

A FRAMEWORK FOR QUALITY MAINTENANCE SYSTEM IN  
CONSTRUCTION INDUSTRY

TIONG KUNG LEONG

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

Faculty of Management  
Universiti Teknologi Malaysia

JULY 2014

## ACKNOWLEDGEMENT

First of all, I would like to express my greatest gratitude to all people who have given their assistance towards the completion of this thesis. Their supports and contribution to the research have made the research a success.

I would like to dedicate a special thanks to my academic supervisor, Dr. Norhayati Binti Mohmad Zakwan who has always given her professional opinions and advices to ensure that all the works are almost flawless. My special thanks also go out to my co-academic supervisor Assoc. Prof. Dr. Muhamad Zamari Bin Mat Saman for his wise counseling, help and guidance; and all the staffs at the Faculty of Management, Universiti Teknologi Malaysia.

My sincere appreciation and gratitude also go to the professional experts from construction industry and academia, for their information and recommendations, which had become valuable contribution to this study. I also wish to express my sincere appreciation to all the respondents in this study. I could not have completed this research without their support and cooperation. Thus, I would like to take this opportunity to extend my special thanks to all of them who ever involved in this study.

Last but not least, I would like to give my thanks to my parents and family for their supports and encouragement.

## 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 focussed 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

Globalisasi ekonomi mendorong syarikat-syarikat pembinaan cuba mencapai tahap kualiti yang diterima di peringkat antarabangsa. Justeru itu, adalah penting bagi organisasi memiliki satu sistem seperti Sistem Pengurusan Kualiti (QMS) bagi menjamin kualiti dalam industri pembinaan. Penyelenggaraan QMS termasuklah pemantauan yang berterusan, pengawalan, penilaian dan pembaikan melalui pendekatan teknikal dan bukan teknikal. Daripada kajian lepas kontraktor lebih menumpukan pendekatan teknikal daripada pendekatan bukan teknikal untuk meningkatkan prestasi projek. Walhal pendekatan bukan teknikal adalah sangat penting. Selain itu kedua-dua pendekatan ini tidak pernah dibandingkan dengan teori kompetitif untuk menghasilkan rangka kerja yang terpiawai yang merangkumi semua kriteria penting untuk sistem penyelenggaraan kualiti. Oleh itu, objektif utama kajian ini adalah untuk membangunkan rangka kerja bagi sistem penyelenggaraan kualiti dengan mengkaji pelaksanaan dan keberkesanan pendekatan teknikal dan bukan teknikal serta hubungannya dengan prestasi projek dalam industri pembinaan. Soal selidik telah digunakan untuk mengumpulkan data kuantitatif. Sebanyak 1,050 salinan soal selidik diedarkan secara peribadi kepada responden daripada pasukan projek. Analisis statistik dilakukan dengan analisis ANOVA, MANOVA, korelasi dan regrasi. Hasil kajian ini mendapati bahawa pendekatan teknikal dan bukan teknikal yang dilaksanakan oleh syarikat-syarikat pembinaan secara umumnya adalah pada tahap sederhana. Walau bagaimanapun pendekatan bukan teknikal menunjukkan hubungan keberkesanan yang signifikan dengan prestasi projek (kepuasan pelanggan dan varians masa) apabila dibandingkan dengan pendekatan teknikal. Daripada hasil kajian, rangka kerja baharu telah mengesahkan pemboleh ubah baharu seperti kepimpinan dan komitmen pengurusan atasan daripada teori-teori sebelumnya. Kesimpulannya, kajian ini menghasilkan satu rangka kerja baharu untuk pengamal industri pembinaan dan penyelidik bagi mengukur keberkesanan sistem penyelenggaraan kualiti dalam industri pembinaan.

## TABLE OF CONTENTS

<b>CHAPTER</b>	<b>TITLE</b>	<b>PAGE</b>
	<b>DECLARATION</b>	ii
	<b>ACKNOWLEDGEMENTS</b>	iii
	<b>ABSTRACT</b>	iv
	<b>ABSTRAK</b>	v
	<b>TABLE OF CONTENTS</b>	vi
	<b>LIST OF TABLES</b>	xiii
	<b>LIST OF FIGURES</b>	xvii
	<b>LIST OF ABBREVIATIONS</b>	xix
	<b>LIST OF APPENDICES</b>	xxi
<b>1.</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Introduction	1
	1.2 Problem Statement	4
	1.3 Research Question	4
	1.4 Research Objectives	5
	1.5 Research Scope	5
	1.6 Importance of Research	5
	1.7 Thesis Outline	6
<b>2.</b>	<b>LITERATURE REVIEW</b>	<b>8</b>
	2.1 Introduction	8
	2.2 Background of Quality Maintenance System	9
	2.3 Introduction of Quality Management System and Its Maintenance System	11

2.3.1	Quality Management Matrix with Maintenance Concepts	15
2.3.2	Total Quality Management (TQM)	16
2.3.3	ISO 9000 Series	19
2.3.4	Technical and Non-technical Approaches	23
2.4	Similarities of Elements in Technical and Non-technical Approaches with Competitive Theories	34
2.4.1	Effectiveness and Efficiency of Quality Management Implementation	35
2.4.2	Relationship between Elements of Quality Management and Organizational Performance	38
2.4.3	Linkage and Integration between Quality Management and Management System in Different Industries	41
2.4.4	Summary of Elements in Technical and Non-technical Approaches with Competitive Theories	43
2.5	Quality Management System Research and Research in Construction Industry	47
2.5.1	Overview of Quality Management System Research in Construction Industry	48
2.5.2	ISO 9000 and Total Quality Management in Construction Industry	53
2.5.3	Integration of ISO 9000 with Other Management System	54
2.5.4	Quality Management System in Engineering Consultancy Companies	55
2.6	Quality Management System research in Malaysian Construction Industry	56
2.7	Theoretical Framework	60
2.8	Research Propositions	60
2.9	Research Hypothesis	62
2.10	Summary	64

<b>3.</b>	<b>RESEARCH METHODOLOGY</b>	<b>66</b>
3.1	Introduction	66
3.2	Flow Chart of Research Methodology	66
3.3	Design and Development of Questionnaire	68
	3.3.1 Questionnaire Design	68
	3.3.2 Theories and Calculation Method of Project	
	Performance Measurements	69
	3.3.2.1 Cost Performance	70
	3.3.2.2 Time Performance	72
	3.3.2.3 Quality Performance	73
	3.3.2.4 Client's Satisfaction	74
	3.3.2.5 Safety and Health	74
	3.3.3 Questionnaire Contents	75
	3.3.4 Instrument for Questionnaire	75
	3.3.5 Research Population	77
	3.3.6 Research Sample Size	78
	3.3.7 Research Sample Selection	80
	3.3.8 Research Rating System	80
3.4	Data Collection Strategy	81
	3.4.1 Survey Procedure	81
	3.4.2 Survey Administration	82
	3.4.3 Opening and Confidentiality Statement	82
	3.4.4 Improvement Gain from Pilot Study	83
	3.4.5 Data Recording	85
3.5	Reliability Evaluation	85
3.6	Validity Evaluation	86
3.7	Statistical Analysis Techniques Used	87
	3.7.1 Analysis of Variance (ANOVA)	87
	3.7.2 Multivariate Analysis of Variance (MANOVA)	88
	3.7.3 Correlation	89
	3.7.4 Regression	89
3.8	Summary	90

<b>4.</b>	<b>DATA ANALYSIS AND RESULTS</b>	<b>91</b>
4.1	Introduction	91
4.2	Data Collected	91
	4.2.1 Profile of Respondents	92
	4.2.2 Reliability Test Result	94
	4.2.3 Validity Test Result	94
	4.2.3 Normality Test Result	95
4.3	Data Analysis	96
	4.3.1 Proposition A - Implementation and Effectiveness towards Project Performance	98
	4.3.1.1 Results of ANOVA	98
	4.3.1.1.1 ANOVA - Cost Variance	98
	4.3.1.1.2 ANOVA - Cost Performance Index (CPI)	101
	4.3.1.1.3 ANOVA - Time Variance	102
	4.3.1.1.4 ANOVA - Non-Conformance Report (NCR)	104
	4.3.1.1.5 ANOVA - Client Satisfaction	105
	4.3.1.1.6 ANOVA - Number of Accident	107
	4.3.1.1.7 ANOVA - Fatalities	109
	4.3.1.2 Results of MANOVA	110
	4.3.1.2.1 MANOVA - Time, Cost and Quality	111
	4.3.1.2.2 MANOVA - Cost and Client Satisfaction	111
	4.3.1.2.3 MANOVA - Cost and Safety & Health	113
	4.3.1.2.4 MANOVA - Time and Client Satisfaction	114
	4.3.1.2.5 MANOVA - Time and Safety & Health	115



4.3.1.2.6 MANOVA - Quality and Client Satisfaction	116
4.3.1.2.7 MANOVA - Quality and Safety & Health	117
4.3.1.2.8 MANOVA - Client Satisfaction and Safety & Health	118
4.3.2 Proposition B - Relationship between variables and Project Performance	119
4.3.2.1 Results of Correlation	120
4.3.2.1.1 Correlation - QMS Maintenance variables towards Project Performance	120
4.3.2.1.2 Correlation - Technical variables towards each Non-technical Variables	124
4.3.2.1.3 Correlation - Non-technical variable towards other Non-technical Variables	125
4.3.2.2 Results of Regression	127
4.3.2.2.1 Regression - Leadership	127
4.3.2.2.2 Regression - Communication & Coordination	129
4.3.2.2.3 Regression - Team	131
4.3.2.2.4 Regression - Decentralization of Resources	132
4.3.2.2.5 Regression - Employee Participation & Responsibilities	133
4.3.2.2.6 Regression - Intersecting Territories	136
4.3.2.2.7 Regression - Culture of Pride & Climate for Success	136
4.3.2.2.8 Regression - Training	138

