

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

Existing Project Management Systems and Its Effect on Total Quality Control in Major Construction Projects

Gangainathan A¹, Anandh S²

PG Student, Department of Civil Engineering, SRM University, Chennai, India¹

Assistant Professor (OG), Department of Civil Engineering, SRM University, Chennai, India²

ABSTRACT: Quality is the prime factor to be concerned more in the construction to satisfy the customer and better output. The purpose of the project is to identify the factors affecting quality and to eliminate the problems due to lack of project management. In this study, the questionnaire survey has been conducted among the professionals in construction industry to know about the problems affecting quality. Quantitative analysis has been done using Student's t-test on the results of the survey and issues are ranked in order.

KEYWORDS: Quality; Project Management; Questionnaire Survey; Quantitative Analysis; Student's t-test

I. INTRODUCTION

Quality control is an iterative process, performed throughout project's life and involves monitoring & controlling project results to determine whether they comply with defined quality standards outlined in the Quality management practice and then identifying ways to eliminate causes of unsatisfactory results. To more easily manage quality within the project, especially large complex projects, it is a common practice to define quality measurement threshold that identify when and what corrective action may be needed to eliminate causes unsatisfactory results.

Quality standards for the projects are defined in the Quality management practice and should include standards for project processes, product functionality, regulatory compliance requirements, project deliverables or project management performance. The practice of QC focuses on area such as,

- Prevention means keeping errors out of process
- Inspection means keeping errors out of hands of customer
- Tolerance means degree to which results are within acceptable range

The main outcomes of quality control activities listed below

- Acceptable decision means whether the accepted or rejected
- Rework means the action taken to rejected products
- Progress adjustments mean the action taken to correct or prevent future quality problems

II. AIM & OBJECTIVES

The main aim of the project is to study the effect of project management in the construction projects. It can be done by achieving the following objectives

- To investigate the adoption and implementation of Quality Management System in the construction industry
- To analyse the major factors affecting quality of construction projects
- To minimize the problems due to lack of Project Management on Quality Control in construction projects

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

III. LITERATURE REVIEW

D.Ashokkumar (2014) discusses the importance and factors that affects the quality management in the execution (construction) phase. The project also includes visiting of some construction companies and conducts the questionnaire survey, then analyse the difficulties (major factors) and the cost variance due to quality defect in quality management and suggests some proactive measures for the improvement of quality in the execution phase of construction projects.

Leanne Bateman (2012) describes about application of tools and techniques of project management in manufacturing industry to ensure quality standard and timely manufacturing of product. This can be achieved primarily through the techniques of planning, scheduling, risk management, quality management, quality assurance and quality control, and lessons learned.

Nashwan Mohammed Noman Saeed, Awad Sad Hasan (2012) examines the relationship between TQM and project performance. The framework had been developed to demonstrate the relationship through examining the effects of nine TQM constructs on three element levels of project performance. The results showed that the proposed hypothesis has positive effects on teamwork satisfaction, quality of construction project implementation, client satisfaction and construction project performance. It had recommended to allocate more amounts for training programs, organizing more training programs and giving rewards & freedom on decision making for employees.

Ahmed S. Agha (2011) pointed out the latest studies which focused on increase the business quality through implementing TQM in construction industry and its suitable applications in the different phases of project construction such as Planning & develop a conceptual design of small and large scale projects and Construction and implementation of small and large scale projects. The conclusion made was the reason behind the late arrival of TQM in construction industry is that the construction professionals unaware of the TQM principles and techniques. To bring these benefits to the construction industry, more efforts must be made to spread the culture of TQM among the construction professionals and TQM courses must be in the engineering under graduated programs.

Raji Al-Ani, Firas I. Al-A dh mawi (2011) have proposed Quality Management System for Construction Site aiming two things such that to raise the quality level of works in construction projects and to improve the construction staff consciousness about quality management concepts and its importance for improving the quality of construction works.

Peter Hoonakker, Pascale Carayona et. al (2010) discuss the problems of defining quality in the construction industry, examine possible benefits of implementing quality and look at barriers to quality implementation in construction. Data collected through interviews and questionnaire surveys from contractors and results show that contractors understand the potential benefits of quality implementation but that there are also many barriers for implementation. However, the change is a slow and often painful process and that much effort is required to implement quality in construction industry.

Ying Cao (2010) found out the shortcoming of quality management in construction projects to help them strengthen the quality management system and raise the overall level of quality management. The theoretical data about quality management system of the company was learnt, and the work experience on the construction site was required. Both the method in application of the company and the methods consulted from Internet were researched and applied. A systematic analysis and summary were made for the quality management of construction for the company. The suggestions for the quality management and control of construction project were given to improve their quality management.

