

QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION

Abdul Hakim bin Mohammed¹ dan Mat Naim bin Abdullah @ Asmoni²

¹Universiti Teknologi Malaysia, Skudai, 81310 Johor Bahru Johor, Malaysia

hakim@fksg.utm.my, matnaim@gerbangperdana.com.my

ABSTRACT: This paper describes the Quality Management System (QMS) concept and its application in the construction industry. A misunderstanding among the construction players on the QMS concept has become the stumbling block for its successful implementation. QMS could be implemented either at the company level or at the project level. The researches on the company-based QMS in construction can be considered as comprehensive in view of the various aspects of implementation have been studied. While many studies have been done on the company-based QMS, study on the project-based QMS is lagging behind. Notwithstanding the claims that the construction organisations enjoyed the benefits and advantages of being an ISO 9000 certified are literally proven, the main objective of QMS implementation namely the achievement of customer satisfaction in the construction projects is still at large. At the project level, QMS requires Project Quality Plan (PQP) as part of the system. PQP is also not well understood by the industry players and consequently the implementation of PQP faces a lot of problems. The significant information to be considered in developing, implementing and maintaining the PQP are the project policy and objectives, the process, the process owners and the work procedures. PQP could be developed either individually for each party of the project or as an integrated documents for all parties of the project team.

Keywords: Quality Management System, Project Quality Plan, Construction

1. INTRODUCTION

For the past decade, the Malaysian construction sector has been going through a radical change driven by the (ISO) quality policy of the Malaysian government. Recently, the number of contractors obtaining certification of ISO 9000 Quality Management System (QMS) is ever increasing. However, this progress is seemed to be a drastic response to the constant pressure and reminder made by the Ministry of Works and quality awareness and Do It Yourself (DIY) programs organized by the Construction Industry Development Board (CIDB). However, with insufficient experience on ISO quality implementation within the Malaysian environment, the construction participants are staggered with several performance-related problems.

The pressure also comes from the ongoing process of economic globalisation. Experiences learned from other countries such as United Kingdom, Singapore and Hong Kong revealed that QMS implementation was very encouraging at the initial stage but over a time period became burdensome to all parties involved if the right approaches were not adopted (Giles R. 1997, Chong 1994, Kam and Tang 1997, Low and Goh 1994). In the United Kingdom, some of the construction industry clients made it compulsory that the contractors implement ISO quality system in their organizations to qualify for participating in the bids (Giles, 1997). As a result, a tremendous impact was observed with more and more contractors seeking for ISO

certification. Consequently, marketing and customers' insistence have become the key factors driving the ISO implementation, which are generally short-lived (Pateman 1994). The quality consultants might further worsen the situation as many of them are not from the construction background, hence do not understand the construction process (Giles, 1997). The organisations will normally trap in the vicious circle of compliance that creates lack of flexibility, emphasis on bureaucracy and paperwork and deficiency in quality improvement (Karapetrovic 1999). In addition, resistance to change in implementing the new system will create a chaotic situation (Al-Nakeeb and Mustapha 1994). As a result the implementation of the ISO system will not earn benefit to the company and neither will bring satisfaction to the customer.

2. OBJECTIVES

This paper aims to explain the concept of QMS and PQP in the construction industry as follows:

- Quality Management System (QMS) in construction
 - i. Company based QMS
 - ii. Project based QMS
- Project Quality Plan (PQP) in construction
 - i. Individual PQP
 - ii. Integrated PQP

3. QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION

ISO 8402, the vocabulary of quality defined quality management as “all activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement, within the quality system”. Meanwhile, the definition of quality system according to ISO 8402 is “the organizational structure, responsibilities, procedures and resources needed to implement quality management”.

Combining the definitions of ‘quality system’ and ‘quality management’ thus concludes that QMS is the interaction of people, processes and documentation to meet both customers’ stated and implied needs. The result would be a reduction in inefficiencies and waste, improved work practices, increased morale and the opportunity for a greater market share. All these benefits are achieved through the

implementation of QMS which ones should perceive it as a wide-scale failure prevention programme that will lead to costs savings.

3.1 Company Based QMS

The industry had lived in the quality programme of inspection and quality control for years. Construction materials and construction works were accepted or rejected base on the inspection and quality control. However, the introduction of BS 5750: Quality Systems in the UK in 1980's had changed the perception of the construction industry's peoples in managing quality in construction environment. The introduction of ISO 9000 in the same period had accelerated the process of introducing the quality management concept to the construction world. ISO 9000, being an international standard for quality system, has been very popular to be used as quality assurance system. Many international construction clients especially the Europeans require their construction team to be registered with the scheme that it is appeared as the ISO 9000 registration is a mandatory if an organisation wish to venture in Europe.

