



بسم الله الرحمن الرحيم

(الَّذِي خَلَقَ الْمَوْتَهُ وَالْحَيَاةَ لِيَبْلُوَنَّهُ أَيْكُمْ  
أَحْسَنُ حَمَلًاً وَهُوَ الْعَزِيزُ الْغَفُورُ)

(سورة الملك آية 2)

صدق الله العظيم

## **Dedication**

This thesis dedicated

To my Compassionate Mother & Father

To my Loving Husband

To my Sincerer Colleagues and friends

To my Loyal Sisters and Brothers

*I Could Do Nothing without Your Concern and Supportiveness*

## **Acknowledgments**

First and Last Gratitude to Our Creator who Never Stop Blessing Us

"Allah"

\*\*\*\*\*

Then, I would like to provide my honest appreciation to my respectful supervisor:

Dr. Awad Saad Hassan  
Dean of Architecture School (SUST)

Having Special Appreciation, respect and love to whom was  
patient and supportive, my Dear Husband:

Salah ElDein AbduAllah

Also I Would Like to provide my sincere thanks to my x-supervisor:

Dr. Mohamed Ebrahim

Many Appreciated Professional people who give their time, thoughts, and concern  
along this journey:

**Dr. Mohamed Yagoub Shadad**  
**Dr. Abbas Ebrahim**  
**Eng. Mohamed Bakr**  
**Eng. Mona Redwam**  
**Eng. Sabir ElSir**

## **Abstract**

The aim of this research is to carry out an empirical study on the determinants of TQM in the Sudanese Construction Companies. The main contribution of this thesis is to persuade managers to take a serious attention on the importance of the effective utilization of CSFs to implement TQM in their construction companies.

TQM has gained widespread global acceptance. However, some have achieved remarkable success while others have suffered dismal failures. Many of the failures can be attributed to a misunderstanding of TQM or the way the organization had implemented TQM.

This thesis has presented the results of a questionnaire on critical success factors of TQM carried out in Sudanese Construction Companies, and it found that there is a failure in implementing TQM through the critical success factors.

The researcher recommended using the CSFs principles and methods to reach the quality in the construction companies.

## المستخلص

الهدف من هذا البحث هو القيام بدراسة تطبيقية لتحديد ادارة الجودة الشاملة ف شركات التشبييد السودانية . ان المساهمة الاساسية في هذا البحث تكمن في دفع المدراء للانتباه بصورة جادة لأهمية استغلال عوامل النجاح الحرجه لتطبيق ادارة الجودة الشاملة في شركات التشبييد الخاصة بيهم.

ان ادارة الجودة الشاملة قد حازت على قبول عالمي واسع النطاق . عموما البعض قد حقق نجاحا باهرا إلا ان البعض الاخر قد عان من فشل ذريع . ان العديد من المحاولات الفاشلة في تطبيق ادارة الجودة الشاملة تعود الى عدم فهمها او الى الطريقة التي عمدت المنظمة الى تطبيق ادارة الجودة الشاملة بها.

قدمت هذه الاطروحة نتائج استبيان عن عوامل النجاح الحرجه لتطبيق ادارة الجودة الشاملة في شركات التشبييد السودانية , وقد فشل تطبيق ادارة الجودة الشاملة في تلك الشركات وذلك من خلال وجود خلل في تطبيق عوامل النجاح الحرجه.

وقد اوصى الباحث باستخدام عوامل النجاح الحرجه وطرقها المتعددة للوصول الى الجودة في شركات التشبييد.

## Contents:

### Implementation of Total Quality Management Critical Success Factors in the Sudanese Construction Industry

Dedication.....	III
Acknowledgements.....	IV
Abstract.....	V
المستخلص.....	VI
Table Of Contents.....	VII
List of Figures.....	X
List of Tables.....	XIV
Abbreviations.....	XV

### CHAPTER 1: Introduction

1.1 Introduction.....	1
1.2 Problem Statement.....	2
1.3 Aims Of Study.....	2
1.4 Objectives Of Study.....	2
1.5 Research Hypotheses.....	2
1.6 Limitation Of The Study.....	2
1.7 Scope Of The Study.....	3
1.8 Methodology Of Data Collection.....	3

