

الجمهورية العربية السورية
جامعة تشرين

Sudan University of Science and Technology
College of Graduates Studies
Department of Civil Engineering

ASSESSMENT AND DEVELOPMENT OF QUALITY MANAGEMENT SYSTEM IN SUDANESE CONSTRUCTION INDUSTRY

Presented by:

Najwan A. Fattah Abu El Wafa Salih

B.Sc. Honors in Architecture. University of Khartoum

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Civil Engineering (Construction Management)

August 2004

Acknowledgement

I would like to extend my profound gratitude to the almighty Allah, for His mercies and His protection through out my course year. I pray and hope that His guidance will always be with us all – Amen.

I want to extend my appreciation and thanks to my able supervisor – Dr. Bakri A. Raheem Gaafar, for his patience and professional advice.

Also, special gratitude to my husband Al Medani Basheer for his moral support, and his assistance.

And special thanks to my parents, my brother, and sister for their moral supports, I thank you all and wish Allah's blessing to you all.

Abstract

The primary purpose of TQM is to provide excellence in customer satisfaction through continuous improvements of products and processes by the total involvement and dedication of each individual who is in any way a part of that product/process. It is a structured approach to improvement. If correctly applied, it will assist a construction company in improving its performance.

For many successful companies, TQM is more than a philosophy; it's a way of life. It's ingrained in the way people do their jobs and how they relate with each other and with their customers. TQM is basic. It's the individual's commitment to continually improving everything that is done and how it's done.

There are a number of problems in the construction industry in Sudan caused by bad management, and the situation seems to be getting worse. Projects are frequently late, over budget and suffer from poor workmanship and materials. There is no a clear method for measuring construction organizations' performance and knowing the defects.

This study investigates the adoption and implementation of TQM in construction industry as a first step towards the knowledge and perception of quality by construction organizations.

This study aims at recognizing TQM tools and techniques and showing the tangible benefits of using them in construction industry.

It develops an example “ how to measure” for the measurement and evaluation of the quality performances of the construction processes as a

tool for continuous improvement and this is clarified in using cause- and – effect diagram for analyzing customer dissatisfaction causes.

The last part of this study is dedicated to El- Nasr construction and housing Company as an example of Construction Company goes step further than the other companies in developing its quality system and has an ISO certificate and showing the benefits they have from applying this quality system.

ملخص الدراسة

السبب الأساسي لإدارة الجودة الشاملة هو الوصول لرضا المستهلك أو الزبون وقناعته عبر التطوير المستمر للمنتجات والخدمات و ذلك بمشاركة الجميع، وإذا تم تطبيقها بصورة صحيحة نصل إلى شركة تشييد ناجحة في تطوير وتحسين أدائها.

تعد إدارة الجودة الشاملة لعدة شركات ناجحة أكثر من فلسفة، بل هي طريقة للحياة. لأنها تغرس في الأفراد طريقة عملهم وتوضح العلاقة التي تربطهم ببعضهم البعض ويزيائهم. وتعتبر إدارة الجودة إلزام للفرد للتطوير المستمر في كل شيء منجز وطريقة إنجازة.

هنالك عدة مشاكل في صناعة التشييد في السودان ويرجع ذلك إلى سوء الإدارة التي تؤدي إلى التأخير في تسليم المشاريع وزيادة ميزانيتها وسوء العمالة والمواد. وليست هنالك أيضاً طريقة واضحة لقياس أداء شركات التشييد ومعرفة أماكن القصور لمعالجتها.

هذه الدراسة تهدف في المقام الأول لمعرفة مدى إلمام وتقبل شركات التشييد لمفهوم الجودة عامة. وتهدف أيضاً لتوضيح تقنيات وأدوات تطبيق إدارة الجودة الشاملة، وعرض الفوائد لاستخدام مثل هذه التقنيات في صناعة التشييد.

ومن أهدافها أيضاً المحاولة للوصول إلى نموذج أو طريقة لقياس وتقييم عمليات التشييد كأداة للتطوير المستمر وهذا يتضح في استخدام ال cause-and-effect diagram لتحليل أسباب ومناطق عدم رضا الزبون في أداء الشركات.

الجزء الأخير من الدراسة يختص بشركة النصر للإسكان والتشييد كمثال لشركة تشييد خطت خطوات أبعد في تطوير نظام الجودة الخاص بها وحصولها على شهادة ال ISO. وتوضيح الفوائد التي جنتها من تطبيق هذا النظام.

