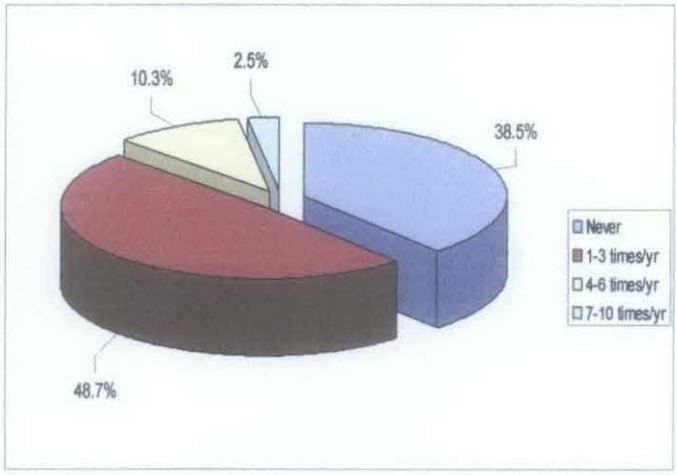
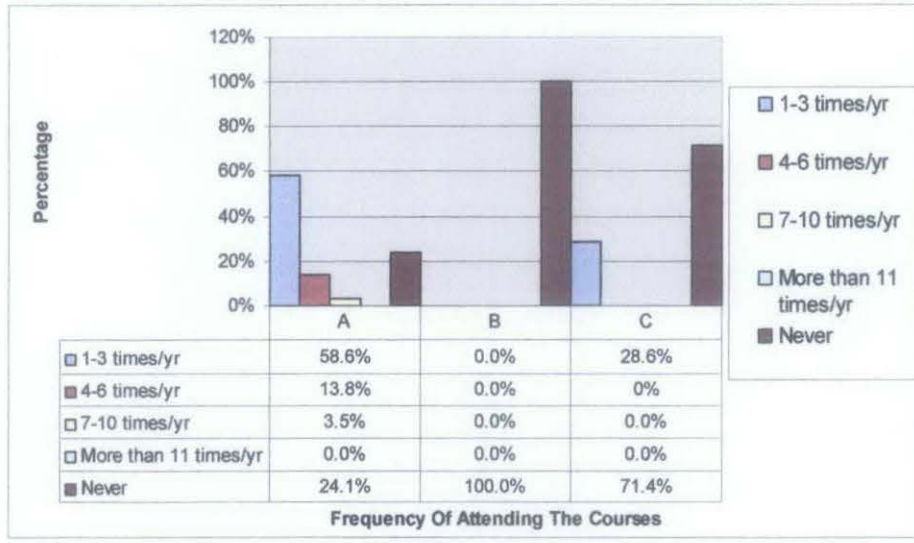


Figure 4.2.1.5 (c) : The Percentage Of Respondents Attending Courses Related To MS ISO 9001:2000 QMS

Based on **Figure 4.2.1.5(d),** 28.6% (2 respondents) of the respondents from the Class C contractor firms attended the course for 1 to 3 times per year. It is hope that this figure will be increased by time so that, the percentage of Class C contractor firms that having MS ISO Certified will be increased from time to time. All of the respondents from Class B contractor firms are never attended any courses that related to the MS ISO 9001:2000 QMS.

This question were being asked in order to know the percentage of respondents who are really undergo for the training or courses in order to improve their knowledge and understanding regarding to the MS ISO 9001:2000 QMS.



	A	B	C
1-3 times/yr	58.6%	0.0%	28.6%
4-6 times/yr	13.8%	0.0%	0%
7-10 times/yr	3.5%	0.0%	0.0%
More than 11 times/yr	0.0%	0.0%	0.0%
Never	24.1%	100.0%	71.4%

Figure 4.2.1.5 (d) : The Percentage Of Respondents Attending Courses Related To MS ISO 9001:2000 QMS According To PKK's Class

For the third question in Section B, the respondents were asked regarding the in-house training and it is surprisingly that 48.7% (19 respondents) of the respondent are never conducted any in-house training as per MS ISO 9001:2000 QMS Requirement. This is maybe due to the lack of staffs that are really master in MS ISO 9001:2000 QMS.

The total of 51.3% of the respondents conducted their in-house training whereby 48.7% (19 respondents) conducted for 1-5 times/year and 2.5% (1 respondent) conducted for 6 -10 times/year as shown in **Figure 4.2.1.5 (e). Figure 4.2.1.5 (f)** explained the percentage of respondents conducted 'in-house' training according to PKK's class and it simply said that, the Class B contractor firms never conducted the 'in-house' training in their business.

