

EVALUATION OF FACTORS AFFECTING THE QUALITY OF CONSTRUCTION FOR RESIDENTIAL PROJECTS

Alpa S.Maisuria¹, Dr. Neeraj D. Sharma², Mr. Vyom B. Pathak

M.E. Student, Civil Eng. Dept., SNPIT&RC, Umrakh, Bardoli, Gujarat, India¹

Head of Civil Eng. Dept. & Assistant Prof. of SNPIT&RC, Umrakh, Bardoli, Gujarat, India²

Assistant Prof. & Research Scholar of SNPIT&RC, Umrakh (GTU), Bardoli, Gujarat, India³

Abstract: Quality Management Systems (QMS) are being operated in some sectors in Turkey but it is rare to meet these systems in construction industry. There are many hindrances that make it difficult to apply these systems effectively due to the nature of construction and therefore, no objective way of measuring the effectiveness of these systems exists in construction industry. This study aims to light the way for the studies and further researches in finding a way to measure the effectiveness of QMS. Matrix model will develop as a way to measure the effectiveness of QMS. Towards this goal, firstly a questionnaire survey will be conducted to a sample of construction firms that have or have not passed through these systems. Appraising some findings from the survey results; the number of QMS operating firms and their way of implementing QMS factors are determined by using the Statistical Method These principles are evaluated on a case study by means of developing quality measurement matrices for QMS operating firms and different results conclude.

Keywords: Quality management systems; Effectiveness; Construction industry; Quality matrix analysis.

1. INTRODUCTION

Quality has become a very popular subject in recent years due to conceptual changes in the industry. Quality and quality systems are topics which have been receiving increasing attention worldwide. The product in any industry should be manufactured to a required standard, one that provides customer satisfaction and value for money. Quality is one of the critical success factors in construction industry. The need for achieving quality of the finished product in the building construction is very important. The high cost of buildings makes it necessary to ensure quality of the finished product. Quality is an essential element for sustainability and customer satisfaction. In construction projects, quality performance is considered as vital for client satisfaction. This study is intended to provide clients, project managers, designers, and contractors with necessary information needed to better manage the quality of a construction building projects by identify the factors that affect process quality of construction projects and to rank them by degree of importance. Quality can be defined as consistently 'meeting' or 'Exceeding' the customer expectations', or 'compliance with customer specification'. No matter what definition we follow for quality, it becomes very

complex when we try to put it into actual practice. Developing a quality system is the first step towards improving quality in construction industry.

For the implementation of quality management in construction projects, the concepts of quality planning (identification of quality standards), quality assurance (evaluation of overall project performance) and quality control (monitoring of specific project results). Several tools and techniques will identified as part of the implementation process, like benefit-cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts, pareto diagrams, statistical sampling, flow-charting and trend analysis.

2. OBJECTIVES

- To find the most affecting factor to quality management system.
- To identify the most crucial factor which affect Quality Management System and Provide reliability for the reputation of firms.

3. QUALITY MANAGEMENT SYSTEM

- A Quality Management System in its basic concept is quite simple. It seeks to: Recognize the external quality related requirements specified in Licenses to Trade, guidelines, specified customer requirements, and the chosen management system standard.
- Ensure that all [requirements](#) have been documented within the management system in the appropriate location in terms of defined specific system requirements.
- Confirm that employees receive [applicable training](#) in the quality system requirements.
- Outline performance processes, where applicable, to the quality system requirements.
- Produce records or evidence that system requirements have been met.
- Measure, monitor and report the extent of compliance with these performance procedures.
- Continually monitor and analyze changes to the requirements and confirm that all changes are reflected in changes to the specific requirements when necessary.
- [Execute the audit](#) and analyze the system processes and correct them when necessary.
- Include processes that will help continually improve the quality system.

4. RESEARCH METHODOLOGY

- A questionnaire survey is performed on random, different size, architectural and contractor firms in different cities.
- The evaluation is based on achieving prescribed project objectives just from the respondents' point of view.
- Apprising the number of the firms operating QMS and the implementation rate of QMS principles from the questionnaire results, matrix model develop.
- Evaluating the quality matrix for the success of Quality Management System.

5. IDENTIFIED FACTOR

Main Factor	Sub Factor	Description
	Requirements for design	To Starting any Construction Project. Design must be require as per Codes and Standards. So From
	Duration	
	Experience and knowledge	
	Conformance to codes and standards	

Design	designer's responsibility	Design Calculate the Estimated cost of Project.
	Coordination and communication	
	Adherence to specifications	
	Bill of quantity	
Owner	organization (Public or Private)	Owner's Organization is Public or Private. Owner's satisfaction regarding quality of construction works
	satisfaction	
	Selection Criteria for Stakeholder	
	Change in Design	
Contractor	Dispute with Stakeholder	A person or firm that undertakes a contract to provide materials or labour to perform a service or do a job.
	Experience of Contractor	
	planning	
	Providing Facility for material procurement	
Execution	execution system	Using integrated execution system through execute the project.
	Testing	
	Clear procedure	
	Preparing and using shop drawings	
	undocumented construction	
	Unclear specifications	
	Improper construction technique	
	Change order	
Limited duration		
Supervision	Knowledge of supervisor	Helping to complete the project on time and on budget, while meeting all relevant regulations and quality standards.
	Lack of timely supervision and inspection	
	Coordination between the contractor and the supervisor	
Labour	Unskilled labors	The skilled labour in the construction industry generally refers to those who were being trained Normally the works requiring the labour who has high degree of manual skill. The labour can be considered as a skilled labour if they are able to fulfill the requirement.
	Using motivation system	
	Training courses for labor	
	Income level and wages of labor	
Material	Material checking and testing before usage	Building material is any material which is used for construction purposes. Many naturally occurring substances, such as clay, rocks, sand, and wood, even twigs and leaves, have been used to construct buildings.
	Specification related to Quality	
	comprehensive material management system	
	Cooperation between contractor and material suppliers	
	Availability of good quality construction materials	
	storage and handling system	
Equipment	Availability of equipment	They are also known as heavy machines, heavy trucks, construction equipment, engineering equipment, heavy vehicles, or heavy hydraulics.
	Equipment management system	
	Measurement of equipment productivity	
	Good utilization of equipment	
	Equipment maintenance	