4.3.2.2.9	Regression - Top Management	
	Commitment	140
4.3.2.2.10	Regression - Organization	
	Structure & Culture	140
4.3.2.2.11	Regression - Cost Variance	142
4.3.2.2.12	Regression - Cost Performance	
	Index	143
4.3.2.2.13	Regression - Client	
	Satisfaction	144
4.3.2.2.14	Regression - Non-Conformance	
	Report	145
4.3.2.2.15	Regression - No. of Accident	146
4.3.2.2.16	Regression - Time Variance	147
4.3.2.2.17	Regression - Fatalities	148
4.3.3	Proposition C - Model of relationship	149
	4.3.3.1 Model of relationship	150
4.3.4	Proposition D - Critical Problem for QMS	
	Maintenance	156
4.3.5	Proposition E - Challenges and Suggestion for	
	Improving QMS maintenance	156
4.4	Hypothesis Testing	158
	4.4.1 Hypothesis No.1	158
	4.4.2 Hypothesis No.2	160
	4.4.3 Hypothesis No.3	162
	4.4.4 Hypothesis No.4	163
	4.4.5 Hypothesis No.5	165
	4.4.6 Hypothesis No.6	167
	4.4.7 Hypothesis No.7	169
	4.4.8 Hypothesis No.8	170
	4.4.9 Hypothesis No.9	172
	4.4.10 Hypothesis No.10	174
	4.4.11 Hypothesis No.11	175
	4.4.12 Hypothesis No.12	177
	4.4.13 Hypothesis No.13	178

4.5	Summary of Data Presentation and Analysis	178
<b>5.</b>	<b>DISCUSSION OF FINDINGS</b>	<b>179</b>
5.1	Introduction	179
5.2	Implementation of QMS Maintenance Approaches	179
5.3	QMS Maintenance Approaches and Project Performance	182
	5.3.1 Technical Approaches and Project Performance	184
	5.3.2 Non-Technical Approaches and Project Performance	186
5.4	Framework of Quality Maintenance System	189
5.5	Problems Discussion and Recommendations to improve QMS Maintenance	192
5.6	Summary	194
<b>6.</b>	<b>CONCLUSIONS, LIMITATIONS AND FURTHER RESEARCH</b>	<b>195</b>
6.1	Introduction	195
6.2	Conclusions	195
	6.2.1 Findings	195
	6.2.2 Contributions of Research	197
	6.2.3 New Framework of Quality Maintenance System	199
6.3	Limitations of Thesis	200
6.4	Further Research	200
6.5	Summary	201
	<b>REFERENCES</b>	<b>202</b>
	Appendices A - E	226 - 299

## LIST OF TABLES

<b>TABLE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	“Soft” and “hard” TQM Elements Used in Recent Studies	18
2.2	Comparison of Technical & Non-technical Approaches and Competitive Theories	44
2.3	Summary of Relevant Researches (Categorized by Non-technical Approaches Elements )	45
2.4	Elements related with Non-technical Approaches	46
3.1	Summary of Sources of Key Measurement Scales	76
3.2	Total Numbers of Construction Projects Awarded by Location	78
3.3	Area and Targeted Number of Samples	80
3.4	Example of Revised Questions	84
3.5	Summary of the Analysis used in Hypothesis	88
4.1	Summary of Incomplete Questionnaires	92
4.2	Questionnaires Collected	92
4.3	Profile of Respondents	93
4.4	Summary of Measures	94
4.5	Validation Results	95
4.6	Normality Results	96
4.7	New Categories for Data in Part C	97
4.8	ANOVA for variables by cost variance	99
4.9	ANOVA - Mean values by cost variance	100
4.10	ANOVA for variables by cost performance index	101
4.11	ANOVA - Mean values by cost performance index	102
4.12	ANOVA for variables by time variance	103
4.13	ANOVA - Mean values by time variance	104

4.14	ANOVA for variables by NCR	105
4.15	ANOVA - Mean values by NCR	106
4.16	ANOVA for variables by client satisfaction	106
4.17	ANOVA - Mean values by client satisfaction	107
4.18	ANOVA for variables by number of accident	108
4.19	ANOVA - Mean values by number of accident	108
4.20	ANOVA for variables by fatalities	109
4.21	ANOVA - Mean values by fatalities	110
4.22	MANOVA - Time, Cost and Quality	112
4.23	MANOVA - Cost and Client Satisfaction	113
4.24	MANOVA - Cost and Safety & Health	114
4.25	MANOVA - Time and Client Satisfaction	115
4.26	MANOVA - Time and Safety & Health	116
4.27	MANOVA - Quality and Client Satisfaction	117
4.28	MANOVA - Quality and Safety & Health	118
4.29	MANOVA - Client Satisfaction and Safety & Health	119
4.30	Correlation - QMS Maintenance Variables towards Project Performance	121
4.31	Correlation - Technical variables towards each Non-technical Variables	125
4.32	Correlation - Non-technical variable towards other Non-technical Variables	126
4.33	Regression - Recode Project Performance Variables	128
4.34	Regression - Leadership	129
4.35	Regression - Communication & Coordination	130
4.36	Regression - Teams	132
4.37	Regression - Decentralization of Resources	134
4.38	Regression - Employee Participation & Responsibilities	135
4.39	Regression - Intersecting Territories	137
4.40	Regression - Culture of Pride & Climate for Success	138
4.41	Regression - Training	139
4.42	Regression - Top Management Commitment	141
4.43	Regression - Organization Structure & Culture	142
4.44	Regression - Cost Variance	143

4.45	Regression - Cost Performance Index	144
4.46	Regression - Client Satisfaction	145
4.47	Regression - Non-Conformance Report	146
4.48	Regression - No. of Accident	147
4.49	Regression - Time Variance	148
4.50	Regression - Fatalities	149
4.51	Regression - Overall Non-Technical Approaches and Technical Approach towards Project Performance	151
4.52	Regression - Non-Technical Approaches towards NTA	152
4.53	Critical Problem for QMS maintenance	157
4.54	Challenges and Suggestion for Improving Project Performance	157
4.55	H1 - ANOVA Result	159
4.56	H1 - MANOVA Result	159
4.57	H1 - Correlation Result	160
4.58	H1 - Regression Result	160
4.59	H2 - ANOVA Result	161
4.60	H2 - Correlation Result	161
4.61	H2 - Regression Result	162
4.62	H3 - ANOVA Result	162
4.63	H3 - Correlation Result	163
4.64	H3 - Regression Result	163
4.65	H4 - ANOVA Result	164
4.66	H4 - Correlation Result	165
4.67	H4 - Regression Result	165
4.68	H5 - ANOVA Result	166
4.69	H5 - MANOVA Result	166
4.70	H5 - Correlation Result	167
4.71	H5 - Regression Result	167
4.72	H6 - ANOVA Result	168
4.73	H6 - Correlation Result	168
4.74	H6 - Regression Result	169
4.75	H7 - ANOVA Result	169
4.76	H7 - Correlation Result	170
4.77	H7 - Regression Result	170

4.78	H8 - ANOVA Result	171
4.79	H8 - Correlation Result	172
4.80	H8 - Regression Result	172
4.81	H9 - ANOVA Result	173
4.82	H9 - Correlation Result	173
4.83	H9 - Regression Result	174
4.84	H10 - ANOVA Result	174
4.85	H10 - Correlation Result	175
4.86	H10 - Regression Result	175
4.87	H11 - ANOVA Result	176
4.88	H11 - Correlation Result	177
4.89	H11 - Regression Result	177
5.1	Summary of hypothesis #2 to hypothesis #11	188

## LIST OF FIGURES

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Total number of contractors by registration grade (2011)	2
1.2	Technical and non-technical approaches to improving service quality	3
2.1	Overview of Literature Review and the Gap of Study	9
2.2	Overview of the Quality Management Maintenance Theories	14
2.3	Quality Management Matrix with Management Concept Model	16
2.4	Index of Clauses in ISO 9000:2008	21
2.5	Kanter's Theory for Maintain quality Management Systems Effectively	30
2.6	Overview of Quality Management System Research in Construction Industry	49
2.7	The effect model of technical approaches and non-technical approaches towards project performance	61
3.1	Flow Chart of Research Methodology	67
3.2	The Iron Triangle of Project Management	70
4.1	Model of Relationship - Cost Variance	153
4.2	Model of Relationship - Cost Performance Index	153
4.3	Model of Relationship - Client Satisfaction	154
4.4	Model of Relationship - Non-conformance Report	154
4.5	Model of Relationship - No. of Accidents	155
4.6	Model of Relationship - Time Variance	155
4.7	Model of Relationship - Fatalities	156
5.1	Initial Framework of Quality Maintenance System (Technical and Non-Technical Approaches)	190



5.2	Revised Framework of Quality Maintenance System (Suggested Model in this Research)	191
5.3	Final Framework of Quality Maintenance System (After Hypothesis Testing and Discussion)	191
6.1	New Framework of Quality Maintenance System	199