### CHAPTER 2: Literature Review

2.1 Background.....	4
2.2 Characteristics Of The Construction Industry.....	5
2.2.1 Definition.....	5
2.2.2 Construction industry in Sudan.....	5
2.3 Concept of Quality.....	6
2.4 Previous Studies.....	7
2.5 Critical Success Factors In TQM.....	17

2.5.1 Leadership.....	19
2.5.2 Vision And Plan Statement.....	20
2.5.3 Customer Focus.....	20
2.5.4 Human Resource Management.....	20
2.5.5 Supplier Quality Management.....	25
2.5.6 Process Control & Improvement.....	26
2.5.7 Communication Management.....	30
<b>CHAPTER 3 - Quality Management Systems</b>	
3.1 Introduction.....	32
3.2 Quality Management System.....	32
3.3 History.....	33
3.4 Structure.....	33
3.5 The right system characteristic.....	33
3.6 ISO 9000 rule in TQM implementation.....	33
3.7 ISO 9001 principles.....	34
3.8 Five reasons why companies dislike ISO 9000.....	34
3.9 Why ISO 9000 helps to make TQM work in the project.....	34
<b>CHAPTER 4</b>	
<b>Methodology -Analyses of adoption and Implementation TQM in the Construction Industry</b>	
4.1 Methodology of Research.....	35
4.1.1 Introduction.....	35
4.1.2 A brief description of the responding .....	35
4.2 Analyses of adoption and Implementation TQM in the Construction Companies.....	36
4.2.1 Knowledge about TQM.....	37
4.2.2 Leadership.....	43
4.2.3 Vision and plan statement.....	48
4.2.4 Customer focus.....	53
4.2.5 Human Resource Management.....	58
4.2.6 Supplier Quality Management.....	63
4.2.7 Process Control & Improvement.....	68
4.2.8 Communications Management.....	72
4.3. The numerical data.....	76
4.4 summary of main findings .....	81
4.4.1 Critical Success Factors .....	79

## CHAPTER 5

### Conclusion and Recommendations

5.1 Interdiction.....	82
5.2 Conclusion .....	82
5.3 Recommendations.....	84
5.4 Farther Studiers.....	84
5.5 Research benefits.....	84
References.....	85
Appendices.....	XVI

## List of figures

<b>Fig. no.</b>	<b>Title</b>	<b>Page no.</b>
Fig. 1	Research framework of this study	3
Fig. 2.	Deming's Quality Circle	9
Fig. 3.	Cause and Effect Diagram-	13
Fig. 4.	Comparison of some previous CSFs studies	16
Fig. 5.	The Critical Success Factors	18
Fig.6.	Continuous improvement cycle	27
Fig.7	Quality implementation means performance improvement	37
Fig.8	Quality implementation means cost increasing	37
Fig.9	Implementing Quality in your organization will increase profits	38
Fig.10	Appling Quality will attract customers to our company	38
Fig.11	Adopting TQM will improve projects planning	39
Fig.12	Customer Satisfaction is the main reason for increasing profits	39
Fig.13	On-site supervision helps us to apply quality	40
Fig.14	Redesign will decrease by implementing quality	40
Fig.15	material on-site submitting will improve by implementing quality	41
Fig.16	Final handover will be effective by implementing quality	41
Fig.17	On-site safety will improve by implementing quality	42
Fig.18	Personnel management of employees will improve by implementing quality	42
Fig.19	The company leadership Has a clear vision for priorities and roles	43
Fig.20	Leadership always working on reduce or eliminate of barriers	43
Fig.21	Leadership energizing motivation in your organization	44

Fig.22	Leadership concern with mobilization of resources required	44
Fig.23	Leadership encouraging employees to come up with new and better ways of doing things	45
Fig.24	Leadership concern with making regular meetings between different teams	45
Fig.25	Leadership implementing the open door policy	46
Fig.26	Leadership makes efforts to identify employees' strengths and weaknesses	46
Fig.27	Usually company leadership makes changes which are positive for the employees	47
Fig.28	Always the leadership make sure there is a budget for training	47
Fig.29	There is a clear vision and mission statement for the next 10 years	48
Fig.30	The projects that company had accomplished enhance the main objectives of the company	48
Fig.31	Quality performance is the best expression for company vision	49
Fig.32	Profitability is the main objective for the company	49
Fig.33	A good reputation is important for the company	50
Fig.34	Internal & external customer satisfaction is one of the main objectives for the company	50
Fig.35	Leading in IT using is one of company mission statement	51
Fig.36	The company always does SWAT analysis	51
Fig.37	It is very important to keep all employees aware of the company vision mission and objectives	52
Fig.38	Always we make a good presentation for our abilities to the customer	53
Fig.39	After dealing with customers we continuously communicating with them to get feedback	53
Fig.40	After dealing with customers we continuously communicating with them because the legislation issues	54
Fig.41	We always can understand customer needs	54
Fig.42	We have the ability to solve problems	55
Fig.43	Our responsiveness is so high	55