Project	Scope of the project (type and nature)	Set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations
	Location of the project	
	Site access	
	Period of the project	
Site Layout	Area of Site	Site layout is large, well organized, and clean. It has storage areas for materials
System	Software and computer applications	A set of things working together as parts of a mechanism or an interconnecting network; a complex whole.
	Implement quality control and assurance system	
	Time schedule	
	cost control system	
	Implementing a safety program	
Site Staff	Cooperation between Supervision and Contractor's staff	The entire group of employees who work at a Project. And to help the complete the Project within Time.
	Understanding of contract administration by Supervision	
	Skill and experience of Supervision staff	
	Skill and experience of Contractor's staff	
Financial Issue	cash flow	Construction projects can suffer from preventable financial problems.
	Political Hindrances	
	Non-delay of interim payments	
Environment	Socio-economic environment	In social science, the term built environment refers to the man-made surroundings their supporting infrastructure, such as water supply or energy networks.
	Stability of Political environment	
	The relations between construction industry and other industries	

6. RESPONDENT DETAIL

Total 270 questionnaires were distributed to different respondents in Vyara, Surat, and Valsad. List of the stakeholders (270) whom questionnaire was distributed. They were sent the reminder for sending their feedback after 10 to 15days of sending the questionnaire. This study received 142 responses. So, the response rate in this research is 51%. Due to constraint of time limit, this study could not collect the responses as per sample size requirement. The list of respondents is shown in below tables.

Sr. No.	Respondent	Questionnaire Distributed	Responses Returned	Percentage of Responses
1	Developer	40	21	52.5
2	Engineer	80	41	51.25
3	Contractor	150	80	53.33
	Total	270	142	52.36

Table: 1 Percentage of Questionnaire distributed and responses received

7. DATA ANALYSIS

Following are the factors which affect according to various respondents like Engineer, Developer and Contractor point of View. Finding the Top 15 Factor From the Analysis of Questionnaire.

Sr. No.	Factors	Average
1	checking and testing	83.94
2	Area of Site	82.82
3	Requirements for design	82.39
4	Availability of good quality materials	82.25
5	Scope of the project	82.11
6	Specification Related to Quality	81.97
7	execution system	81.41
8	Experience of Contractor	80.42
9	material management system	79.44
10	Testing	78.87
11	Availability of equipment	78.73
12	Cash Flow	77.18
13	Clear procedure	77.04
14	cost control system	76.06
15	Preparing and using shop drawings	75.63

ACKNOWLEDGMENT

The author thankfully acknowledge to Mr. J.N.Patel, Chairman Vidyabharti Trust, Mr. K.N.Patel, Hon. Secretary, Vidyabharti Trust, Dr. H.R.Patel, Director, Dr Y.C. Rotliwala, Principal, Dr. Neeraj Sharma, Head of Civil Engineering Department, Mr. Vyom B. Pthak ,Asst. Prof & Research scholar, S.N.P.I.T.&R.C, Umrah, Bardoli, Gujarat, India for their motivational & infrastructural supports to carry out this research.

REFERENCES

- [01] Ahmet Ozats, Serra S.Guzelsoy, Mehmet Tekinkus,” Development of quality matrix to measure the effectiveness of quality management systems in Turkish construction industry”, *Building and Environment* 42 (2007) 1219–1228.
- [02] Alarcon, L.F., & Ashley, D.B. (1992). *Performance modeling: A methodology for evaluating project execution strategies* (No. Source document 80). Austin, TX: Construction Industry Institute (CII).
- [03] Al-Nakeeb AR, Williams T, Hibberd P, Gronow S.,” Measuring the effectiveness of quality assurance systems in the construction industry.” *Property Management Journal* 1998;16(4):222–8.
- [04] Chini AR, Valdez HE. *ISO 9000 and the US Construction Industry. Journal of Management in Engineering* 2003;19(2): 69–77.
- [05] D.Ashokkumar,”Study of Quality Management in Construction Industry”, *Volume 3, Special Issue 1, February 2014*.
- [06] Hoyle D. *ISO 9000 Quality systems handbook*. Oxford: Butterworth Heinemann Ltd.; 1995. p. 415.
- [07] Husband SG. *Innovation in advanced professional practice: doctor of technology*. Report No. 2. Faculty of Science and Technology, Deakin University, Geelong, Australia, 1997

- [08] José Manuel Conde Hernad, Cristina González Gaya,” Methodology for implementing Document Management Systems to support ISO 9001:2008 Quality Management Systems “Procidia Engineering 63(2013) 29-35.
- [09] Latham M. Constructing the team: joint review of procurement and contractual arrangements in the United Kingdom Construction Industry. Final Report, 1994. p. 80.
- [10] Peter Hoonakker, Pascale Carayon, Todd Loushinec,” Barriers and benefits of quality management in the construction industry: An empirical study”, Vol. 21, No. 9, September 2010, 953–969.
- [11] Quality Liaison Group. Constructing quality: a strategy for quality in construction. Department of the Environment, 1995.