List of tables

Table (3.1) 47
Table (3.2) 48
Table (6.1) 82

List of figures

Fig.(2.1)	17
Fig.(2.2)	20
Fig.(2.3)	26
Fig.(2.4)	28
Fig.(3.1)	38
Fig.(3.2)	39
Fig.(3.3)	40
Fig.(3.4)	40
Fig.(3.5)	42
Fig.(3.6)	43
Fig.(3.7)	46
Fig.(4.1)	50
Fig.(4.2)	51
Fig.(4.3)	52
Fig.(4.4)	54
Fig.(4.5)	55
Fig.(5.1)	60
Fig.(5.2)	60
Fig.(5.3)	61
Fig.(5.4)	61
Fig.(5.5)	62
Fig.(5.6)	63
Fig.(5.7)	63
Fig.(5.8)	64
Fig.(5.9)	64
Fig.(5.10)	65
Fig.(5.11)	66
Fig.(5.12)	66
Fig.(5.13)	67
Fig.(5.14)	67
Fig.(5.15).....	67
Fig.(5.16)	68
Fig.(5.17).....	68
Fig.(5.18)	69
Fig.(5.19)	70
Fig.(5.20)	70
Fig.(5.21)	71
Fig.(5.22)	71

Fig.(5.23) 72
Fig.(5.24) 72
Fig.(5.25) 73
Fig.(5.26) 73
Fig.(5.27) 74
Fig.(5.28) 74
Fig.(5.29) 75
Fig.(5.30) 75
Fig.(5.31)..... 76

<u>TABLE OF CONTENTS</u>	
Acknowledgement	2
Abstract	3
List of Tables	6
List of Figures	7
<u>CHAPTER ONE</u>	
1. INTRODUCTION	
1.1 General Introduction	12
1.2 Research Problem	13
1.3 Research objectives	13
1.4 Research Hypothesis	14
1.5 Research Methodology	14
1.6 Research Limitations	14
<u>CHAPTER TWO</u>	
2. LITERATURE REVIEW	
2.1 Background	15
2.2 Terminologies	15
2.2.1 Quality	15
2.2.2 Quality Systems	15
2.2.3 Quality Assurance	15
2.2.4 Quality Control	16
2.2.5 Quality Management	16
2.2.6 Total Quality Management	16
2.3 Quality Evolution	17
2.4 Characteristics of the construction projects	19
2.5 TQM Benefits	23
2.6 TQM Principles	24
2.7 Critical Success Factors in TQM	24
2.7.1 Customer Focus	24
2.7.2 Process Improvement	26
2.7.3 Continuous Improvements	27
2.8 The philosophies of the leading sages:	29
2.8.1 W. Edwards Deming's	29
2.8.2 Juran	32
2.8.3 Crosby	33
2.8.4 Feigenbaum	34
2.9 Conclusion	36
<u>CHAPTER THREE</u>	
3. QUALITY IMPROVEMENT TECHNIQUES	
3.1 Overview of continual improvement	37
3.2 Data Types and Summaries	38
3.3 Graphs for Numeric Data	38
3.3.1 Histograms	38
3.4 Graphs for Categorical Data	39

3.4.1 Bar chart	39
3.4.2 Pie Chart	40
3.4.3 Pareto Analysis	40
3.5 Flowcharts	40
3.6 Cause and Effect Diagram (Fishbone Diagram)	40
3.7 Check-sheet	41
3.8 Checklist	42
3.9 Scatter Diagram	42
3.10 The Seven – Step Method for continuous improvement	42
3.10.1 The Seven Steps	43
3.10.2 Relation to the PDCA Cycle	43
3.11 Development and implementation of a quality system	45
3.11.1 Introduction	46
3.11.2 Elements of a quality system	46
3.11.3 Development of a quality system by project phase and responsibilities	47
3.12 Conclusion	48
<u>CHAPTER FOUR</u>.....	
4. Using Cause- and – Effect Diagram in analyzing Client Dissatisfaction Causes for Improvement	
4.1 Identification of the client dissatisfaction causes	49
4.2 The critical problems related to client dissatisfaction	49
4.2.1 Fail in implementing Planning	49
4.2.2 Lack of Attention to Client Priorities	50
4.2.3 Poor Scheduling	51
4.2.4 Processing Change Orders	53
4.2.5 Poor Delivery	54
4.3 Sub- causes for main causes of client dissatisfaction	55
4.4 Improvement of the dissatisfaction areas	56
4.5 Conclusion	57
<u>CHAPTER FIVE</u>	
5. Adoption and Implementation of TQM in the Construction Industry	
5.1 Questionnaire (1)	59
5.2 Analysis of questionnaire (1)	59
5.2.1 Knowledge of TQM	62
5.2.2 Perception of quality	65
5.2.3 Data acquisition method	65
5.2.4 Quality in your organization	69
5.2.5 Training	75
5.2.6 Others	76
5.3 Conclusion and Discussion	77
5.3.1 Knowledge of TQM	77
5.3.2 Perception of quality	77
5.3.3 Data acquisition method	78
5.3.4 Quality in your organization	78

5.3.5 Training	78
5.3.6 Barriers to implementing TQM	79
CHAPTER SIX.....	
6. Development and Implementation of a Quality System (El-Nasr Construction and Housing Company)	
6.1 Introduction	80
6.2 Implementation of a Quality System in the company	80
6.2.1 Elements of quality system	80
6.2.2 Development of a quality system by project phase and responsibilities	83
6.2.3 Benefits of implementation of a quality system in the company	83
6.3 Conclusion	84
CHAPTER SEVEN.....	
7. Conclusion and Recommendations	
7.1 Phase 1	85
7.2 Phase 2	86
7.3 Phase 3	88
List of References	
Appendix	