Fig.44	In the execution phase we Immediately do any customer's order	56
Fig.45	We keep customer aware with everything	56
Fig.46	We involve customer in solving problems	57
Fig.47	We have an employment system that satisfy employees	58
Fig.48	The employees have the tools and resources to do their job well	58
Fig.49	The employees have clearly defined quality goals	59
Fig.50	Keeping employees informed about matters affecting them is very important	59
Fig.51	Our employees were trained to satisfy the customers	60
Fig.52	There is a consistent and equitable system of rewards	60
Fig.53	The company assigns the employees in jobs according to their Skills & abilities	61
Fig.54	There is a number of employees who leave their jobs	61
Fig.55	The relationships between teams members are Great	62
Fig.56	The recognition that employees receive from doing their job is below their expectations	62
Fig.57	There are opportunities available to employees to express their ideas to upper management.	63
Fig.58	We usually use on-line computer order system to place our orders	63
Fig.59	There is arrangement between our company and suppliers on training programs	64
Fig.60	The company deals with many suppliers	64
Fig.61	Supplier chosen only according to his reputation	65
Fig.62	Supplier chosen according to facilities provided by him	65
Fig.63	Supplier chosen according to his products quality	66
Fig.64	Our supplier has a good timeliness of deliveries	66
Fig.65	Our supplier delivers the products without breakage	67
Fig.66	Our supplier concern with Phone answered immediately -- available lines	67

Fig.67	Our supplier has discounting policies	68
Fig.68	Usually you perform your job as processes	68
Fig.69	Usually you identify every process in your job and make appropriate preparation for it	69
Fig.70	A good planning for every process will Increase profits	69
Fig.71	A good planning for every process will decrease errors & rework	70
Fig.72	A good planning for every process will lead to customer satisfaction	70
Fig.73	A good planning for every process will reduce quality costs	71
Fig.74	you are aware about the TQM seven process measures	71
Fig.75	There is a good amount of quality communications in the company	72
Fig.76	At the regular meetings between you consultant and customer you can spend a long periods at it	72
Fig.77	There is an effective documentation system in your company	73
Fig.78	You are satisfied with the appropriateness of the documentation to your needs	73
Fig.79	The employees can reach documents easily	74
Fig.80	There is appropriate number of meeting inside the company	74
Fig.81	There is sound results come out of the meetings	75
Fig.82	Usually the employees at site make a regular reports to the company and the customer	75

## **List of Tables**

Tab. 4.1.	The numerical data.....	76
Tab. 4.2.	TQM Factors Mean.....	81

## Abbreviations

**QS** *Quality Systems*: a network of processes made up of elements.

**QMS** *Quality Management Systems*: a collection of business processes focused on achieving your quality policy and quality objectives

**QA** *Quality Assurance*: the planned and systematic activities implemented within quality system

**QC** *Quality Control*: the operational technique and activity to control and measure the characteristics of some standard.

**ANSI** *American National Standards Institute*: a private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States.

**ISO** *International Organization for Standardization*: a voluntary organization whose members are recognized authorities on standards, each one representing one country.

**TQM** *Total Quality Management*: the management approach that tries to achieve and sustain long-term organizational success

**CSFs** *Critical Success Factors*: the behavioral aspects of management styles or the human factors which emphasized on organization's total quality management.