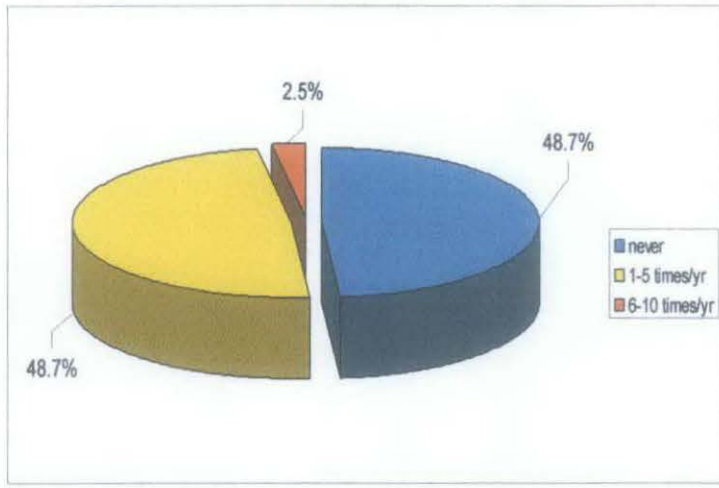
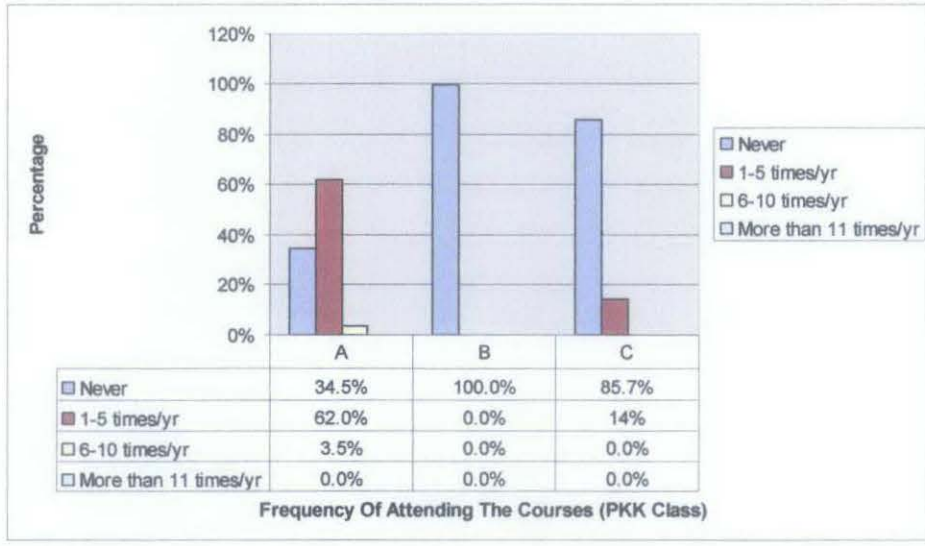


Figure 4.2.1.5 (e): The Percentage Of Respondents Conducted 'In-house' Training



	A	B	C
Never	34.5%	100.0%	85.7%
1-5 times/yr	62.0%	0.0%	14%
6-10 times/yr	3.5%	0.0%	0.0%
More than 11 times/yr	0.0%	0.0%	0.0%

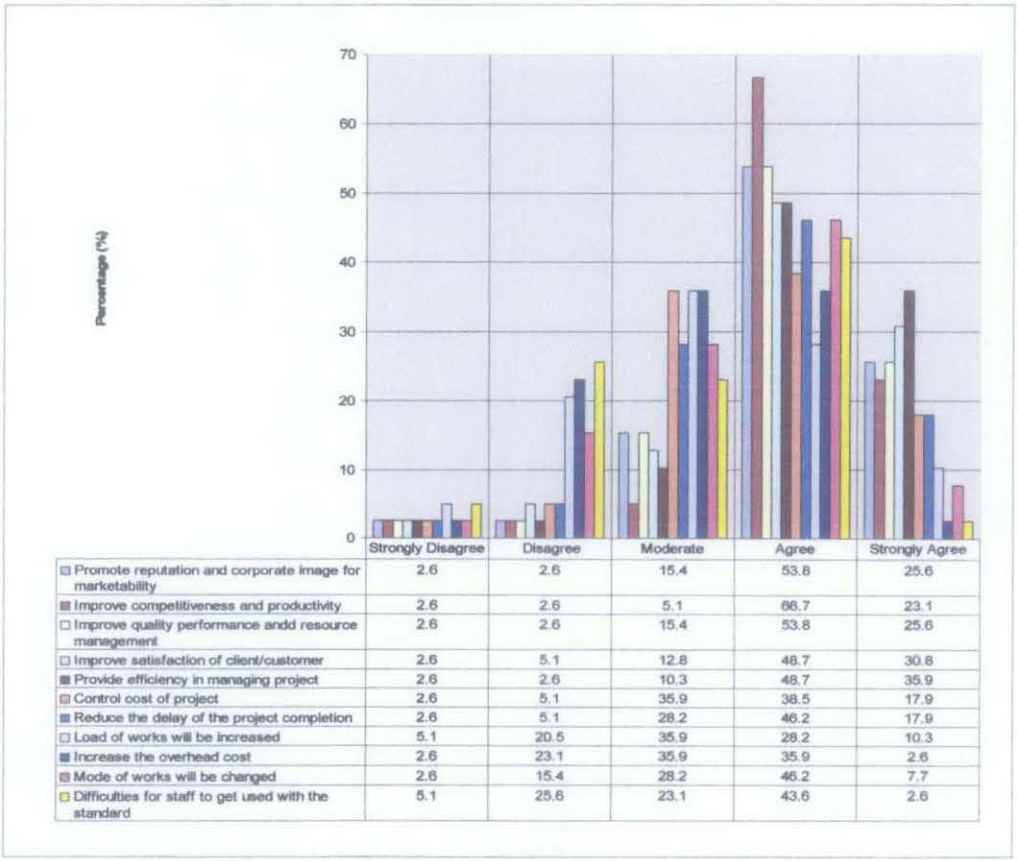
Figure 4.2.1.5 (f): The Percentage Of Respondents Conducted 'In-house' Training According To PKK's Class

Basically, the 'in-house' training is one of the requirements as stated in the standard as per Clause 6 – Resource Management (6.2.2 – Competence, Awareness and Training) in order to develop the awareness and competency of all the staff in the Organization.

4.2.1.6 Perception On The Of MS ISO 9001:2000 QMS

In Section C of the MS ISO 9001:2000's perception, the respondents were asked regarding their perception on the MS ISO 9001:2000 QMS. The respondents were given choices of answer based on the likert-scale and the respondents need to choose the best answer for choices given either *"1-Strongly Disagree"*, *"2-Disagree"*, *"3-Moderate"*, *"4-Agree"* or *"5-Strongly Agree"*.

Based on the **Figure 4.2.1.6 (a)**, most of the respondents' perception agreed that by implementing the MS ISO 9001:2000 QMS, it will improve the competitiveness and productivity of work as it represented the most highest percentage of 66.7%, followed by promoting the reputation and corporate image for marketability and improve quality performance and resource management which represented 53.8% respectively.