## LIST OF ABBREVIATIONS

ACWP	-	Actual Cost of Work Performed
ANOVA	-	Analysis of Variance
ATWP	-	Actual Time of Work Performed
BCWP	-	Budgeted Cost of Work Performed
BTWT	-	Budgeted Time of Work Performed
CIDB	-	Construction Industry Development Board Malaysia
CNC	-	Communication & Coordination
COPNCFS	-	Culture of Pride & Climate for Success
CPI	-	Cost Performance Index
CS	-	Client Satisfaction
CV	-	Cost Variance
DOR	-	Decentralization of Resources
EFA	-	Exploratory Factor Analysis
EPNR	-	Employee Participation & Responsibilities
F	-	Fatalities
IT	-	Intersecting Territories
L	-	Leadership
MANOVA	-	Multiple Analysis of Variance
NA	-	No. of Accidents
NCR	-	Non-conformance Report
NTA	-	Non-Technical Approaches
OSNC	-	Organization Structure & Culture
QA	-	Quality Assurance
QC	-	Quality Control
QMS	-	Quality Management System
SIRIM	-	Standard And Industrial Research Institute of Malaysia
SPI	-	Schedule Performance Index

SPSS	-	Statistical Package for Social Sciences
SV	-	Schedule Variance
T	-	Teams
TA	-	Technical Approaches
TMC	-	Top Management Commitment
TQM	-	Total Quality Management
TR	-	Training
TV	-	Time Variance

**LIST OF APPENDICES**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	Questionnaire	226
B	Population of Sample	234
C	Likert-Type Scale Response Anchors	260
D	Project List	263
E	Example of SPSS Output	272

## **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.

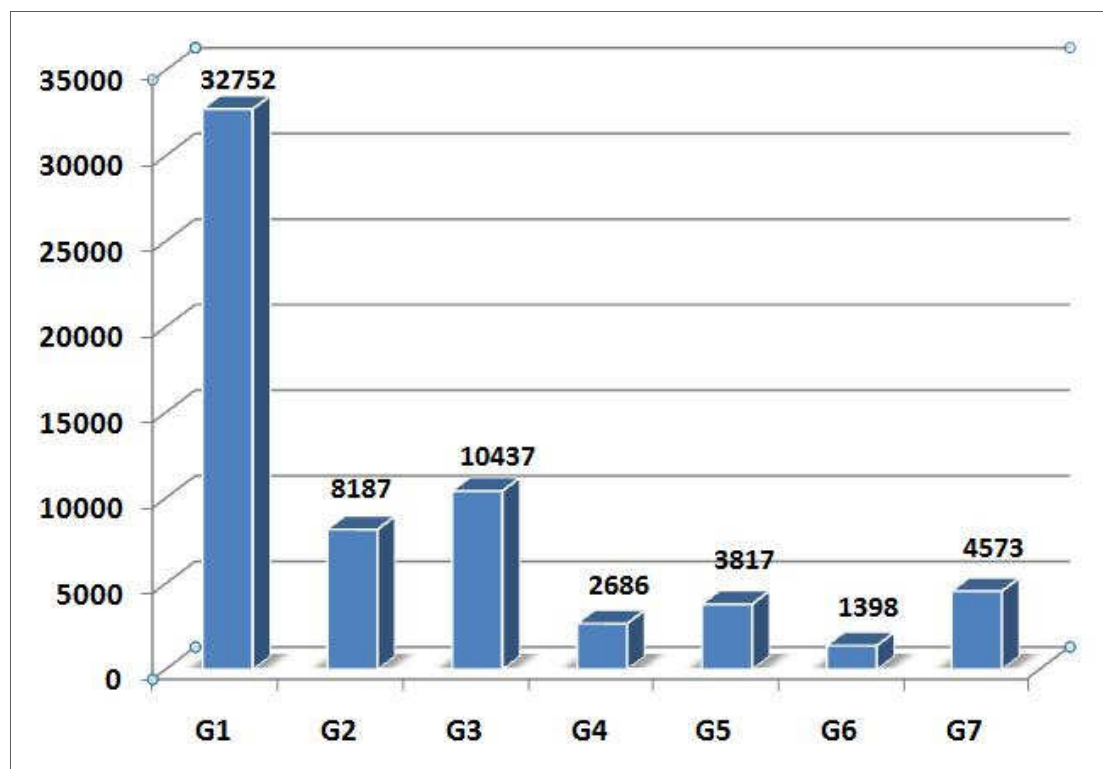


Figure 1.1: Total number of contractors by registration grade (2011) (Anonymous, 2011)

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.

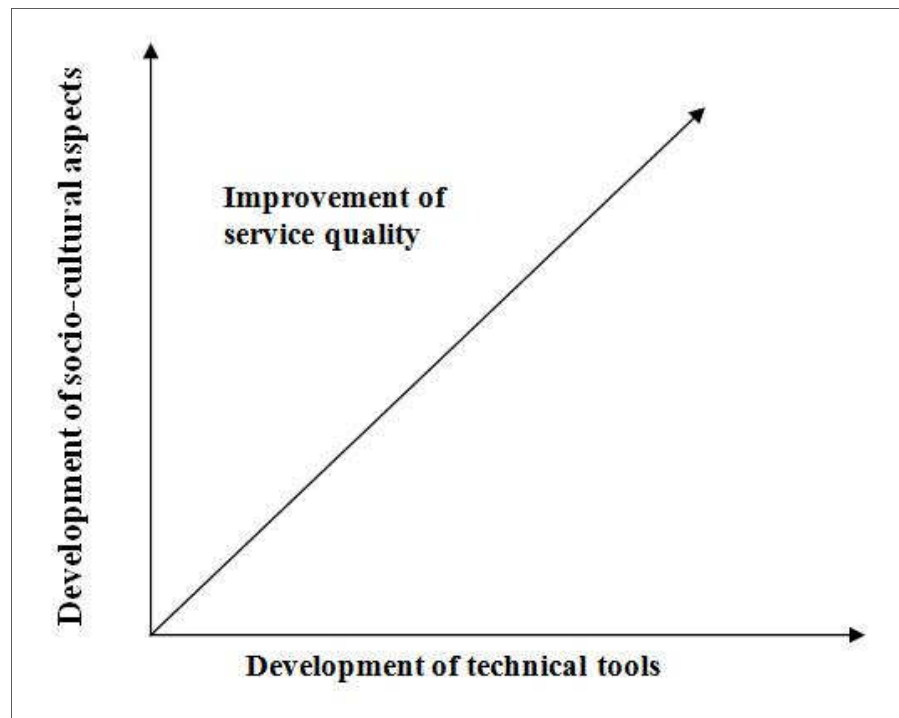


Figure 1.2: Technical and non-technical approaches to improving service quality (Spekknink, 1995)

## **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 confined 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 hypothesises 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

- Abdul-Rahman, H. (1997). Some observations on the issues of quality cost in construction. *International Journal of Quality & Reliability Management*, 14(5), 464-481.
- Abdul-Rahman, H., Berawi, M. A., Berawi, A. R., Mohamed, O., Othman, M., & Yahya, I. A. (2006). Delay mitigation in the Malaysian construction industry. *Journal of Construction Engineering and Management*, 132(2), 125-133.
- Abdulaziz, A. B., & Tawfiq, H. A. (1999). ISO 9000 quality standards in construction. *Journal of Management in Engineering*, 15(6), 41-45.
- Abdullah, M. (1996). *Pengukuran Kualiti Ke Arah Peningkatan Daya Saing*. Bangi: Universiti Kebangsaan Malaysia.
- Abdullah, M. N. B. (2005). *A Case Study on Quality Management System in Construction Project*. Universiti Teknologi Malaysia, Skudai.
- Aboulnaga, I. A. (1998). Integrating quality and environmental management as competitive business strategy for 21st century. *Environmental Management and Health*, 9(2), 65-71.
- Abraham, M., Crawford, J., Carter, D., & Mazotta, F. (2000). Management decisions for effective ISO 9000 accreditation. *Management Decision*, 38(3), 182-193.
- Adam, E., Corbett, L., Flores, B., Harrison, N., Lee, T., Rho, B., et al. (1997). An international study of quality improvement approach and firm performance. *International Journal of Operations and Production Management*, 17(9), 842-873.
- Ahire, S. L., Golhar, D. Y., & Waller, M. A. (1996). Development and validation of TQM implementation constructs. *Decision Sciences Journal*, 27(1), 23-56.
- Ahmad, M. F. B., Yusof, S. r. M., & Yusof, N. M. (2007). Comparative Study of Quality Practices Between Japanese and Non-Japanese Based Electrical and Electronics Companies in Malaysia: A Survey. *Jurnal Teknologi*, 47(A), 75-89.

- Ahmed, S., & Hassan, M. (2003). Survey and case investigations on application of quality management tools and techniques in SMIs. *International Journal of Quality & Reliability Management*, 20(7), 795-826.
- Ahmed, S. M. (1993). *An Integrated Total Quality Management (TQM) Model for the Construction Process*. Georgia Institute of Technology, Atlanta.
- Ahmed, S. M., Aoieong, R. T., Tang, S. L., & Zheng, D. X. M. (2005). A comparison of quality management systems in the construction industries of Hong Kong and the USA. *International Journal of Quality & Reliability Management*, 22(2), 149-161.
- Al-Alawi, A. I., Al-Marzooqi, N. Y., & Mohammed, Y. F. (2007). Organizational culture and knowledge sharing: critical success factors. *Journal of Knowledge Management*, 11(2), 22-42.
- Alaghbari, W. e., Kadir, M. R. A., Salim, A., & Kamal, E. M. (2007). The significant factors causing delay of building construction projects in Malaysia. *Engineering, Construction and Architectural Management*, 14(2), 192-206.
- Ali, A. S., & Rahmat, I. (2010). The performance measurement of construction projects managed by ISO-certified contractors in Malaysia. *Journal of Retail & Leisure Property*, 9(1), 25-35.
- American Psychological Association. (1985). *Standards for Educational and Psychological Testing*. Washington, DC.: American Psychological Association.
- Amsden, D. N., & Amsden, R. T. (1976). *QC Circles: Applications, Tools and Theory*: American Society for Quality Control, Milwaukee, WI.
- Andersen, H. V., & Lawrie, G. (2004). Effective quality management through third-generation balanced scorecard. *International Journal of Productivity and Performance Management*, 53(7), 634-645.
- Anderson, E., Fornell, C., & Rust, R. T. (1997). Customer Satisfaction, Productivity, and Profitability: Differences between Goods and Services. *Marketing Science*, 16(2), 129-145.
- Anderson, J. C., Rungtusanatham, M., Schroeder, R. G., & Devaraj, S. (1995). A path analytic model of a theory of quality management underlying the Deming management method: preliminary empirical findings. *Decision Sciences*, 26(5), 637-658.

