A FRAMEWORK FOR QUALITY MAINTENANCE SYSTEM IN CONSTRUCTION INDUSTRY

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A thesis submitted in fulfilment of the requirements for the award of the degree of Doctor of Philosophy (Management)

Faculty of Management
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ABSTRACT

Globalization of economy has resulted in construction firms trying to achieve internationally accepted quality construction work. Hence, it is critical for organizations to have a system such as Quality Management System (QMS) to ensure quality in the construction industry. Maintenance in QMS includes constant monitoring, controlling, assessing and improving of the system through technical and non-technical approaches. In previous studies, contractors in construction focused more on technical rather than non-technical approaches to improve project performance. On the contrary, these non-technical approaches are very important. Besides that, both these approaches have not been compared with competitive theories to produce a standard framework that covers all the crucial criteria for quality maintenance system. Thus, the main objective of this research is to develop a framework of quality maintenance system by studying the implementation and effectiveness of technical and non-technical approaches and their relationship with project performance in construction industries. Questionnaires were used to collect quantitative data. 1050 questionnaires were distributed personally to respondents via project management teams. Statistical analysis of data was done by using ANOVA, MANOVA, correlation and regression analysis. The findings indicate that both non-technical and technical approaches in construction companies were generally implemented at moderate level. However, non-technical approaches have a significant correlation in effectiveness relationship with project performance (client satisfaction and time variance) when compared with technical approaches. Based on the findings, the new framework has verified new variables such as leadership and top management commitment from previous theories. To conclude, the research has generated a new framework for industry practitioners or researchers to measure effectiveness of quality maintenance system in construction industry.
ABSTRAK

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</tr>
<tr>
<td>NCR</td>
<td>Non-conformance Report</td>
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<tr>
<td>NTA</td>
<td>Non-Technical Approaches</td>
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<tr>
<td>OSNC</td>
<td>Organization Structure &amp; Culture</td>
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<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
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<td>QC</td>
<td>Quality Control</td>
</tr>
<tr>
<td>QMS</td>
<td>Quality Management System</td>
</tr>
<tr>
<td>SIRIM</td>
<td>Standard And Industrial Research Institute of Malaysia</td>
</tr>
<tr>
<td>SPI</td>
<td>Schedule Performance Index</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>SV</td>
<td>Schedule Variance</td>
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<td>T</td>
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<td>TQM</td>
<td>Total Quality Management</td>
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CHAPTER 1

INTRODUCTION

1.1 Introduction

In year 1987, there are many local companies began to notice the importance of ISO 9000 Standard and implement it as the quality management system after launching of ISO 9000 series certification scheme by SIRIM (Standard and Industrial Research Institute of Malaysia) in Malaysia (Yeoh and Lee, 1996). There are total 680 organizations included public agencies, consultants in engineering field, main-contractors, sub-contractors, developers and property services companies had been certified by ISO 9000 series in the end of October 1996 (Yeoh and Lee, 1996). The numbers of ISO 9000 series certified companies kept increasing 2425 companies by the end of 2005 (SIRIM, 2005) and 532 companies out of the total numbers are in construction industry. In order to achieve the International Standards’ requirements, the ISO 9000 has become a standard guideline to follow that can create a new quality system or innovate an existing system (Low and Omar, 1997a).

Since then, the Malaysian government has declared that all the Grade Seven contractors must obtain the ISO 9001: 2000 certifications before end of year 2008 (Anonymous, 2011). This requirement has brought immediate effect to encourage many construction companies to adopt quality management system in their companies. As stated in Construction Industry Development Board Malaysia (CIDB) statistic (Anonymous, 2011), there are total 4573 Grade Seven contractors in the end of year 2011 and this is approximately 7.2 percent of the total number of contractors in construction industry (See Figure 1.1). Consequently, it also means that there are
more than 4573 construction companies having ISO 9001: 2000 certifications in the end of 2011.

However, this requirement cannot be the main reason to implement quality management system in a company. The old management system style will remain even though quality management system is adopted if the requirement has become the main reason for certification. This is because the socio-cultural or non-technical aspects may be ignored and lack of human behavioural skills development if the company tend to concentrate on upgrading those standard tools and procedures. Therefore, certification is only an evidence or reward to show that all the staffs work together to achieve minimum requirement of quality management.