	Strongly Disagree	Disagree	Moderate	Agree	Strongly Agree
Promote reputation and corporate image for marketability	2.6	2.6	15.4	53.8	25.6
Improve competitiveness and productivity	2.6	2.6	5.1	66.7	23.1
Improve quality performance andd resource management	2.6	2.6	15.4	53.8	25.6
Improve satisfaction of client/customer	2.6	5.1	12.8	48.7	30.8
Provide efficiency in managing project	2.6	2.6	10.3	48.7	35.9
Control cost of project	2.6	5.1	35.9	38.5	17.9
Reduce the delay of the project completion	2.6	5.1	28.2	46.2	17.9
Load of works will be increased	5.1	20.5	35.9	28.2	10.3
Increase the overhead cost	2.6	23.1	35.9	35.9	2.6
Mode of works will be changed	2.6	15.4	28.2	46.2	7.7
Difficulties for staff to get used with the standard	5.1	25.6	23.1	43.6	2.6

Figure 4.2.1.6 (a) : The Total Percentage Of Perception On MS ISO 9001:2000 QMS

Perhaps, the judgment of the respondents regarding to those perceptions are reliable to take into account whereby MS ISO 9001:2000 QMS is a management system to direct and control an organization regarding to the quality. Besides that, by having the status of MS ISO 9001:2000 certified, it will promote the reputation and corporate image for the company so that the performance and resource management of the company will be improved.

Consequently, up to 5.1% of the respondents strongly disagreed to those of the highest perception regarding the standard implementation.

Table 4.2.1.6: The Perception On MS ISO 9001:2000 QMS

SCALE	STRONGLY DISAGREE		DISAGREE		MODERATE		AGREE		STRONGLY AGREE		INDEX AVERAGE		CATEGORY	
PERCEPTION	RESPONDENT													
	MS ISO	NON MS ISO	MS ISO	NON MS ISO	MS ISO	NON MS ISO	MS ISO	NON MS ISO	MS ISO	NON MS ISO	MS ISO	NON MS ISO	MS ISO	NON MS ISO
a) Promote reputation and corporate image for marketability	0	1	0	1	2	4	9	12	9	1	4.35	3.58	Agree	Agree
b) Improve competitiveness and productivity	0	1	0	1	2	0	10	16	8	1	4.3	3.79	Agree	Agree
c) Improve quality performance and resource management	0	1	0	1	3	3	8	13	9	1	4.3	3.63	Agree	Agree
d) Improve satisfaction of client/customer	0	1	0	2	1	4	9	10	10	2	4.46	3.63	Agree	Agree
e) Provide efficiency in managing project	0	1	0	1	3	1	7	12	10	4	4.35	3.89	Agree	Agree
f) Cost control of the project	0	1	0	2	6	8	8	7	6	1	4	3.26	Agree	Moderate
g) Reduce the delay of the project completion	0	1	0	2	4	7	11	7	5	2	4.05	3.37	Agree	Moderate
h) Load of works will be increased	1	1	6	2	7	7	5	6	1	3	2.95	3.42	Moderate	Moderate
i) Increase the overhead cost	0	1	6	3	10	4	4	10	0	1	2.9	3.37	Moderate	Moderate
j) Mode of works will be changed	0	1	5	1	8	3	5	13	2	1	3.2	3.63	Moderate	Agree
k) Difficulties for staff to get used with the standard	1	1	9	1	5	4	5	12	0	1	2.7	3.58	Moderate	Agree

By applying the descriptive statistical analysis using Index Average method, the perception of the respondents towards the implementation of MS ISO 9001:2000 QMS in construction industry could be identified as shown in the **Table 4.2.1.6 (a)** and **Figure 4.2.1.6 (b)** and this method is more accurate compared to the percentage evaluation since its identified each of the perception.

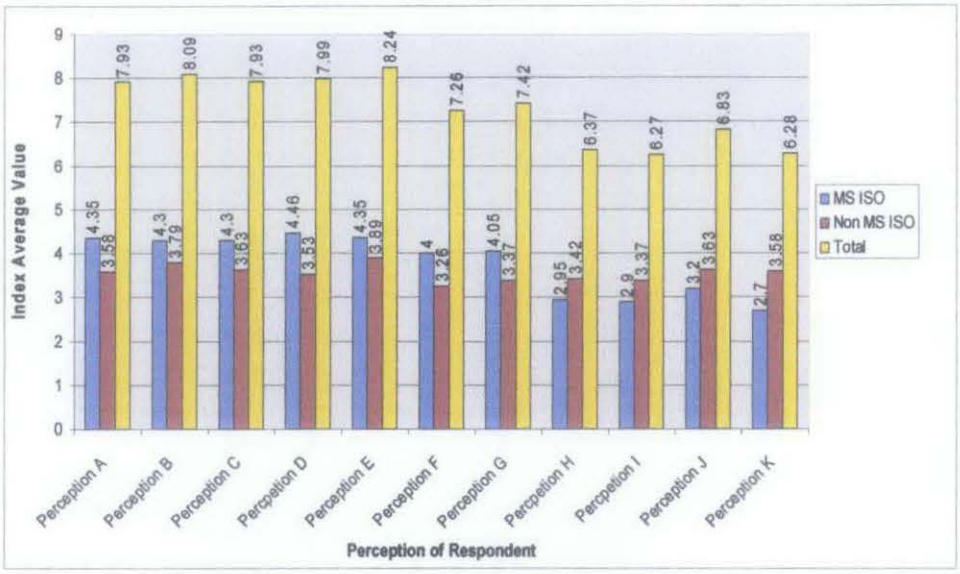


Figure 4.2.1.6 (b) : The Total Perception On The MS ISO 9001:2000 QMS For MS ISO Certified and Non MS ISO Certified

From the eleven of the perceptions provided, most of the respondent from MS ISO certified contractors and non MS ISO contractors agreed that the by implementing MS ISO 9001:2000 QMS in their business practices, it will :

- Promote the reputation and corporate image for marketability
- Improve the competitiveness and productivity
- Improve quality performance and resource management
- Improve satisfaction of client / customer
- Provide efficiency in managing project

Basically, the item of the perceptions in the Section C could be categorized in two perceptions which are positive perception (advantages) for item (a) to (g) and negative perception (disadvantages) for item (h) to (k).