However as construction is a project-based industry, the success of QMS implementation should not be measured at the company level rather the benefits should be extended to the project level. The following sections discuss on the implementation of QMS at company and project level. A review on the literature regarding the QMS in construction over the last ten years showed many studies had been focussed on the company-based QMS. The majority of the studies were on the ISO 9000 QMS. The focal points of the study on the implementation of ISO 9000 QMS in construction organisations were on the applicability, benefit and obstacles of implementing it. Another popular approach was many researchers reported the findings of their study in their country such as Bray (1995) for the USA, Low and Henson (1997) for Singapore, Kam et al (1997) for Hong Kong, Giles (1997) for the UK, Hung (1999) for Taiwan, Abdulaziz and Tawfiq (1999) for Saudi Arabia and Wan Yusof et al (1994) for Malaysia.

During the 1990's many researchers reported the benefits and advantages enjoyed by an ISO 9000 certified construction companies and some also highlighted the problems encountered by the companies especially at the initial stage of ISO 9000 implementation (Low and Goh, 1994; Eltigani and Djebarni, 1996; Low and Henson, 1997; Hareton et al, 1999; Abdulaziz and Tawfiq, 1999 and Tat et al, 1999). In general, the benefits and advantages reported by the above authors can be summarised

as communications would be improved; reduce rework; time and money would be saved; increase work performance; and increase market share.

Various obstacles in the implementation of the ISO 9000 construction industry had also been identified by the some researchers (Low and Goh, 1994; Wan Yusoff et al, 1994; Oakland and Aldridge,1995; McCabe, 1996 Low and Hennie, 1997; Giles, 1997; Abdulaziz and Tawfiq, 1999). Some of the obstacles are resistance to change; misconception of the ISO 9000 quality system; quality perceived as something secondary to the business; scheme may have appeared too complex; lack of understanding of the ISO 9000 quality standards; high cost especially the initial cost; loss of productivity of the workforce due to the effort exerted in learning and implementing the new system besides their regular duties; absence of special regulation that make it incumbent upon contracting companies to establish and implement QMS; no encouragement from the construction industry clients; and difficult to apply to the construction industry.

The researches on the company-based QMS in construction can be considered as comprehensive in view of the various aspects of implementation have been studied, for instances measuring the effectiveness of the QMS in construction organisations by Al Nakeeb et al (1998) and Low et al (1999); QMS and productivity in construction organisations by Eltigani and Djebarni (1996); training programme under QMS for construction organisations by Lo (1998); quality costs for construction organisations by Low and Henson (1998) and Davis (1987); legal implication of QMS on construction organisations by Netto et al (1997); and QMS and quality culture in construction organisations by Low and Winifredo (2001).

While many studies have been done on the company-based QMS, study on the project-based QMS is lagging behind. Notwithstanding the claims that the construction organisations enjoyed the benefits and advantages of being an ISO 9000 certified are literally proven, the main objective of QMS implementation namely the achievement of customer satisfaction in the construction projects is still at large. The reason being and the detail explanation are provided in the next section.

3.2 Project-based QMS

In reality there is no such term as 'Project-based QMS'. ISO 9000, TQM or any quality programmes are organisation-based. The reason is all quality programmes are originated from manufacturing sector where normally the products are processed by a

single entity. This situation is not typical in construction industry. Construction is a project-based industry where different parties work together to achieve the quality of the construction works. Barrett and Grower (1998) had figured out that for those companies that have achieved certification, the actual impact on the quality of the service from the client's viewpoint has been only slightly positive and does not correlate in any way to the importance of the factors such as accessibility of personnel, appearance of staff, client's technical input, frequency of communications, interest and enthusiasm of professional, politeness of support personnel, professionalism demonstrated, speed of response of client's needs, standard of presentation, technical correctness of service, understanding of client's organisation and understanding of client's problems.

The traditional way of managing the relationship between the parties involved in the construction works is through the contract agreement. The existing contract agreement is normally based on the traditional roles and authorities that have been accepted and recognised by the industry. The emerging of the QMS concept if successfully adopted by the contractors (being an internal system) could indicate the removal of external quality controls (inspection and testing by the architect, engineer or clerk of works) traditionally practiced in building contracts (Netto et al, 1997). Some researchers suggested that amendment should be done on the existing forms of contract (Low and Goh, 1994 and Leon, 1994) and others such as Nesan (1995) suggested a contract structure that fit the partnering arrangement should be developed to cater the TQM environment. The above difficulties on the QMS implementation in a construction project do not suggest that QMS should not be implemented at the project level but rather reinforce its implementation as the evidences are strong enough to support that the certified companies had enjoyed benefits by implementing it at the company level. The next section discusses the concept of project quality plan as a system that is essential for a construction project.