- Anderson, M., & Sohal, A. S. (1999). A study of the relationship between quality management practices and performance in small businesses. *International Journal of Quality & Reliability Management*, 16(9), 859-877.
- Anderson, S. W., Daly, J. D., & Johnson, M. F. (1999). Why firms seek ISO 9000 certification: regulatory compliance or competitive advantage. *Production and Operations Management*, 8(1), 28-43.
- Andi, & Minato, T. (2003). Design documents quality in Japanese construction industry. *International Journal of Project Management*, 21, 537-546.
- Anifto, S. C. (1996). *International standards: U.S. construction industry competitiveness*. Ann Arbor, Mich: UMI Dissertation Services.
- Anonymous. (1994). *BS5750/ISO 9000-Setting Standards for Better Business*. Croydon: Lloyds Register Quality Assurance Ltd.
- Anonymous. (2000, December 12, 2011). ISO 9000 and ISO 9001 plain English introduction. Retrieved 28 December, 2011, from <http://praxiom.com/iso-intro.htm>
- Anonymous. (2011). CIDB Official Portal. Retrieved 10 March, 2011, from <http://www.cidb.gov.my/v6/?q=en/annoucement/it-compulsory-gred-g7-contractors-obtain-iso-9001-2000-certification-1st-january-2009>
- Anonymous. (2012a). Construction Quarterly Statistical Bulletin Retrieved 2 Feb, 2012, from <http://www.cidb.gov.my/>
- Anonymous. (2012b). ISO 9001 Training- Understanding ISO 9001:2008. Retrieved 29 June, 2012, from <http://askartsolutions.com/iso9001training/>
- Arditi, D., & Gunaydin, H. M. (1997). Total quality management in the construction process. *International Journal of Project Management*, 15(4), 235-243.
- Armstrong-Stassen, G., Reavley, M., & Ghanam, D. (2005). Organizational downsizing and its perceived impact on quality management practices. *International Journal of Quality & Reliability Management*, 22(9), 950-967.
- Arnold, K. L. (1994). *The Manager's Guide to ISO 9000*: The Free Press, New York, NY.
- Ashford, J. L. (2003). *The Management of Quality in Construction*. London: E & FN SPON.
- Atkinson, R. (1999). Project management: Cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *International Journal of Project Management*, 17(6), 337-342.

- Aubrey, C. I., & Ferlkins, P. (1988). *Teamwork: Involving People in Quality and Productivity Improvement*. Milwaukee, WI, Quality Press, American Society for Quality Control; White Plains, NY, Unipub/Quality Resources.
- Badri, M. A., Davis, D., & Davis, D. (1995). A study of measuring the critical factors of quality management. *International Journal of Quality & Reliability Management*, 12(2), 36-53.
- Bagozzi, R. P. (1994). Measurement in Marketing Research. In R. P. Bagozzi (Ed.), *Principles of Marketing Research*. Oxford, UK: Blackwell Business.
- Barad, M., & Raz, T. (2000). Contribution of quality management tools and practices to project management performance. *International Journal of Quality & Reliability Management*, 17(4/5), 571-583.
- Barkley, B., & Saylor, J. (1994). *Customer-driven Project Management*. New York: McGraw-Hill.
- Barrett, P. (2000). Systems and relationships for construction quality. *International Journal of Quality & Reliability Management*, 17(4/5), 377-392.
- Battikha, M. G. (2002). QUALICON: Computer-Based System for Construction Quality Management. *Journal of Construction Engineering and Management*, 128(2), 164-173.
- Battikha, M. G. (2003). Quality management practice in highway construction. *International Journal of Quality & Reliability Management*, 20(5), 532-550.
- Bayazit, O. (2003). Total quality management (TQM) practices in Turkish manufacturing organizations. *The TQM Magazine*, 15(5), 345-350.
- Besterfield, D. H., Besterfield-Michna, C., Besterfield, G. H., & Besterfield-Sacre, M. (2003). *Total Quality Management* (Third ed.). Upper Saddle River, New Jersey: Pearson Education.
- Black, S. A., & Porter, L. J. (1996). Identification of the critical factors of TQM. *Decision Science*, 27(1), 1-21.
- Blanchard, B. S. (1986). *Logistic Engineering and Management* (3rd ed.): Prentice-Hall, Englewood Cliffs, NJ.
- Bou-Llusar, J. C., Escrig-Tena, A. B., Roca-Puig, V., & Beltran-Martin, I. (2005). To what extent do enablers explain results in the EFQM excellence model? An empirical study. *International Journal of Quality & Reliability Management*, 22(4), 337-353.

- Bray, J. H., & Maxwell, S. E. (1985). *Multivariate Analysis Of Variance*. Newbury Park: Sage Publications.
- Broth, R. A. (1982). *Managing Quality for Higher Profits*: McGraw-Hill, New York, NY.
- Brown, A., & Wiele, T. (1996). A typology of approaches to ISO certification and TQM. *Australian Journal of Management Science*, 21(1), 57-72.
- Bryman, A., & Bell, E. (2011). *Business Research Methods* New York: Oxford University Press.
- BSI, B. S. I. (1992). BS 7850 Total Quality Management. London: British Standards Publishing Limited.
- Bubshait , A. A., & Almohawis , S. A. (1994). Evaluating the general conditions of a construction contract. *International Journal of Project Management*, 12(3), 133-135.
- Burati, J. L., Jr, F., J.J. , & Ledbetter, W. B. (1992). Causes of quality deviations in design and construction. *Journal of Construction Engineering and Management*, 118(1), 34-49.
- Carlsson, M., & Carlsson, D. (1996). Experiences of implementation ISO 9000 in Swedish industry. *International Journal of Quality & Reliability Management*, 13(7), 36-47.
- Carmeli, A. (2005). The relationship between organizational culture and withdrawal intentions and behavior. *International Journal of Manpower*, 26(2), 177-195.
- Carr, F., Hurtado, K., Lancaster, C., Markert, C., & Tucker, P. (1999). *Partnering in Construction-A practical guide to project success*. Chicago: American Bar Association.
- Carson, K. P., & Stewart, G. L. (1996). Job Analysis and the Sociofechnical Approach fo Quality: A Critical Examination. *Journal of Quality Management*, 1(1), 49-65.
- Caudron, S. (1993). Keys to starting a TQM programme. *Personnel Journal*, 72(2), 28-35.
- Chan, A. (2001). A Quest for Better Construction Quality in Hong Kong. *Construction Paper 131, CIOB Construction Information Quarterly*, 3(2), 9-16.



- Chan, A. P. C., & Tam, C. M. (2000). Factors affecting the quality of building projects in Hong Kong. *International Journal of Quality & Reliability Management*, 17(4/5), 423-441.
- Chan, K. W., & Chan, H. C. (1997). Meeting quality assurance standards in the construction industry: experience from Hong Kong. *International Journal of Management*, 14(1), 87-91.
- Chen, W.-H. (1997). The human side of total quality management in Taiwan: leadership and human resource management. *International Journal of Quality & Reliability Management*, 14(1), 24-45.
- Cheung, S. O., Suen, H. C. H., & Cheung, K. K. W. (2004). PPMS: a web-based construction project performance monitoring system. *Automation in Construction*, 13(3), 361-376.
- Chin, K. S., & Choi, T. W. (2003). Construction in Hong Kong: Success Factors for ISO9000 Implementation. *JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT*, 129(6), 599-609.
- Chini, A. R., & Valdez, H. E. (2003). ISO 9000 and the U.S. Construction Industry. *Journal of Management in Engineering*, 19(2), 69-77.
- Choi, T., & Eboch, K. (1998). The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. *Journal of Operations Management*, 17, 59-75.
- Choi, T. W., & Chin, K. S. (2001). A Study of ISO9000 Implementation and Quality Management Practices in Hong Kong Construction Industry. *The Asian Journal on Quality*, 2(2), 1-23.
- Cochran, W. G. (1977). *Sampling techniques (3rd ed.)*. New York: John Wiley & Sons.
- Cohen, S. G., & Ledford, G. E. (1994). The effectiveness of self-managing teams: A quasi-experiment. *Human Relations*, 47(13-43).
- Coleman, S., & Douglas, A. (2003). Where next for ISO 9000 companies? *The TQM Magazine*, 15(2), 88-92.
- Crosby, P. B. (1979). *Quality is Free: The Art of Making Quality Certain*. NY: McGraw-Hill Book Company, New York.
- Curkovic, S., & Pagell, M. (1999). A critical evaluation of the ability of ISO 9000 to lead to a competitive advantage. *Journal of Quality Management*, 4, 51-67.