By referring to the index average value, as shown in the **Table 4.2.1.6,** it could be simply said that the consistency of the index average value for MS ISO certified companies is acceptable and reliable since the positive perception and negative perception lay within the range of index average of 4.00 and 2.00 respectively. It is

show that all of the respondents from the MS ISO certified companies are really understood on the implementation of MS ISO 9001:2000 QMS.

However, there is an incredulous of consistency of the index average value for non MS ISO companies since both positive and negative perception lay within the same range of 3.00 and its view that these non MS ISO companies are not really understood and knowledgeable with the implementation of MS ISO 9001:2000 QMS and maybe the respondents just answered the questionnaire for the sake to complete the form.

Related authorities to construction industry such as CIDB perhaps need to prepare the comprehensive short courses, seminars and so on to the contractors since some of the non MS ISO companies agreed that by implementing this standard, the mode of works will be changed and it is difficult for staff to get used and this negative perception should not interfere their perception so that all the contractor firms could achieved the MS ISO 9001:2000 QMS certification.

4.2.1.7 Level Of Practices Of MS ISO 9001:2000 QMS

In this section, the questionnaire were designed for the respondents with MS ISO 9001:2000 QMS certified only in order to identify their level of practices to what extend that their company practices the given values of principle of management system. The respondents were given choices of answer based on the likert-scale and the respondents need to choose the best answer for choices given either *"Very High Extend", "High Extend", "Moderate", "Very Small Extend"* or *"Small Extend"*.

By applying the descriptive statistical analysis using Index Average method, the level of practices towards the implementation of MS ISO 9001:2000 QMS in construction industry could be identified and rated as shown in the **Table 4.2.1.7 (a). Table 4.2.1.7 (a)** and **Figure 4.2.1.7** shown the rating of MS ISO practices based on the basic approach of '*Plan-Do-Check-Act*' (PDCA) by using Index Average and mean as an

indicator. The variance is reliable since the range of limitation is quite smaller in numbers.

Table 4.2.1.7 (a) : The Rating Of Level Of Practices For PDCA

ITEM	MEAN	VARIANCE	RATING
a) Customer focus	4.15	0.4500	High Extend
b) Leadership	4.05	0.5763	High Extend
c) Involvement of people	3.90	0.5158	High Extend
d) Process approach	4.00	0.4211	High Extend
e) System approach to management	4.05	0.4711	High Extend
f) Continual improvement	4.15	0.4500	High Extend
g) Factual approach to decision making	3.80	0.4842	High Extend
h) Supplier relationship	3.75	0.4079	High Extend

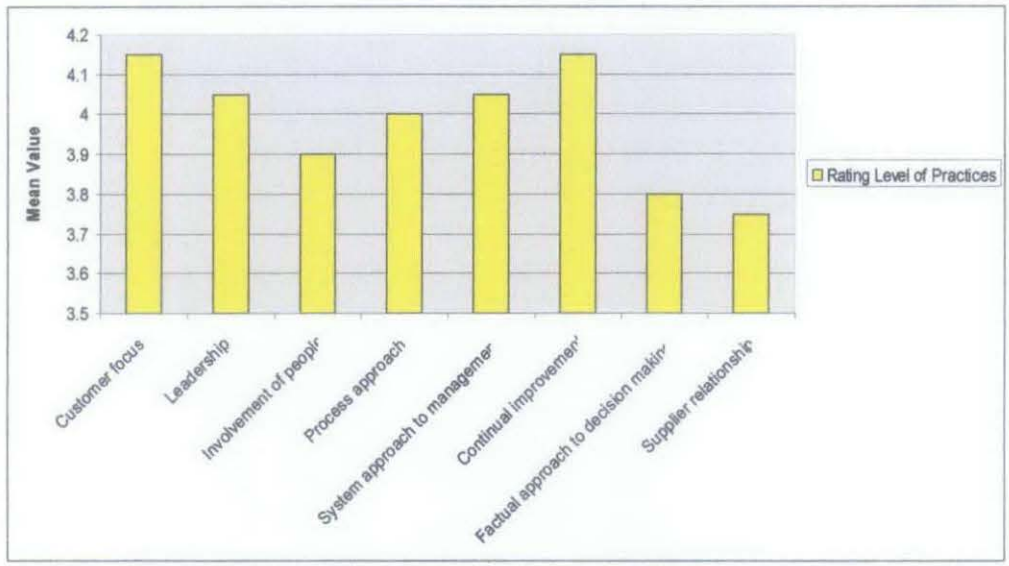


Figure 4.2.1.7 : The Mean Value For Level Of Practices Of PDCA

Based on the **Table 4.2.1.7 (a)**, in the 'mean column', the levels of practices of MS ISO 9001:2000 for the respondents are mainly for the customer focus and continual improvement since it's represented the highest values of mean. This values of principles of management will reflect the best practice and which designed to enable a continual improvement of the business, overall efficiency and capable to response for the customer needs and expectations.

Mean while, the extention of the practices of these basic approaches of PDCA are rated as a high extends practices in their business. This could be simply said that all the respondents take into account of these basic approaches in their business routine which reflect the best management practices. These basic approaches of PDCA are actually depending on each other of basic approaches, the people and the system itself. Willis & Willis (1996) agreed that by practicing the basic approach, it opens the lines of communication among the groups in under the construction industry and helpful for improving both internal and external customer supplier relationships.

By applying the severity index method to this analysis of section D, the severity of survey was calculated to reflect the level of severity effect of the level of practices of MS ISO 9001:2000. Based on the analysis, the rating of the level of severity effect then could be identified as shown in the **Table 4.2.1.7 (b)** whereby the range of each basic approach within 60% - 80% of the severity index and as stated by Al-Hammed (2000), this range could be categorized as a 'severe'. Thus, the practices of the MS ISO 9001:2000 QMS in their business is to the level of severe with no exception to any of the basic approaches of PDCA. The rationale is that, if the process management based on the PDCA is good, then the resultant products will also be good (Bubshait & Al-Atiq, 1999).