4. PROJECT QUALITY PLAN (PQP)

Being a project-based QMS document and originated from ISO 9000 standards, PQP is designed to ensure the success of quality programme at project level. Therefore, it is imperative to understand the concept of PQP and value it as a system rather than a segment of a system. The PQP for the individual organisation is similar to the QMS for an organisation. Even though it is prepared to reinforce the implementation of

QMS at project level, its successful and effective implementation in terms of quality definition should be in tandem with the overall project objective and clear demarcation of duties and responsibilities between the construction parties.

The overall concept of a quality management in an organisation is shown in Figure 1 (Stebbing, 1993). As shown in Figure 1, Stebbing (1993) divided the QMS into two tier namely the company quality system and PQP. Company quality system comprises of company quality manual and procedures that are developed based on the company and client's requirements. A similar process is copied in order to develop the PQP but the project quality manual and procedures are established based on the company manual and procedures and as well as the contract work scope. As such the PQP will have the same elements as the company quality manual, and apart from that will contain additional documentation and procedures pertaining to that particular project (Stebbing, 1993). Therefore it is essential to understand the quality manual in order to develop the PQP.

It is a formal requirement of ISO 9000 to produce quality manual. It is usually defined as a document setting out the general quality policy, procedures and practises of an organisation (Stebbing, 1993). The main purpose of a quality manual is to describe what to be done and how an organisation meets the requirements of ISO 9000 through the quality system in place, as well as providing a cross reference to other parts of the system (Ashton and Jackson, 1995). Key elements in a quality manual are quality policy statement, authority and responsibility, organisation structure and objectives and the summary of the firm's standard operational procedures. Because the quality manual will be the basis of developing the PQP, the content should be similar to the quality manual with emphasis given to project level. Thus, the general content of the quality plan is project quality policy statement, project organisation structure with specific authority and responsibility of each department and key personnel and day to day standard operating procedures together with work instructions.

Thus, the project quality manual should contain the followings:

- (a) The policy statement that will reflect the quality policy of the project and will be signed by the project or contract manager;
- (b) Responsibilities will be defined to reflect the requirements of the project or contract;
- (c) The organisation will relate to the project and may include customer representation;

- (d) The amendments and reissue will conform to contract requirements;
- (e) The system outlines will address the applicable criteria of the quality standard specified in the contract; and
- (f) The procedure index will identify only those procedures applicable to the contract.

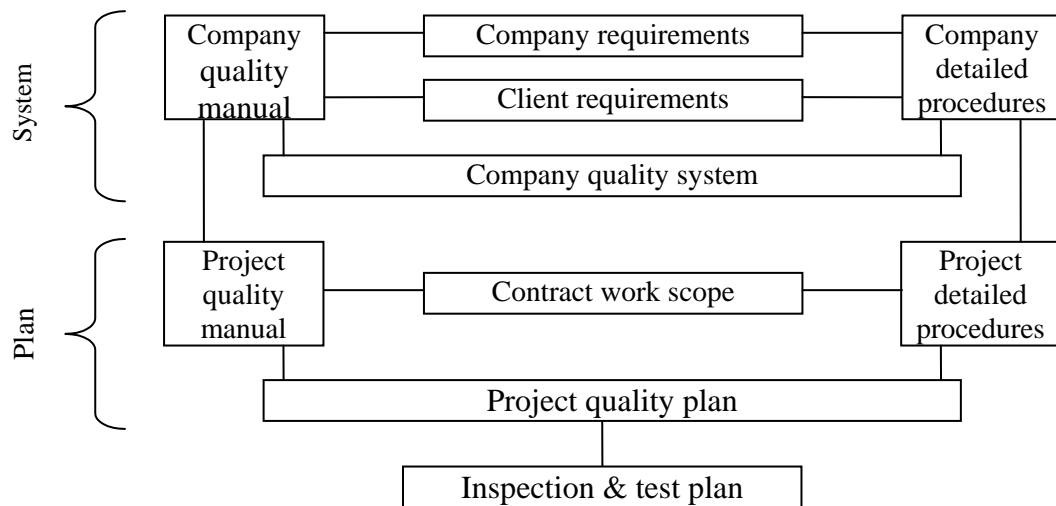


Figure 1. Organisation Quality System and Plan (Source: Stebbing, 1993)

He added that besides the above features, the fundamental procedures for an organisation to operate at the corporate level should also be included in the PQP. The fundamental procedures should address the functions of administration; finance; document control; record storage, retention and retrieval; planning (contract review); corrective action; audits; Training; and customer liaison. To sum up, the significant information to be considered in developing, implementing and maintaining the PQP are the project policy and objectives, the process, the process owners and the work procedures.