- Curkovic, S., Vickery, S., & Droge, C. (2000). Quality related action programs - their impact on quality performance and firm performance. *Decision Science*, 31(4), 885-905.
- Dahlgaard, S. M. P. (2000). *From Ancient Philosophies to TQM and Modern Management Theories*. Linköping: Linköping University.
- Dale, B. G. (2002). European quality challenges for the new millennium. *Measuring Business Excellence*, 6(4), 28-32.
- Dean, H. W., & Bowen, D. E. (1994). Management theory and total quality: improving research and practice through theory development. *Academy of Management Review*, 19(3), 392-418.
- Deming, W. E. (1981). Improvement of quality and productivity through action by management. *National Productivity Review*, 1(1), 12-22.
- Deming, W. E. (1982). *Quality, Productivity, and Competitive Position*: MIT Centre for Advanced Engineering Study, Cambridge, MA.
- Deming, W. E. (1986). *Out of Crisis*: MIT Centre for Advanced Engineering, Cambridge, MA.
- Deros, B. M., Rahman, M. N. A., Ghani, J. A., Wahab, D. A., Hashim, M. H., & Khamis, N. K. (2009). Role of Senior Management in TQM Implementation in Malaysian Small and Medium Enterprises. *Journal - The Institution of Engineers*, 72(3), 15-20.
- Deros, B. M., Saibani, N., Yunus, B., Rahman, M. N. A., & Ghani, J. A. (2012). Evaluation of Training Effectiveness on Advanced Quality Management Practices. *Procedia - Social and Behavioral Sciences*, 56, 67-73.
- Deros, B. M., Yusof, S. r. M., & Salleh, A. M. (2003). A Comparative Study of Benchmarking Practices of Malaysian Companies with and without Quality Certification. *Proceedings of the International Conference on Mechanical Engineering 2003*. 26-28, December. Dhaka, Bangladesh: 1-6.
- Dick, G. P. M. (2000). ISO 9000 certification benefits, reality or myth? *TQM Magazine*, 12(6), 365-371.
- Din, S., Abd-Hamid, Z., & Bryde, D. J. (2011). ISO 9000 certification and construction project performance: The Malaysian experience. *International Journal of Project Management*, 29(8), 1044-1056.

- Dissanayaka, S. M., Kumaraswamy, M. M., Karim, K., & Marosszeky, M. (2001). Evaluating outcomes from ISO 9000-certified quality systems for Hong Kong constructors. *Total Quality Management*, 12(1), 29-40.
- Dow, D., Samson, D., & Ford, S. (1999). Exploding the myth: do all quality management practices contribute to superior quality performance? *Production and Operations Management*, 8(1), 1-27.
- Drew, E., & Healy, C. (2006). Quality management approaches in Irish organizations. *The TQM Magazine*, 18(4), 358-371.
- Dumas, R. A. (1989). Organizationwide quality: how to avoid common pitfalls. *Quality Progress*, 22(5), 41-44.
- Ebrahimpour, M., Withers, B. E., & Hikmet, N. (1997). Experiences of US- and foreign-owned firms: a new perspective on ISO 9000 implementation. *International Journal of Production Research*, 35(2), 569-576.
- Egan, J. (1998). *Rethinking construction*. London: Department of the Environment, Transportation, and Regions.
- Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive processes: product innovation in the global computer industry. *Administrative Science Quarterly*, 40, 84-110.
- Elghamrawy, T., & Shibayama, T. (2007). Total Quality Management Implementation in the Egyptian Construction Industry. *Journal of Management in Engineering*, 24(3), 156-161.
- Emery, F. E., & Thorsrud, E. (1969). *Form and content in industrial democracy*: London: Tavistock.
- Emery, F. E., & Trist, E. L. (1969). *Sociotechnical systems*: London: Penguin.
- Emison, G. A. (2004). Pragmatism, adaptation, and total quality management: Philosophy and science in the service of managing continuous improvement. *Journal of Management in Engineering*, 20(2), 56-61.
- Endrijonas, J. (1994). Certification a bane or a boon? *Managing Automation*, 9(5), 38-39.
- Eng, Q. E., & Yusof, S. r. M. (2002). *Comparison of TQM Implementation Practices in Malaysian Electrical and Electronics Industry: A Survey*. Paper presented at the 2nd World Engineering Congress.
- European Construction Institute, E. (1996). *Implementing TQ in the construction industry*. London: Thomas Telford.

- Evans, J. R., & Lindsay, W. M. (1996). *The Management and Control of Quality* (3rd ed.). Minneapolis, West.
- Evans, J. R., & Lindsay, W. M. (1999). *The Management and Control of Quality*: South-Western College Publishing, Cincinnati, OH.
- Everett, J. G., & Jr., P. B. F. (1996). Costs of Accidents and Injuries to the Construction Industry. *Journal of Construction Engineering and Management*, 122(2), 158-164.
- Ezeldin, A. S., & Abu-Ghazala, H. (2007). Quality Management System for Design Consultants: Development and Application on Projects in the Middle East. *Journal of Management in Engineering*, 23(2), 75-87.
- Feigenbaum, A. V. (1990). Management of quality: the key to the nineties. *Journal for Quality and Participation*, 13(2), 14-19.
- Feigenbaum, A. V. (1992). Quality: our new competitive edge. *Executive Excellence*, 9(5), 18-19.
- Fening, F. A., & Amaria, G. P. a. P. (2008). Relationship between quality management practices and the performance of small and medium size enterprises (SMEs) in Ghana. *International Journal of Quality & Reliability Management*, 25(7), 694-708.
- Fisscher, A. M. (1994). Kwaliteitsmanagement en bedrijfsethisch handelen. *Faculteit der Technische Bedrijfskunde, Universiteit Twente, Enschede*.
- Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1994). A framework for quality management research and an associated measurement instrument. *Journal of Operations Management*, 11(4), 339-366.
- Flynn, B. B., Schroeder, R. G., & Sakakibara, S. (1995). The impact of quality management practices on performance and competitive advantage. *Decision Sciences*, 26(5), 659-692.
- Fok, L. Y., Hartman, S. J., Patti, A. L., & Razek, J. R. (2000). Human factors affecting the acceptance of total quality management. *International Journal of Quality & Reliability Management*, 17(7), 714-729.
- Forbes, L. H. (2002). Lean method in construction. *Proceedings of the First International Conference on Construction in the 21st Century—Challenges and Opportunities for Management and Technology*. 25-26, April. CITC, Miami: 459-466

- Forker, L. B. (1996). The contribution of quality to business performance. *International Journal of Operations & Production Management*, 16(8), 44-62.
- Forza, C., & Flippini, R. (1998). TQM impact on quality conformance and customer satisfaction: a causal model. *International Journal of Production Economics*, 55(1), 1-20.
- Fotopoulos, C., & Psomas, E. (2009). The impact of “soft” and “hard” TQM elements on quality management results. *International Journal of Quality & Reliability Management*, 26(3), 150-163.
- Fram, E., & Presberg, M. (1992). TQM is a catalyst for new marketing applications. *Marketing News*, 26(23), 17.
- Gadenne, D., & Sharma, B. (2009). An investigation of the hard and soft quality management factors of Australian SMEs and their association with firm performance. *International Journal of Quality & Reliability Management*, 26(9), 865-880.
- Ganaway, N. B. (2006). *Construction Business Management: A Guide to Contracting for Business Success*. London: Butterworth-Heinemann.
- Garvin, D. (1988). *Managing Quality*. Free Press, New York, NY.
- Georgy, M. E., Chang, L. M., & Zhang, L. (2005). Prediction of engineering performance: A Neurofuzzy approach. *Journal of Construction Engineering and Management*, 131(5), 548-557.
- Giles, R. (1997). perspective for construction industry in the UK. *Training for Quality*, 5(4), 178-181.
- Gits, C. W. (1984). On the Maintenance Concept for a Technical System - A Framework for Design. *Helmond, Dissertatie Drukkery Wibro*.
- Glass, G. V., Peckham, P. D., & Sanders, J. R. (1972). Consequences of failure to meet assumptions underlying the fixed effects analysis of variance and covariance. *Review of Educational Research*, 42(3), 237-288.
- Gotzamani, K. D., Theodorakioglou, Y. D., & Tsiotras, G. D. (2006). A longitudinal study of ISO 9000 (1994) series' contribution towards TQM in Greek industry *The TQM Magazine*, 18(1), 44-54.
- Gotzamani, K. D., & Tsiotras, D. G. (2001). An empirical study of the ISO 9001 Standards' contribution towards total quality management. *International Journal of Operations & Production Management*, 7(4), 247-260.

- Gryna, F. M. (1981). *Quality Circles – A Team Approach to Problem Solving*: AMACOM, American Management Association, New York, NY.
- Gu, S., & Zhou, Y. (2002). *Case studies on construction companies implementing ISO9001*. Beijing: Chinese Measurement.
- Hafeez, K., Malak, N., & Abdelmeguid, H. (2006). A framework for TQM to achieve business excellence. *Total Quality Management*, 17(9), 1213-1229.
- Hage, J. (1980). *Theories of Organization: Form, Process and Transformation*: John Wiley & Sons Inc., New York, NY.
- Harwell, M. R., Rubinstein, E. N., Hayes, W. S., & Olds, C. C. (1992). Summarizing Monte Carlo results in methodological research: The one-and two-factor effects ANOVA cases. *Journal of Educational Statistics*, 17(4), 315-339.
- Hendricks, K., & Singhal, V. (1997). Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science*, 43(9), 1258–1274.
- Hewitt, S. (1994). Strategic advantages emerge from tactical TQM tools. *Quality Progress*, 27(10), 57-59.
- Hiyassat, M. (2000). Applying the ISO Standards to a Construction Company: A Case Study. *International Journal of project Management*, 18(4), 275-280.
- Hoang, D. T., Igel, B., & Laosirihongthong, T. (2006). The impact of total quality management on innovation. Findings from a developing country. *International Journal of Quality & Reliability Management*, 23(9), 1092-1117.
- Huang, F., Horng, C., & Chen, C. (1999). A study of ISO 9000 process, motivation and performance. *Total Quality Management*, 10(7), 1009-1025.
- Huselid, M. A. (1994). Document HR's effect and company performance. *HR Magazine*, 39, 79-84.
- Huselid, M. A., Jackson, S. E., & Schuler, R. S. (1997). Technical and strategic human resource management effectiveness as determinants of firm performance. *Academy of Management Journal*, 40, 171-181.
- Idris, M. A., & Zairi, M. (2006). Sustaining TQM: a synthesis of literature and proposed research framework. *Total Quality Management*, 17(9), 1245-1260.
- Ingle, S. (1982). *Quality Circle Master Guide*: Prentice-Hall, Englewood Cliffs, NJ.