Table 4.2.1.7 (b) : The Ranking And Level Of Practices Based On Severity Index

LEVEL OF PRACTICES	RESPONSE					MEAN	SEVERITY INDEX (%)	RANK
	VSE	SE	M	HE	VHE			
a) Customer focus	0	0	3	11	6	4.15	79	Severe
b) Leadership	0	0	5	9	6	4.05	76	Severe
c) Involvement of people	0	0	6	10	4	3.9	73	Severe
d) Process approach	0	0	4	12	4	4	70	Severe
e) System approach to management	0	0	4	11	5	4.05	76	Severe
f) Continual improvement	0	0	3	11	6	4.15	79	Severe
g) Factual approach to decision making	0	0	7	10	3	3.8	70	Severe
h) Supplier relationship	0	0	7	11	2	3.74	69	Severe

4.3 MARGIN ERROR

The margin of error is simply a measure of how precise the data are. As a result, it is necessary to know how precisely the results of the sample reflect true feelings of the entire population. A low sampling error means that we had relatively less variability or range in the sampling distribution. The greater the sample standard deviation, the greater the margin error. The standard error is also related to the sample size. The greater your sample size, the smaller the standard error. This is because the greater the sample size, the closer your sample is to the actual population itself. The margin error were calculated based on the 95% of confident interval, as below :

$$\textbf{Margin error (95\% CI)} = \frac{\pm 1.95 \sqrt{0.5\,(1-0.5)}}{\textbf{sample size}}$$

$$= \frac{\pm 1.95 \sqrt{0.5\,(1-0.5)}}{39}$$

$$= \mathbf{15.7\%}$$

Based on the calculation above, the margin error based on 95% of confident interval is 15.7% and it could be simply said this research could represent the whole population of the construction industry in Malaysia.

4.4 DISCUSSION AND LIMITATION OF RESEARCH

4.4.1 Discussion

The beneficial informations were gathered concerning the MS ISO 9001:2000 QMS and also general overview of the current situation in Malaysia. The feedback on the survey will be important so that the data and results will be more appropriate and reliable. 39

out of 200 respondents or 20% were replied the questionnaire and the respondents are mostly from the Top Management level of the company.

Based on the data analysis, most of the respondents are aware of the implementation of MS ISO 9001:2000 QMS within construction industry. For some of the company, the process of certification is in progress and in total, 51.3% (20 respondents) are being certified by the MS ISO 9001:2000 QMS from authorized bodies of certification. It is hoped that the ISO certified company will be increased from time-to-time. The CIDB regulation required all G7 contractors to be ISO 9001 certified by January 1, 2009.

In this survey, most of the respondents are from contractor firms Class A and G7 status with 74.4% (29 respondents) and there are less response from contractor firms Class B and C maybe due to the certification itself in which most of the respondents are not being certified and lacking of knowledge in MS ISO 9001:2000 QMS.

For the Section C and D, the Index Average is being used in order to interpret the data. Most of the respondents are aware with the implementation of MS ISO 9001:2000 QMS within construction industry. The perception of the respondents toward the implementation of MS ISO 9001:2000 QMS was identified. While for the Section D, most of the MS ISO 9001:2000 QMS practices are mainly for customer focus and continual improvement of the business. They practiced the basic approaches of PDCA to the high extend in their routine of works as accordance to the standard and requirement.

During the fabrication of questionnaire, the pilot survey were being conducted for the reliable of questionnaire and initially, it was commented on being too subjective and lengthy, reaching 7 pages which is not suitable for a professional questionnaire. Thus, re-designed the questionnaires into a more objective manner were prepared then sent it to the respondents.

Data compilation was done after the feedback from the respondents have been received. Descriptive data collection is being implemented where by each question answers by the

respondents are being summed up through cumulative method. After data compilation, the analyses can commence.

4.4.2 Limitation Of Research

As the survey research method is being conduction, this study has its own limitations that have affected the results of the finding :

i) The respondents (The 39 respondents only represented 20% of the target sample of 200 respondents. This might be caused by the questionnaires failing to reach the respondents desired address which the registration list of the population sample may have not been updated correctly in term of address and not interested in answering the questionnaire)

ii) Non-stated answers (There is minor percentage in the questionnaire whereby the questionnaires are not answered. This might have slightly affected the results and the actual scenario of the construction market)

iii) MS ISO 9001:2000 QMS knowledge (Level of MS ISO 9001:2000 knowledge of the respondents cannot be assured of. Respondents may be knowledgeable and experience in MS ISO 9001:2000 QMS but unfamiliar with the level of implementation)

iv) Population sample (Due to time constraints, small sample size of 120 samples around Peninsular Malaysia was being selected for the questionnaire research. Thus, the result might not portray the actual situation happening in the market)

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

MS ISO 9001:2000 QMS implementations help Malaysia contractor firms achieve the objectives as they expected from the quality management system certification. However, it can be roughly observed that, the number of MS ISO 9001:2000 QMS certified construction firms in Malaysia is low when compared manufacturing firms. By having an increment in this number of certified will improve the existing position of Malaysia construction industry. However, the implementation of the standard was believed to have increase in operational cost and takes time.

In order to develop the awareness of the MS ISO 9001:2000 QMS, the training or courses are mainly plays the major roles that could enhance the awareness, and develop the skills towards to the MS ISO 9001:2000 QMS. All the employees are also encouraged participating by guidance of senior staff of Quality Management Representative to avoid the undesirable consequence. Most of the peoples in the construction industry are aware with the implementation of MS ISO 9001:2000 QMS.

The MS ISO 9001:2000 QMS are designed to with some advantages in order to improve the business but there are also some barriers or mindset toward the standards that maybe lead to the failure whereby, the construction's people claimed that it will change their mode of works and load of works will be increased since it all about the documentation

and management system. The customer focus and continual improvement are main reason why the companies implement the standard and its has been used for some extend in their business.