4.1 The Individual PQP

A PQP is normally prepared by the Project Manager and the Site Quality Co-ordinator. The person in-charge of the quality system, usually the Project Manager and/or the Site Quality Co-ordinator will initiate the preparation of a PQP. It will involve changes to the existing Quality System with the advice from the contract staff. Project inspection and test plan supplied by the client specifically for the project will be included in the PQP.

After the PQP is prepared, it will be checked and reviewed by the Project Manager where he will add check and witness points before he signs off for acceptance. With the acceptance signature by the Project Manager, the PQP will be implemented and upheld by the contract staff at site. Subsequent monitoring will be carried out by the Site Quality Co-ordinator to verify that all staffs are following the PQP on site. After verifying through inspection that the PQP is successfully implemented, the Project Manger shall give the thumbs up for the PQP to be documented into records.

4.2 The Integrated PQP

In general the process of the construction projects can be divided into five stages namely briefing (conceptual), design, tendering (procurement), construction and final inspection (Costantini et al, 1994). In order to manage quality, each stage of the process through which the construction project evolves must be defined and their influences upon quality determined. Judging on this basis, Hill (1987) divided the quality aspects of construction project into four categories: Quality of the design process; Quality of the construction process; Quality of the products; and Quality of maintenance.

In terms of construction life cycle quality, the above quality requirements place responsibility upon the above five main parties involved in construction to effectively communicate with each other and work together as a team as the conceptual framework and structure for promoting their strategy and efforts towards improving, not only through their own excellence but also through the synergetic contribution towards improving the quality of the project.

The responsibility to work as a team is more critical during the construction stage because more parties participated in the construction works compared to previous stages. For instance, under the traditional contract, at briefing and tendering stages it is usual for the client, his representative and the design consultant to be involved. However at the construction stage, the client, his representative, the consultant, the contractors, the subcontractors and even the suppliers are participated but subject to their degree of involvement. The interfaces between the individual systems should be well planned, implemented and tightly controlled. This led to the need of integrating the individual QMS into one project-based quality system.

Hence, the use of an explicit project quality plan (PQP) is called for. This PQP is a document attributed to QMS for a particular project. Sjiholt (1995) illustrated the arrangement of the PQP as shown in Figure 2.

Figure 2 shows that the customer's QMS is the prime document to tie the subsequence QMS from other parties. As QMS deals with goal congruent, synergetic effort and clear processes and procedures, the customer shall set up his objectives, his requirements for the quality system, line of communication and delegation of duties and responsibilities clearly in his QMS. The rest shall institute their QMS accordingly. For construction project this means the customer or his representative shall be the champion and the maintainer of the PQP. He shall ensure the adequacy of the PQP against the specified requirements and compliance of activities of the parties against the PQP (Costantini et al, 1994).

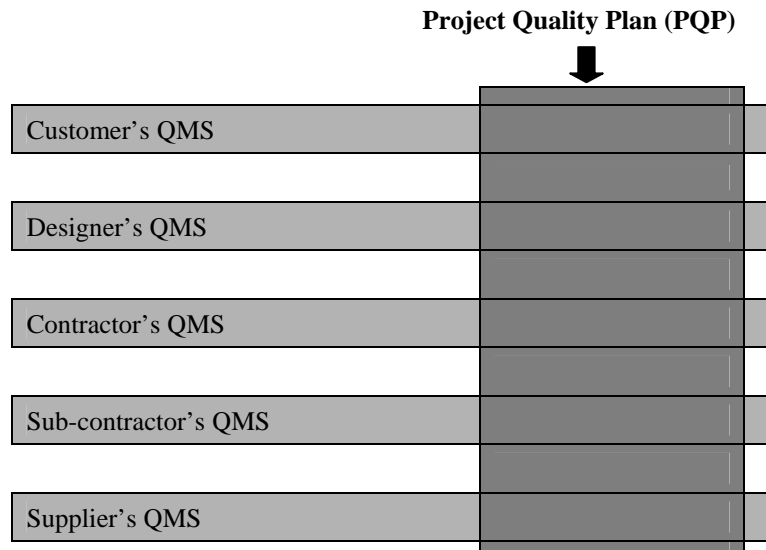


Figure 2. The Integrated Project Quality Plan (PQP) (Adopted from Sjiholt, 1995)

The PQP integrates the individual QMS of parties involved in the construction project who are bound through a contractual agreement. Therefore besides construction drawings and specification of a particular project, the PQP should also be drawn up according to the contract document (Yeoh and Lee, 1996) in order to have a common source of client's requirements and to understand the obligations of and relationships between the parties.

5. SUMMARY

This paper describes the Quality Management System (QMS) concept and its application in the construction industry. The description includes company based

QMS and project based QMS. Project based QMS requires project quality plan (PQP) as part of the system. At the end, the paper explains individual PQP and integrated PQP.

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