- Ismail, M. Y., Baradie, M. E., & Hashmi, M. S. J. (1998). Quality Management in the Manufacturing Industry: Practice vs Performance. *Journal of Computers Industry Engineering*, 35(3), 519-522.
- Ismail, M. Y., & Hashmi, M. S. J. (2010). The state of quality management in the Irish manufacturing industry, Total Quality Management. *Total Quality Management*, 10(6), 853-862.
- ISO8402. (1994). International Standard: Quality Management and Quality Assurance –Vocabulary. Geneva, Switzerland: International Organization for Standardization.
- Issac, R., & Pitt, D. (2000). Organization culture: it's alive! But there's no fixed address. *Golembiewski, R. (Ed.), Handbook of Organizational Behavior*, 2nd ed, 113-144.
- Jusoh, A., & Yatim, S. M. (2008). Pelaksanaan ISO 9000: Pengajaran Dari Kajian Baru *Jurnal Teknologi*, 48(E), 71-83.
- Jusoh, A., Yusoff, R. Z., & Mohtar, S. (2008). Determining TQM practices in university R&D activities using factor analysis: Research experience of Malaysian universities. *Jurnal Kemanusiaan*, 11(6), 36-54.
- Kam, C. W., & Tang, S. L. (1997). Development and implementation of quality assurance in public construction works in Singapore and Hong Kong. *International Journal of Quality & Reliability Management*, 14(9), 909-928.
- Kanter, R. (1994). *The Change Masters: Corporate Entrepreneurs at Work*. Routledge, London.
- Kanter, R. (2006). Innovation: The Classic Traps. *Harvard Business Review*, 11(2006), 1-15.
- Karim, K., Marosszeky, M., & Kumaraswamy, M. (2005). Organizational Effectiveness Model for Quality Management Systems in the Australian Construction Industry. *Total Quality Management*, 16(6), 793–806.
- Karuppusami, G., & Gandhinathan, R. (2006). Pareto analysis of critical success factors of total quality management. A literature review and analysis. *The TQM Magazine*, 18(4), 372-385.
- Kaushik, N. (2011). Difference Between ANOVA and MANOVA. Retrieved 1 March, 2014, from <http://www.differencebetween.net/science/mathematics-statistics/difference-between-anova-and-manova/>

- Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of Behavioral Research* (4th ed.). USA: Wadsworth Thomson Learning.
- Kim, D.-Y., Kumar, V., & Kumar, U. (2011). A performance realization framework for implementing ISO 9000. *International Journal of Quality & Reliability Management*, 22(4), 383-404.
- Kivipold, K., & Vadi, M. (2010). A measurement tool for the evaluation of organizational leadership capability. *Baltic Journal of Management*, 5(1), 118-136.
- Kubal, M. T. (1994). *Engineered quality in construction: partnering and TQM*. New York: McGraw-Hill.
- Kumaraswamy, M. M., & Thorpe, A. (1999). Systematizing construction project evaluations. *Journal of Management in Engineering*, 12(1), 34-39.
- Lagrosen, Y., & Lagrosen, S. (2005). The effects of quality management - a survey of Swedish quality professionals. *International Journal of Operations & Production Management*, 25(10), 940-952.
- Landin, A. (2000). ISO 9001 within the Swedish construction sector. *Construction Management and Economics*, 18(5), 509-518.
- Larson, C. (1988). Team tactics can cut product development costs. *Journal of Business Strategy*, 9(5), 22-25.
- Lasserre, P., & Probert, J. (1994). Competing on the Pacific Rim: high risks and high returns. *Long Range Planning*, 27(2), 3-11.
- Latham, M. (1994). *Constructing the Team*. London: HMSO.
- Lau, A. W. T., & Tang, S. L. (2009). A survey on the advancement of QA (quality assurance) to TQM (total quality management) for construction contractors in Hong Kong. *International Journal of Quality & Reliability Management*, 26(5), 410-425.
- Lawler, E. E. I. (1986). *High involvement management*. San Francisco: Jossey-Bass.
- Lawler, E. E. I., Mohrman, S. A., & Ledford, G. E., Jr. (1992). *Employee involvement and total quality management*. San Francisco: Jossey-Bass.
- Lee, D. E., Lim, T. K., & Arditi, D. (2011). An Expert System for Auditing Quality Management Systems in Construction. *Computer-Aided Civil and Infrastructure Engineering*, 26(8), 612-631.
- Lee, J. (2003). E-manufacturing: fundamental, tools, and transformation. *Robotics and Computer-Integrated Manufacturing*, 19(6), 501-507.



- Lee, T. Y. (1998). The development of ISO 9000 certification and the future of quality management: A survey of certified firms in Hong Kong. *International Journal of Quality & Reliability Management*, 15(2), 162-177.
- Lester, R. H., Enrick, N. L., & Motley, H. E. J. (1977). *Quality Control for Profit*: Industrial Press, New York, NY.
- Leung, H. K. N., Chan, K. C. C., & Lee, T. Y. (1999). Costs and benefits of ISO 9000 series: a practical study. *International Journal of Quality & Reliability Management*, 16(7), 675-690.
- Levin, I. (2000). Five windows into organizational culture. *Organizational Development Journal*, 18(1), 83-94.
- Lewis, W. G., Pun, K. F., & Lalla, T. R. M. (2006). Empirical investigation of the hard and soft criteria of TQM in ISO 9001 certified small and medium-sized enterprises. *International Journal of Quality & Reliability Management*, 23(8), 964-985.
- Liao, W.-C., & Tsai, C.-C. (2001). A study of cockpit crew teamwork behaviors. *Team Performance Management: An International Journal*, 7(1/2), 21-26.
- Lim, C., & Mohamed, M. (2000). An exploratory study into recurring construction problems. *International Journal of Project Management*, 18, 267-273.
- Lix, M. L., Keselman, J. C., & Keselman, H. J. (1996). Consequences of assumption violations revisited: A quantitative review of alternatives to the one-way analysis of variance F test. *Review of Educational Research*, 66(4), 579-619.
- Love, P. E. D., & Holt, G. D. (2000). Construction business performance measurement: the SPM alternative. *Business Project Management Journal*, 6(5), 408-416.
- Low, S. P. (1993). The rationalisation of quality in the construction industry: some empirical findings. *Construction Management and Economics*, 11(4), 247-259.
- Low, S. P. (1998). Managing total service quality: a systemic view. *Managing Service Quality*, 8(1), 34-45.
- Low, S. P., & Abeyegoonasekera, B. (2001). Integrating buildability in ISO 9000 quality management systems: case study of a condominium project. *Building and Environment*, 36(3), 299-312.

- Low, S. P., & Alfelor, W. M. (2000). Cross-cultural influences on quality management systems: two cases studies. *MCB University Press*, 49(4), 134-144.
- Low, S. P., & Chan, F. M. (1997). Quality management systems: a study of authority and empowerment. *Building Research and Information*, 25(3), 158-169.
- Low, S. P., & Goh, K. H. (1994). Construction quality assurance: problems of implementation at infancy stage in Singapore. *International Journal of Quality & Reliability Management*, 11(1), 22-37.
- Low, S. P., Kee, T. B., & Leng, A. A. A. (1999). Effectiveness of ISO 9000 in raising construction quality standards: some empirical evidence using CONQUAS scores. *Structural Survey*, 17(2), 89-108.
- Low, S. P., & Lim, B. L. (2000). Quality system QS 9000 for construction: Is the industry in Singapore ready? *Journal of Construction Research*, 1(1), 63-69.
- Low, S. P., & Omar, H. F. (1997a). The effective maintenance of quality management systems in the construction industry. *International Journal of Quality & Reliability Management*, 14(8), 768-790.
- Low, S. P., & Omar, H. F. (1997b). Integration, segmentalism and the maintenance of quality management systems in the construction industry. *Building Research and Information*, 25(1), 36-49.
- Low, S. P., & Shiua, S. C. (2000). The maintenance of construction safety: riding on ISO 9000 quality management systems. *Journal of Quality in Maintenance Engineering*, 6(1), 28-44.
- Low, S. P., & Tan, J. H. K. (2005). Integrating ISO 9001 Quality Management System and ISO 14001 Environmental Management System for Contractors. *Journal of Construction Engineering and Management*, 131(11), 1241-1244.
- Low, S. P., & Teo, J. A. (2004). Implementing Total Quality Management in Construction Firms. *Journal of Management in Engineering*, 20(1), 8-15.
- Mack, T. (1990). Oryx Energy Corp.: Energizing a Bureaucracy. *Forbes*, September 17, 76-80.
- Mahmood, W. Y. W., & Mansor, N. (1996). Quality Management In Construction Industry - Malaysia Experience. *Jurnal Ukur Bahan*.
- Mandal, P., Howell, A., & Sohal, A. S. (1998). A systemic approach to quality improvements: The interactions between the technical, human and quality systems. *Total Quality Management*, 9(1), 79-100.