Employers and employees especially in this construction industry need to change their attitude and perception rather than skills in ensuring the successful of MS ISO 9001:2000 QMS implementations. By implementing this MS ISO 9001:2000 QMS and practicing it with a proper way, it will ensure an efficient and timely delivery of the construction processes on site and in the site are successfully.

5.1.1 Achievement Of Objective 1 - To study the awareness of the implementation of MS ISO 9001:2000 QMS in local construction industry

The general opinion concerning the implementation of MS ISO 9001:2000 QMS is that 95% of the construction firms were aware of this implementation. Mainly due to the lack of knowledge, promotion and information from related bodies failed to see the need to obtain the MS ISO 9001:2000 QMS certifications. Besides that, the respondents also conducted an 'in-house' training for their staffs and at the same time, attended the courses related to the MS ISO 9001:2000 QMS since this training is part of the MS ISO requirement.

5.1.2 Achievement Of Objective 2 – To study the perception on the MS ISO 9001:2000 QMS

This research attempted to collect the industries' views on the perception on the MS ISO 9001:2000 QMS and thus, the perception of the MS ISO 9001:2000 QMS from the construction industry's views could be achieved by applying the Index Average method for each of the perception. For example, all the respondents agreed that by implementing the MS ISO 9001:2000 QMS in the business practices, it will promote the reputation and corporate image for marketability and at the same time, it will improve the competitiveness, productivity and client satisfaction. The respondents also have

their moderate perception whereby by implementing this quality management system, the load of works and overhead cost will be increased.

5.1.3 Achievement Of Objective 3 – To examine the implementation of MS ISO 9001:2000 QMS

By applying Index Average and Severity Index method the level of practices and rate of the basic approach of 'Plan-Do-Check-Act' (PDCA) could also be identified through this research. Based on the analysis, it identified that, all the basic approaches of PDCA rated by the respondents as in high extention of practices in their business routine. Further analysis using Severity Index in order to reflect the level of severity effect of level of practices of MS ISO 9001:2000 QMS and it was found that, severity effect is in the acceptable level of severity which is severe in their practices.

5.2 RECOMMENDATION

Taking into consideration the questionnaire results, the following recommendations have been formed for the implementation of MS ISO 9001:2000 QMS within construction industry and for future research :

a) Provide an effective guidance for the contractor firms for the process of the certification.
b) Studies need to be carried out in order to determine the effectiveness of the MS ISO 9001:2000 QMS within MS ISO certified company.
c) Studied also need to be done in order to know the suitability of implementation either the standard is suitable to be implemented to small project, mega project or from the office to the site office.
d) Provide some kind of incentive scheme in order to encourage the contractors to continually seek quality improvement.

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17th December 2007

ear Sir/Madam,

he Implementation Of MS ISO 9001:2000 Quality Management System Within Construction Industry In alaysia.

We seek your help in a university research survey on the implementation of MS ISO 9001:2000 QMS ithin construction industry in Malaysia especially around peninsular Malaysia

MS ISO 9001:2000 outlines how a company can establish an effective quality system that will :monstrate commitment to quality and ability to meet the customers or client requirements. In Malaysia, more id more companies in construction-related industry have applied to be MS ISO 9001:2000 certified. However e number is still yet relatively small when compared to the total number of companies in this industry. Besides, IDB regulation requires all G7 contractors to be ISO 9001 certified by January 1, 2009.

To address to above issues, we have devised a questionnaire which we would like you to complete and turn and which only take no more than 15 minutes of your time. The objectives of this survey are to study the vareness, the perception and to examine level of practice of MS ISO 9001:2000 QMS in the local construction dustry. With your cooperation, we should be able to collect as many data as possible regarding the plementation of MS ISO 9001:2000 QMS within construction industry in Malaysia. It is hope the data would able the relevant authorities to formulate strategies to improve the implementation of MS ISO 9001:2000 in the nstruction industry.

It would help us very much if you could complete the questionnaire and return back to us before **30 larch 2008**. As an enclosure to this letter, please find a self-addresses and stamped envelope to return the uestionnaire. **Alternatively, you may fax to 05 – 3656716 (att: AP. Ir. Dr. Arazi Idrus / Mohd. Rashdan).**

Please contact **Mr. Mohd Rashdan** at **012-9671900** or through email at ***iohd.rashdan@yahoo.com*** if you have any question regarding the survey. We thank you in advanced or your support and co-operation.

ours sincerely,

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lead Of Civil Engineering Department,
Iniversiti Teknologi PETRONAS.
c: Assoc. Prof . Ir. Dr. Arazi Idrus
Mr. Mohd. Rashdan Bin Che. Azmi

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he Implementation Of MS ISO 9001 : 2000 Quality Management System (QMS) Within Construction dustry In Malaysia

The reception and attitude towards the quality system in constructions in Malaysia are still relatively low. IDB regulation required all G7 contractors to be ISO 9001 certified by January 1, 2009. The objectives of this rvey are to study **the awareness, perception** and to examine the **level of practice** of MS ISO 9001:2000 QMS local construction industry.

The questionnaire is divided into 4 sections which are Section A, B, C and D. Please answer the iestionnaire by referring to their instructions. Preferably this form shall be completed by General Manager (GM), uality Management Representative (QMR) or Assistant Quality Management Representative (AQMR).

ECTION A : GENERAL / BACKGROUND INFORMATION

ease fill in the blanks and tick in box provided

Name of Company : _____

CIDB Registration No & Grade : _____

PKK Registration No & Grade : _____

Has your company been certified with MS ISO 9001:2000 QMS? Yes [ ] No [ ]

Date of certification : _____

Which certification bodies? : _____

If your answer in question number 4 is NO, please comment why your company doesn't need or still not implement the MS ISO 9001:2000 QMS?

_____

_____

_____

Does your company has a Quality Department or QA/QC Department?

Yes [ ] No [ ]

What is your designation with the company?