**JUSE** *Union of Japanese Scientists and Engineers*

**ISA** *International Federation of the National Standardizing Associations*

**UNSCC** *United Nations Standards Coordinating Committee*

**Sudan University for Science and Technology**

**Graduate Studies- Civil Engineering Dept.**

**Construction Management**

**The Company Name:.....**

**Nature of your job (Contractor – Sub-contractor – Consultant - Supplier)**

---

**A)Knowledge about TQM**

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1.Quality implementation means performance improvement					
2. Quality implementation means cost increasing					
3. Implementing Quality in your organization will increase profits.					
4. Applying Quality will attract customers to our company					
5. Adopting TQM will improve projects planning					
6. Customer Satisfaction is the main reason for increasing profits					
7. On-site supervision helps us to apply quality					
8. Redesign will decrease by implementing quality					
9. material on-site submitting will improve by implementing quality					
10. Final handover will be effective by implementing quality					

11.On-site safety will improve by implementing quality					
12. Personnel management of employees will improve by implementing quality					

## B) Leadership

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. The company leadership Has a clear vision for priorities and roles					
2. Leadership always working on reduce or eliminate of barriers					
3. Leadership energizing motivation in your organization					
4. Leadership concern with mobilization of resources required					
5. Leadership encouraging employees to come up with new and better ways of doing things					
6. Leadership concern with making regular meetings between different teams					
7. Leadership implementing the open door policy					
8. Leadership makes efforts to identify employees' strengths and weaknesses					
9. Usually company leadership makes changes which are positive for the employees					
10. Always the leadership make sure there is a budget for training					

### C) Vision and plan statement

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. There is a clear vision and mission statement for the next 10 years					
2. The projects that company had accomplished enhance the main objectives of the company					
3. Quality performance is the best expression for company vision					
4. Profitability is the main objective for the company					
5. A good reputation is important for the company					
6. Internal & external customer satisfaction is one of the main objectives for the company					
7. Leading in IT using is one of company mission statement					
8. The company always does SWAT analysis					
9. It is very important to keep all employees aware of the company vision , mission and objectives					

### D) Customer focus

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. Always we make a good presentation for our abilities to the customer					
2. After dealing with customers communicating with we continuously them to get feedback					

3. After dealing with customers we continuously communicating with them because the legislation issues					
4. We always can understand customer needs					
5. We have the ability to solve problems					
6. Our responsiveness is so high					
7. Always we deal with customer with Courtesy & Friendliness					
8. In the execution phase we Immediately do any customer's order					
9. We keep customer aware with every thing					
10. We involve customer in solving problems					

### **E) Human Resource Management**

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. We have an employment system that satisfy employees					
2. The employees have the tools and resources to do their job well					
3. The employees have clearly defined quality goals					
4. Keeping employees informed about matters affecting them is very important					
5. Our employees were trained to satisfy the customers					
6. There is a consistent and equitable system of rewards					
7. The company assigns the employees in jobs according to their Skills & abilities					

8. There is a number of employees who leave their jobs					
9. The relationships between teams members are Great					
10. The recognition that employees receive from doing their job is below their expectations					
11. There are opportunities available to employees to express their ideas to upper management.					

#### **F) Supplier Quality Management**

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. We usually use on-line computer order system to place our orders					
2. There is arrangement between our company and suppliers on training programs					
3. The company deals with many suppliers					
4. Supplier chosen only according to his reputation					
5. Supplier chosen according to facilities provided by him					
6. Supplier chosen according to his products quality					
7. Our supplier has a good timeliness of deliveries					
8. Our supplier delivers the products without breakage					
9. Our supplier concern with Phone answered immediately -- available lines					
10. Our supplier has discounting policies					

## G) Process Control & Improvement

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. Usually you perform your job as processes					
2. Usually you identify every process in your job and make appropriate preparation for it					
3. A good planning for every process will Increase profits					
4. A good planning for every process will decrease errors & rework					
5. A good planning for every process will lead to customer satisfaction					
6. A good planning for every process will reduce quality costs					
7. you are aware about the TQM seven process measures					

## H) Communications Management

	Strongly agree	Agree	Neutral	Strongly disagree	Disagree
1. There is a good amount of quality communications in the company					
2. At the regular meetings between you consultant and customer you can spend a long periods at it					
3. There is an effective documentation system in your company					
4. You are satisfied with the appropriateness of the					

documentation to your needs					
5. The employees can reach documents easily					
6. There is appropriate number of meeting inside the company					
7. There is sound results come out of the meetings					
8. Usually the employees at site make a regular reports to the company and the customer					