- Matthews, M., & Burati, J. J. (1989). *Quality Management organizations and Techniques*: The Construction Industry Institute, USA.
- Mbugua, L. M., Harris, P., Holt, G. D., & Olomolaiye, P. O. (1999). A framework for determining critical success factors influencing construction business performance. *Proceedings of the 15th Annual ARCOM Conference*. 5-7, September. Liverpool, United Kingdom: 255-264
- McCabe, S. (1996). Creating excellence in construction companies: UK contractors' experiences of quality initiatives. *The TQM Magazine*, 8(6), 14-19.
- McIntyre, C., & Kirschenman, M. (2000). Survey of TQM in construction industry in upper Midwest. *Journal of Management in Engineering*, 16(5), 67-70.
- Mills, D. (1993). *Quality Auditing*. London, UK: Chapman and Hall.
- Miyagawa, M., & Yoshida, K. (2005). An empirical study of TQM practices in Japanese-owned manufacturers in China. *International Journal of Quality & Reliability Management*, 22(6), 536-553.
- Mo, P. T., & Chan, M. S. (1997). Strategy for the successful implementation of ISO 9000 in small and medium manufacturers. *The TQM Magazine*, 9(2), 135-145.
- Moatazed-Keivani, R., Ghanbari-Parsa, A. R., & Kagaya, S. (1999). ISO 9000 standards: perceptions and experiences in the UK construction industry. *Construction Management and Economics*, 17(1), 107-119.
- Moch, M. K. (1976). Structure and resource allocation. *Administrative Science Quarterly*, 21(4), 661-674.
- Mohammed, A. H. b., & Abdullah, M. N. b. (2006). Quality Management System In Construction. *Proceedings of the International Conference on Construction Industry*. 12-24 June. Padang, Indonesia: 1-15.
- Montes, F. J. L. n., Jover, A. V., & Ferná'ndez, L. M. M. (2003). Factors affecting the relationship between total quality management and organizational performance. *International Journal of Quality & Reliability Management*, 20(2), 189-209.
- Motwani, J. G., Mahmoud, E., & Rice, G. (1994). Quality practices of Indian organizations: an empirical analysis. *International Journal of Quality & Reliability Management*, 1(1), 38-52.
- Naagarazan, R. S., & Arivalagar, A. A. (2005). *Total Quality Management*. New Delhi: New Age International.

- Naor, M., Goldstein, S. M., Linderman, K. W., & Schroeder, R. G. (2008). The Role of Culture as Driver of Quality Management and Performance: Infrastructure Versus Core Quality Practices. *Decision Sciences Journal of Innovative Education*, 39(4), 671–702.
- Ng, S. T. (2005). Performance of engineering consultants in ISO 9000-based quality management systems implementation. *Engineering, Construction and Architectural Management*, 12(6), 519-532.
- Noori, H. (1991). TQM and its building blocks: learning from world-class organizations. *Optimum*, 22(3), 31-38.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory* (3rd ed.). New York: McGraw-Hill, Inc.
- Oakland, J. S., & Aldridge, A. J. (1995). Quality management in civil and structural engineering consulting. *International Journal of Quality & Reliability Management*, 12(3), 32-48.
- Odeh , A. M., & Battaineh , H. T. (2002). Causes of construction delay: Traditional contracts. *International Journal of Project Management*, 20, 67-73.
- Orwig, R. A., & Brennan, L. L. (2000). An integrated view of project and quality management for project-based organizations. *International Journal of Quality & Reliability Managemen*, 17(4/5), 351-363.
- Öztaş, A., & Ökmen, Ö. (2005). Judgmental risk analysis process development in construction projects. *Building and Environment*, 40(9), 1244-1254.
- Palaneeswaran, E., Ng, T., & Kumaraswamy, M. (2006). Client satisfaction and quality management systems in contractor organizations. *Building and Environment*, 41(11), 1557–1570.
- Parasuraman , A., Zeithaml , V. A., & Berry , L. L. (1988). Service quality: A multi-item scale for measuring consumer perceptions of quality. *Journal of Retailing*, 64, 13-40.
- Parfitt , M. K., & Sanvido , V. E. (1993). Checklist of critical success factors for building projects. *Journal of Management in Engineering*, 9(3), 243-249.
- Parsa, A., & Keivani, R. (1997). Making the most of quality management systems. *Construction Manager*, September(1), 16-17.
- Patti, A. L., Fok, L. Y., & Hartman, S. J. (2004). Differences between managers and line employees in a quality management environment. *International Journal of Quality & Reliability Management*, 21(2), 214-230.

- Pheng, L., & Teo, J. (2004). Implementing Total Quality Management in Construction Firms. *Journal of Management in Engineering*, 20(1), 8-15.
- Powell, T. C. (1995). Total quality management as competitive advantage: a review and empirical study. *Strategic Management Journal*, 16, 15-37.
- Prajogo, D. I. (2005). The comparative analysis of TQM practices and quality performance between manufacturing and service firms. *International Journal of Service Industry Management*, 16(3), 217-228.
- Prajogo, D. I., & McDermott, D. M. (2005). The relationship between total quality management practices and organizational culture. *International Journal of Operations & Production Management*, 25(11), 1101-1122.
- Putri, N. T., & Yusof, S. r. M. (2008). Critical Success Factors for Implementing Quality Engineering (QE) In Malaysian's and Indonesian's Automotive Industries: A Proposed Model. *International Journal of Automotive Industry and Management*, 2(1), 1-15.
- Rahman, H. A., Karim, S. B. A., Danuri, M. S. M., Berawi, M. A., & Wen, Y. X. (2007). Does Professional Ethic Affects Construction Quality? *Proceedings of the Quantity Surveying International Conference*. 4-5, September. Kuala Lumpur, Malaysia: 1-10
- Rahman, S. (2004). The future of TQM is past. Can TQM be resurrected? *Total Quality Management*, 15(4), 411-422.
- Rahman, S., & Bullock, P. (2005). Soft TQM, hard TQM, and organizational performance relationships: an empirical investigation. *Omega*, 33(1), 73-83.
- Rausch, E., & Anderson, C. (2011). Enhancing Decisions with Criteria for Quality Abstract.
- Reddy, J., & Berger, A. (1983). Three essentials of product quality. *Harvard Business Review*, 61(4), 153-159.
- Reed, R., Lemak, D. J., & Mero, N. P. (2000). Total quality management and sustainable competitive advantage. *Journal of Quality Management*, 5, 5-26.
- Reich, R. (1994). Leadership and the high performance organization. *Journal for Quality and Participation*, 17(2), 6-11.
- Rosenthal, R., & Rosnow, R. L. (1991). *Essentials of Behavioral Research. Methods and Data Analysis* (2nd ed.). Boston: McGraw Hill.
- Run, E. C. D., Chiun, L. M., & Kusnaryadi, H. (2008). *Basic Analysis: A Guide For Students and Researchers*. Kuching: Jade Tree Press.

- Sa'nchez-Rodriguez, C., & Mart'inez-Lorente, A. R. (2004). Quality management practices in the purchasing function: an empirical study. *International Journal of Operations & Production Management*, 24(7), 666-687.
- Sail, R. M., & Alavi, K. (2010). Social skills and social values training for future k-workers. *Journal of European Industrial Training*, 34(3), 226-258.
- Salter , A., & Torbett , R. (2003). Innovation and performance in engineering design. *Journal of Construction Management and Economics*, 21, 573-580.
- Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management*, 25(5), 517-526.
- Samson, D., & Terziovski, M. (1999). The relationship between total quality management practices and operational performance. *Journal of Operations Management*, 17(4), 393-409.
- Sanvido, V., Grobler, F., Parfitt, K., Guvenis, M., & Coyle, M. (1992). Critical success factors for construction projects. *Journal of Construction Engineering and Management*, 118(1), 94-111.
- Saporito, B. (1986). The revolt against "working smarter.". *Fortune*, 114(2), 58-65.
- Schonberger, R. J. (1982). *Japanese Manufacturing Techniques*: Macmillan, New York, NY.
- Schonberger, R. J. (1986). *World class manufacturing: The lessons of simplicity applied*: New York: Free Press.
- Seawright, K. W., & Young, S. T. (1996). A quality definition continuum. *Interfaces*, 26(3), 107-113.
- Sekaran, U. (2005). *Research Methods For Business: A skill-building appraoch* (4th ed.). Singapore: John Wiley & Sons, Inc.
- Seymour, D. (1997). *Assessing quality control systems: some methodological considerations*. Rotterdam: Balkema: Lean Construction.
- Seymour, D., & Low, S. (1990). The quality debate. *Construction Management and Economics*, 8(1), 13-29.
- Shammas-Toma, M., Seymour, D. E., & Clark, L. (1996). The effectiveness of formal quality management systems in achieving the required cover in reinforced concrete. *Construction Management and Economics*, 14(4), 353-364.