[ ] General Manager [ ] Project Manager

[ ] QA/QC Manager [ ] Project Engineer / Site Engineer

[ ] Assistant QA/QC Manager

[ ] Others: _____

ECTION B : AWARENESS ON THE IMPLEMENTATION OF MS ISO 9001:2000 QMS

ease tick in the appropriate box

Are you aware of the implementation of MS ISO 9001:2000 Quality Management System?

Yes [ ] No [ ]

Have you attended any courses related to ISO Training / Quality Training?

Never	[ ]
1 – 3 times / year	[ ]
4 – 6 times / year	[ ]
7 – 10 times / year	[ ]
More than 11 times / year	[ ]

Has your company conduct any 'in-house' training to develop the awareness of the implementation of MS ISO 9001:2000 QMS?

Never	[ ]
1 – 5 times / year	[ ]
6 – 10 times / year	[ ]
More than 11 times / year	[ ]

ECTION C : PERCEPTION OF THE IMPLEMENTATION OF MS ISO 9001:2000 QMS

lease circle your assessment based on the scale of 1 to 5.

An implementation of MS ISO 9001:2000 Quality Management System is able to achieve the following :	**1 Strongly disagree**	**2 Disagree**	**3 Moderate**	**4 Agree**	**5 Strongly agree**
a. Promote reputation and corporate image for marketability	1	2	3	4	5
b. Improve the competitiveness and productivity	1	2	3	4	5
c. Improve quality performance and resource management	1	2	3	4	5
d. Improve satisfaction of customers / clients	1	2	3	4	5
e. Provide the efficiency in managing the projects including the documentation	1	2	3	4	5
f. Control the cost of the project	1	2	3	4	5
g. Reduce the delay of the project completion	1	2	3	4	5

An implementation of MS ISO 9001:2000 Quality Management System is able to achieve the following :	1 Strongly disagree	2 Disagree	3 Moderate	4 Agree	5 Strongly agree
ı. Load of works will be increased	1	2	3	4	5
. Increase the overhead cost	1	2	3	4	5
. Mode of works/operations will be changed	1	2	3	4	5
:. Difficulties to staff to get used with the standard	1	2	3	4	5

ECTION D : LEVEL OF PRACTICES OF MS ISO 9001:2000 QMS PROCEDURES
'o be filled by ISO Certified Company Only)

Please circle your assessment based on the scale of 1 to 5.

To what extent is your company permeated by the following values :	1 Very small extent	2 Small extent	3 Moderate	4 High extent	5 very high extent
ı. Customer focus	1	2	3	4	5
). Leadership	1	2	3	4	5
:. Involvement of people	1	2	3	4	5
l. Process approach	1	2	3	4	5
:. System approach to management	1	2	3	4	5
: Continual improvement	1	2	3	4	5
;. Factual approach to decision making	1	2	3	4	5
ı. Supplier relationship	1	2	3	4	5

. Any general comment pertaining the implementation of MS ISO 9001:2000 Quality Management System in which has been implemented to the construction industry?

_____

_____

_____

'hank you for your precious time and cooperation in completing the questionnaire and in sharing valuable information. ' would be highly appreciated if you could send back the questionnaire before 30 March 2008.

Analysis On The Perception Of The Implementation Of MS ISO 9001:2000 QMS (For MS ISO 9001:2000 QMS Certified Contractor Firms)

ITEM	PERCEPTION	RESPONDENTS,xi	CONSTANT, ai	ai.xi/∑xi	TOTAL	INDEX AVE.
a) Promote reputation and corporate image for marketability	Strongly Disasgree	0	1	0	4.35	Agree
	Disagree	0	2	0		
	Moderate	2	3	0.3		
	Agree	9	4	1.8		
	Strongly Agree	9	5	2.25		
b) Improve competitiveness and productivity	Strongly Disasgree	0	1	0	4.3	Agree
	Disagree	0	2	0		
	Moderate	2	3	0.3		
	Agree	10	4	2		
	Strongly Agree	8	5	2		
c) Improve quality performance and resource management	Strongly Disasgree	0	1	0	4.3	Agree
	Disagree	0	2	0		
	Moderate	3	3	0.45		
	Agree	8	4	1.6		
	Strongly Agree	9	5	2.25		
d) Improve satisfaction of clients / customers	Strongly Disasgree	0	1	0	4.45	Agree
	Disagree	0	2	0		
	Moderate	1	3	0.15		
	Agree	9	4	1.8		
	Strongly Agree	10	5	2.5		
e) Provide efficiency in managing project	Strongly Disasgree	0	1	0	4.35	Agree
	Disagree	0	2	0		
	Moderate	3	3	0.45		
	Agree	7	4	1.4		
	Strongly Agree	10	5	2.5		
f) Cost control of project	Strongly Disasgree	0	1	0	4	Agree
	Disagree	0	2	0		
	Moderate	6	3	0.9		
	Agree	8	4	1.6		
	Strongly Agree	6	5	1.5		
g) Reduce the delay of the project completion	Strongly Disasgree	0	1	0	4.05	Agree
	Disagree	0	2	0		
	Moderate	4	3	0.6		
	Agree	11	4	2.2		
	Strongly Agree	5	5	1.25		
h) Load of works will be increased	Strongly Disasgree	1	1	0.05	2.95	Moderate
	Disagree	6	2	0.6		
	Moderate	7	3	1.05		
	Agree	5	4	1		
	Strongly Agree	1	5	0.25		
i) Increase the overhead cost	Strongly Disasgree	0	1	0	2.9	Moderate
	Disagree	6	2	0.6		
	Moderate	10	3	1.5		
	Agree	4	4	0.8		
	Strongly Agree	0	5	0		
j) Modes of works will be changed	Strongly Disasgree	0	1	0	3.2	Moderate
	Disagree	5	2	0.5		
	Moderate	8	3	1.2		
	Agree	5	4	1		
	Strongly Agree	2	5	0.5		
k) Difficulties for staff to get used with the standard	Strongly Disasgree	1	1	0.05	2.7	Moderate
	Disagree	9	2	0.9		
	Moderate	5	3	0.75		
	Agree	6	4	1		
	Strongly Agree	0	5	0		