![Figure 1.1: Total number of contractors by registration grade (2011) (Anonymous, 2011)](image)

Figure 1.1: Total number of contractors by registration grade (2011) (Anonymous, 2011)

Moreover, the quality management system must have proper maintenance where the company has to be self-motivated and develop for better quality in both products and services persistently. Stewart (1995) stated proper maintenance as using
technical approaches and non technical approaches (socio-cultural) to monitor, control, assess and improve existing management system constantly. There are some few findings showed that the some contractors put more concentration to the technical approaches and instrumental tools compare to the non-technical approaches (Low, 1993; Seymour and Low, 1990) when they try to improve the current quality management system. Nevertheless, a balance development of technical aspects and socio-cultural aspects has been used widely and effectively in some manufacturing sectors. The purpose of balancing is to improve service quality and it is necessary to implement if organizations in construction sector want to maintain their quality management system effectively (Spekknink, 1995). The concept of balancing the technical requirements and theoretical approach is illustrated in Figure 1.2. Quality management system can be more effective by proper maintenance of the system and it is very important to the construction companies especially those main contractors managing mega projects. Hence, the balance of non-technical aspects and technical aspects will also bring effects towards project performance of the contractors in construction industry.

![Figure 1.2: Technical and non-technical approaches to improving service quality (Spekknink, 1995)](image-url)
1.2 Problem Statement

The theoretical approaches indicated that the application of both technical and non-technical approaches in an organization is very crucial in quality maintenance system. Technical approaches are mainly referred to the requirements which have been set out in Clause 4 of the ISO 9000 standards when those ISO certified companies implemented quality management systems (Low and Omar, 1997b) while non-technical approaches are referred to the methodology of implementing quality management systems to form integrative and culture that enhance an organization towards ideal egalitarian and meritocratic (Low, 1998; Low and Omar, 1997b; Low and Omar, 1997a). The combination of implementing technical and non-technical approaches will show better results than those only focus in technical approaches. Although there are many research of quality management system study the stage of implementation and effectiveness of technical approaches but there are few research looking at the effectiveness of non-technical approaches and balancing of both technical approaches and non-technical approaches. Moreover, most of the quality management studies in construction management tend to focus on construction quality. There is limited research study the quality maintenance system in construction management area. Besides, quality management system has become mandatory for Grade Seven contractors in Malaysia to implement so that quality of the mega-projects can be assured. Therefore, it is significant to know the relationship between project performance of the construction companies with the effectiveness of both non-technical approaches and technical approaches.

1.3 Research Question

The research questions of this research are as follows:

a) What is the status of non-technical approaches and technical approaches in Malaysian construction industry?

b) How strong is the relationship between the effectiveness of quality maintenance system and the project performance in Malaysian construction industry?
1.4 Research Objectives

The objectives of this research are as follows:

i. To assess both non-technical approaches and technical approaches which have been implemented in construction companies and effectiveness towards project performance in construction companies

ii. To analyze the relationship between effectiveness of non-technical approaches and technical approaches on project performance

iii. To develop theoretical framework showing the effect of quality management system maintenance on project performance

iv. To identify the problems in Malaysian ISO certified construction companies while implementing both technical and non-technical approaches, and also recommendation to improve on maintenance for quality maintenance system in construction industry

1.5 Research Scope

This research is confines to the ISO 9000 certified companies in Malaysia. The research will be carried out within construction companies including developers, consultants, contractors and sub-contractors. The research scope is also limited to the companies involved in project management.

1.6 Importance of Research

This research will contribute to better understanding of implementation and effectiveness of non-technical approaches and technical approaches towards project performance of construction companies in Malaysia construction industry. The importance of this research can be summarized as below:-
a. To help those large construction companies improving their quality management system and project performance by emphasizing on the quality maintenance system variables that have significant relationship with project performance;

b. To help those medium construction companies who only focus on technical approaches to understand the importance of non-technical approaches so that they can solve the problems related with quality maintenance system;

c. To assist small size contractors to understand more about implementation of quality maintenance system in main contractor companies so that they can work together under main contractors with ISO 9001 certified to increase the productivity and quality of projects towards the common goal of minimum input with maximum output in construction industry;

d. To provide a standard quality maintenance framework for researchers to study effectiveness of quality maintenance system in future with significant project performance variables.

1.7 Thesis Outline

This thesis consists of six chapters. The first chapter is introduction, it specifies the needs, objectives, benefits, hypothesis statements and research methodology of the study. Chapter two is the literature review, it reviews the fundamental theories and theories of quality maintenance system, evolution of technical and non-technical approaches and those relevant researches which have been carried out in construction industry. Research methodology used in the research design and the development of questionnaires and structured interviews are explained in chapter three. Chapter four provides explanation of the results and findings of research. It also summarizes those data which has been collected from the survey interviews. The hypotheses are tested then the results are organized and presented. Then, the discussion and implication of study will be done in chapter five. This chapter explains the effects and implication of technical approaches and non-
technical approaches towards project performance of contractors in Malaysia construction industry. Lastly, chapter six will summarize and conclude the finding of the study. It also provides limitations of research and recommendations for further researches in future.
REFERENCES