- Sharma, B., & Gadenne, D. (2002). An inter-industry comparison of quality management practices and performance. *Managing Service Quality*, 12(6), 394-404.
- Shea, C. M., & Howell, J. M. (1998). Organizational Antecedents to the Successful Implementation of Total Quality Management: A Social Cognitive Perspective. *Journal of Quality Management*, 3(1), 3-24.
- Sila, I., & Ebrahimpour, M. (2005). Critical linkages among TQM factors and business results. *International Journal of Operations & Production Management*, 25(11), 1123-1155.
- Simon, J. C., & Hoes, F. (1994). Standard based quality - the use of ISO 9000 standards and total quality. *EOQ*, 169-178.
- Sinclair, D., & Zairi, M. (1995). Effective process management through performance measurement: part III-an integrated model of total quality-based performance measurement. *Business Process Re-engineering & Management Journal*, 1(3), 50-65.
- Singh, P. J., & Smith, A. (2006). An empirically validated quality management measurement instrument. *Benchmarking: An International Journal*, 13(4), 493-522.
- SIRIM. (1994). MS ISO 8402:1994 Quality Management System - Vocabulary: SIRIM Malaysia.
- SIRIM. (2005). Malaysian Standard MS ISO9000 (Vol. 12: Part 2): SIRIM Malaysia.
- Snee, R. D. (1986). In pursuit of total quality. *Quality Progress*, 19(8), 25-53.
- Snell, S. A., & Dean, J. W., Jr. (1992). Integrated manufacturing and human resource management: A human capital perspective. *Academy of Management Journal*, 35(3), 467-504.
- Soetanto, R., & Proverbs, D. G. (2004). Intelligent models for predicting levels of client satisfaction. *Journal of Construction Research*, 5(2), 233-255.
- Soetanto, R., Proverbs, D. G., & Holt, G. D. (2001). Achieving quality construction projects based on harmonious working relationships – clients' and architects' perceptions of contractor performance. *International Journal of Quality & Reliability Management*, 18(5), 528-548.
- Sohail, M. S., & Hoong, T. B. (2003). TQM practices and organizational performances of SMEs in Malaysia: Some empirical observations. *Benchmarking: An International Journal*, 10(1), 37-53.

- Solis, L. E., Raghu-Nathan, T. S., & Rao, S. S. (2000). A regional study of quality management infrastructure practices in USA and Mexico. *International Journal of Quality & Reliability Management*, 17(6), 597-613.
- Sousa, R., & Voss, C. A. (2002). Quality management re-visited: a reflective review and agenda for future research. *Journal of Operations Management*, 20(1), 91-109.
- Sousa, S., & Teixeira, J. (2004). *Prevention measures to reduce risk of falling from heights (in Portuguese)*. Paper presented at the IX National Symposium of ISMAI.
- Spekknink, D. (1995). Architect's and consultant's quality management system. *Building Research and Information*, 23(2), 97-105.
- Steeple, M. M. (1992). The Corporate Guide to the Malcolm Baldrige National Quality Award. *BusinessOne Irwin, Homewood, IL*.
- Stevens, J. D. (1996). Blueprint for measuring project quality. *Journal of Management in Engineering*, 12(2), 34-39.
- Stewart, R. (1995). "Alive and kicking – quality assured: getting it was hard work, but keeping it means constant improvement": The Chartered Builder, The Chartered Institute of Building.
- Sun, H., Li, S., Ho, K., Gersten, F., Hansen, P., & Frick, J. (2004). The trajectory of implementing ISO 9000 standards versus total quality management in Western Europe. *International Journal of Quality & Reliability Management*, 21(2), 131-153.
- Takeuchi, C., & Quelch, J. A. (1983). Quality is more than making a good product. *Harvard Business Review*, 61(4), 139-145.
- Takim, R., Akintoye, A., & Kelly, J. (2003). Performance measurement systems in construction. *Association of Researchers in Construction Management*, 1, 423-432.
- Tam, C. M. (1996). Benefits and costs of the implementation of ISO 9000 in the construction industry of Hong Kong. *Journal of Real Estate and Construction*, 6(1), 53-66.
- Tam, C. M., & Hui, M. Y. T. (1996). Total quality management in a public transport organization in Hong Kong. *International Journal of Project Management*, 14(5), 311-315.



- Tang, S. L., Ahmed, S. M., Aoieong, R. T., & Poon, S. W. (2005). *Construction Quality Management*: Hong Kong University Press.
- Tang, S. L., & Kam, C. W. (1999). A survey of ISO 9001 implementation in engineering consultancies in Hong Kong. *International Journal of Quality & Reliability Management*, 16(6), 562-574.
- Tang, S. L., Poon, S. W., Ahmed, S. M., & Wong, F. K. W. (2003). Modern Construction Project Management. *Hong Kong University Press, Hong Kong*.
- Tari, J. J. (2005). Components of successful total quality management. *The TQM Magazine*, 17(2), 182-194.
- Terziovski, M. (1998). *Best predictors of high performance quality organisations: evidence from Australia and New Zealand*. Victoria, Australia: Faculty of Business & Economics, Monash University.
- Terziovski, M., Power, D., & Sohal, A. S. (2003). The longitudinal effects of the ISO 9000 certification process on business performance. *European Journal of Operational Research*, 146(3), 580-595.
- Thelen, M. J. (1997). ISO 9000 and TQA in SITA research and development. *The TQM Magazine*, 9(4), 265-269.
- Thiagaragan, T., Zairi, M., & Dale, B. G. (2001). A proposed model of TQM implementation based on an empirical study of Malaysian industry. *International Journal of Quality & Reliability Management*, 18(3), 289-306.
- Tobin, L. M. (1990). The new quality landscape: total quality management. *Journal of Systems Management*, 41(11), 10-14.
- Torres Peraza, M. (1995). Planen fur den Tag danach. *Global Quality Management*, 6(6), 694.
- Townend, J. (2002). *Practical Statistics for Environmental and Biological Scientist*. West Sussex, England: John Wiley & Sons, Ltd.
- Trist, E. (1981). *The sociotechnical perspective.: Perspectives on organization design and behavior*. New York: Wiley.
- Vagias, W. M. (2006). *Likert-type scale response anchors.:* Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management, Clemson University.
- Verespej, M. A. (1990). When you put the team in charge. *Industry Week*, 239(23), 30-32.

- Versteeg, A. (1990). Self-directed work teams yield long-term benefits. *Journal of Business Strategy*, 11(6), 9-12.
- Vouzaz, F., & Psychogios, A. G. (2007). Assessing managers' awareness of TQM. *The TQM Magazine*, 19(1), 62-75.
- Vouzaz, F. K., & Gotzamani, K. D. (2005). Best practices of selected Greek organizations on their road to business excellence. *The TQM Magazine*, 17(3), 259-266.
- Wahid, R. A., Corner, J., & Tan, P.-L. (2011). ISO 9000 maintenance in service organisations: Tales from two companies. *International Journal of Quality & Reliability Management*, 28(7), 735-757.
- Waldman, D. A. (1993). A theoretical consideration of leadership and total quality management. *Leadership Quarterly*, 4(1), 65-79.
- Wan, H. L. (2007). Human capital development policies: enhancing employees' satisfaction. *Journal of European Industrial Training* 31(4), 297-322.
- Wan Yusoff, W. M., Ghani, A., & Norizan, K. M. (1994). *Quality management in contracting*. Paper presented at the Quality Management in Building and Construction.
- Wardhani, V., Utarini, A., Dijk, J. P. v., Post, D., & Groothoff, J. W. (2009). Determinants of quality management systems implementation in hospitals. *Health Policy*, 89(3), 239-251.
- Water, H. v. d. (2000). A maintenance model for quality management. *International Journal of Quality & Reliability Management*, 17(7), 756-770.
- Water, H. v. d., & de Vries, J. (1992). The organization of quality management: from abstract model to real example. *International Journal of Quality & Reliability Management*, 9(2), 10-18.
- Webster, C. (1995). Marketing culture and marketing effectiveness in service firms. *Journal of Services Marketing*, 9(2), 6-21.
- Wilkinson, A. (1992). The other side of quality: 'soft' issues and the human resource dimension. *Total Quality Management*, 3(3), 323-329.
- Wruck, K. H., & Jensen, M. C. (1994). Science, specific knowledge, and total quality management. *Journal of Accounting and Economics*, 18, 247-287.
- Xiao, H., & Proverbs, D. (2002). The performance of contractors in Japan, the UK and the USA - an evaluation of construction quality. *International Journal of Quality & Reliability Management* 19(6), 672-687.

- Yang, C. C. (2006). The impact of human resource management practices on the implementation of total quality management. *The TQM Magazine*, 18(2), 162-173.
- Yasamis, F., Arditi, D., & Mohammadi, J. (2002). Assessing contractor quality performance. *Construction Management and Economics*, 20(3), 211-223.
- Yeoh, S., & Lee, N. (1996). *ISO 9002 in the Malaysian construction industry guide and implementation*: Malaysia: McGraw-Hill Book Co.
- Yeung, A. C. L., Lee, T. S., & Chan, L. Y. (2003). Senior management perspectives and ISO 9000 effectiveness: An empirical research. *International Journal of Production Research*, 41(3), 545-569.
- Zairi, M., & Thiagarajan, T. (1997). A review of total quality management in practice: understanding the fundamentals through examples of best practice applications – Part III. *The TQM Magazine*, 9(6), 414-417.
- Zeng, S. X. (2003). The Rise and Fall of Total Quality Management in the Chinese Construction Industry. *Architectural Science Review*, 46(2), 105-113.
- Zhao, X., Yeung, A. C. L., & Lee, T. S. (2004). Quality management and organizational context in selected service industries of China. *Journal of Operations Management*, 22, 575-587.
- Zin, R. M., Chen, G. H., & Ali, M. C. (2009). An Observation of Impact in Implementation of Quality Management System by Contractors *Malaysian Construction Research Journal*, 4(1), 52-71.
- Zu, X. (2009). Infrastructure and core quality management practices: how do they affect quality? *International Journal of Quality & Reliability Management*, 26(2), 129-149.