Legend	
0 - 1.5	Strongly disagree
1.5 - 2.5	disagree
2.5 - 3.5	moderate
3.5 - 4.5	agree
> 4.5	strongly agree

Analysis On The Perception Of The Implementation Of MS ISO 9001:2000 QMS For Non ISO Company

ITEM	PERCEPTION	RESPONDENTS,xi	CONSTANT, ai	ai.xi/∑xi	TOTAL	INDEX AVE.
a) Promote reputation and corporate image for marketability	Strongly Disasgree	1	1	0.05	3.58	Agree
	Disagree	1	2	0.11		
	Moderate	4	3	0.63		
	Agree	12	4	2.53		
	Strongly Agree	1	5	0.26		
b) Improve competitiveness and productivity	Strongly Disasgree	1	1	0.05	3.79	Agree
	Disagree	1	2	0.11		
	Moderate	0	3	0.00		
	Agree	16	4	3.37		
	Strongly Agree	1	5	0.26		
c) Improve quality performance and resource management	Strongly Disasgree	1	1	0.05	3.63	Agree
	Disagree	1	2	0.11		
	Moderate	3	3	0.47		
	Agree	13	4	2.74		
	Strongly Agree	1	5	0.26		
d) Improve satisfaction of clients / customers	Strongly Disasgree	1	1	0.05	3.53	Agree
	Disagree	2	2	0.21		
	Moderate	4	3	0.63		
	Agree	10	4	2.11		
	Strongly Agree	2	5	0.53		
e) Provide efficiency in managing project	Strongly Disasgree	1	1	0.05	3.89	Agree
	Disagree	1	2	0.11		
	Moderate	1	3	0.16		
	Agree	12	4	2.53		
	Strongly Agree	4	5	1.05		
f) Cost control of project	Strongly Disasgree	1	1	0.05	3.26	Moderate
	Disagree	2	2	0.21		
	Moderate	8	3	1.26		
	Agree	7	4	1.47		
	Strongly Agree	1	5	0.26		
g) Reduce the delay of the project completion	Strongly Disasgree	1	1	0.05	3.37	Moderate
	Disagree	2	2	0.21		
	Moderate	7	3	1.11		
	Agree	7	4	1.47		
	Strongly Agree	2	5	0.53		
h) Load of works will be increased	Strongly Disasgree	1	1	0.05	3.42	Moderate
	Disagree	2	2	0.21		
	Moderate	7	3	1.11		
	Agree	6	4	1.26		
	Strongly Agree	3	5	0.79		
i) Increase the overhead cost	Strongly Disasgree	1	1	0.05	3.37	Moderate
	Disagree	3	2	0.32		
	Moderate	4	3	0.63		
	Agree	10	4	2.11		
	Strongly Agree	1	5	0.26		
j) Modes of works will be changed	Strongly Disasgree	1	1	0.05	3.63	Agree
	Disagree	1	2	0.11		
	Moderate	3	3	0.47		
	Agree	13	4	2.74		
	Strongly Agree	1	5	0.26		
k) Difficulties for staff to get used with the standard	Strongly Disasgree	1	1	0.05	3.58	Agree
	Disagree	1	2	0.11		
	Moderate	4	3	0.63		
	Agree	12	4	2.53		
	Strongly Agree	1	5	0.26		

Legend	
0 - 1.5	Strongly disagree
1.5 - 2.5	disagree
2.5 - 3.5	moderate
3.5 - 4.5	agree
> 4.5	strongly agree

Severity Index For Basic Approach Of PDCA For MS ISO 9001:2000 QMS Certified Contractor Firms

BASIC APPROACH OF PDCA	PERCEPTION	RESPONDENTS,xi	CONSTANT, Xi	ai.xi/∑xi	TOTAL ai.xi/∑xi	SEVERITY INDEX [(total ai.xi/∑xi)/(4x20)]	CATEGORY OF SEVERITY
a) Customer Focus	Very Small Extend	0	0	0	63	79	Severe
	Small Extend	0	1	0			
	Moderate	3	2	6			
	High Extend	11	3	33			
	Very High Extend	6	4	24			
b) Leadership	Very Small Extend	0	0	0	61	76	Severe
	Small Extend	0	1	0			
	Moderate	5	2	10			
	High Extend	9	3	27			
	Very High Extend	6	4	24			
c) Involvement Of People	Very Small Extend	0	0	0	58	73	Severe
	Small Extend	0	1	0			
	Moderate	6	2	12			
	High Extend	10	3	30			
	Very High Extend	4	4	16			
d) Process Approach	Very Small Extend	0	0	0	56	70	Severe
	Small Extend	0	1	0			
	Moderate	4	2	8			
	High Extend	12	3	36			
	Very High Extend	3	4	12			
e) System Approach To Management	Very Small Extend	0	0	0	61	76	Severe
	Small Extend	0	1	0			
	Moderate	4	2	8			
	High Extend	11	3	33			
	Very High Extend	5	4	20			
f) Continual Improvement	Very Small Extend	0	0	0	63	79	Severe
	Small Extend	0	1	0			
	Moderate	3	2	6			
	High Extend	11	3	33			
	Very High Extend	6	4	24			
g) Factual Approach To Decision Making	Very Small Extend	0	0	0	56	70	Severe
	Small Extend	0	1	0			
	Moderate	7	2	14			
	High Extend	10	3	30			
	Very High Extend	3	4	12			
h) Supplier Relationship	Very Small Extend	0	0	0	55	69	Severe
	Small Extend	0	1	0			
	Moderate	7	2	14			
	High Extend	11	3	33			
	Very High Extend	2	4	8			

*The Total Respondent are 20 Respondents

Legend	
0% - 20%	Non Severe
20% - 40%	Somewhat Non Severe
40% - 60%	Moderately Severe
60% - 80%	Severe
80% - 100%	Must Severe