Adnan Enshassi, Sherif Mohamed, Saleh Abushaban (2009) discussed about many problems and complex issues in construction projects at Gaza. The objective of the paper is to identify the factors affecting the performance of local construction projects. Through questionnaire survey of 120 people, findings indicate that all 3 groups agree that the most important factors affecting project performance are delays because of borders/roads closure, unavailability of resources, low level of project leadership skills, escalation of material prices, unavailability of highly experienced and qualified personnel and poor quality of available equipment and raw materials. Based on these findings, the paper recommends that project owners must work collaboratively with contractors and facilitate regular payments in order to overcome delays, disputes and claims, project participants should actively have their input in the process of decision-making and continuous coordination and relationship between project participants are required through the project life cycle in order to solve problems and develop project performance.

David Joaquin, Fernando Hernandez, et. al (2008) has developed a new framework to help build quality by incorporating manufacturing improvement methods suited to construction projects. The framework includes quality

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

policy, product & service quality, the construction process, people & their culture and quality improvement methods. A set of guidelines for implementing the framework's method was prepared

IV. QUESTIONNAIRE SURVEY

The purpose of the questionnaire survey is to obtain the views of professionals regarding the Total Quality Control in the construction industry. The main objective of the survey is to identify the range of the factors affecting quality control in project. The questionnaire survey has been conducted among 35 construction companies and collected their opinions about the factors disturbing the quality of the construction projects.

TABLE I. RESULTS OF THE QUESTIONNAIRE SURVEY

Sl. No.	Factors affecting the quality of the project	Standard deviation	Sample mean	Population mean
A	Design Factors			
1	Unclear client's idea for design	0.90	2.20	1.85
2	Completion duration for designing activity	0.90	2.31	1.96
3	Experience & knowledge of designers	0.83	3.11	2.79
4	Lack of standards for determination of designer's responsibility	1.01	1.74	1.35
5	Coordination & communication among design parties	0.79	2.97	2.67
6	Low quality drawing specification	1.36	2.26	1.73
7	Conflict between architect and structural designer	1.44	2.57	2.00
8	Innovation or experimental touch on designing	0.68	1.66	1.39
9	Modification in drawings	1.24	2.74	2.25
10	Usage of Green building concept	1.28	1.89	1.39
B	Contractual Factors			
11	Co-operation between parties involved	1.00	2.23	1.84
12	Type of contract between the parties	1.11	2.20	1.77
13	Previous relationship between parties	0.93	3.11	2.75
14	Conditions of contract	1.11	2.97	2.54
15	Quality of technical specifications	1.03	2.66	2.26
16	Influence of incentives or penalty	1.25	2.97	2.48
C	Material Factors			
17	Material management system	1.09	2.43	2.00
18	Relationship between contractor and material supplier	1.29	1.89	1.39
19	Delay in lead time	1.12	2.8	2.36
20	Storage facility at site	1.26	2.34	1.85
21	Construction materials monopoly	1.30	1.94	1.43
22	Wastage of materials	1.17	1.91	1.45
23	Inventory model adopted	0.94	2.23	1.86
24	Import of material at bulk amount	0.95	2.51	2.14
D	Executional Factors			
25	Labour management system	1.20	2.46	1.99
26	Experience of labour	1.20	2.74	2.27
27	Training system adopted for labours	1.08	2.11	1.69
28	Supervision of works	1.11	2.57	2.14
29	Income of labours	0.99	2.20	1.81
30	Recruitment system of labour	1.22	2.43	1.95
31	Insurance scheme for labours	1.25	1.89	1.40

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

32	Leadership	1.13	2.8	2.36
33	Labour productivity	1.04	2.74	2.30
34	Accommodation facility	1.07	1.71	1.29
35	Safety system at site	0.80	2.74	2.43
E	Equipment Factors			
36	Selection of equipment	1.17	2.86	2.40
37	Equipment management system	0.95	2.46	2.09
38	Utilization of equipment	0.90	2.69	1.53
39	Maintenance of equipment	0.91	2.86	2.50
40	Measurement technique of productivity	0.85	2.60	2.22
41	Equipment service	1.05	2.63	2.22
42	Indian made equipment (local made)	1.11	2.06	1.63
F	Sub-Contractor Factors			
43	Procedure of selection of subcontractor	1.08	2.23	1.81
44	Co-operation of subcontractor with main contractor	0.87	2.86	2.52
45	Evaluation system for performance	1.09	2.26	1.83
46	Safety regulations followed by sub-contractors	0.95	2.91	2.54
G	Ownership Factors			
47	Nature of client(individual/entity)	1.09	2.57	2.14
48	Quick response in decision making	1.03	2.66	2.26
49	Payment of money	0.87	3.00	2.66
50	Freedom to the contractor	1.07	2.49	2.07
51	Solving disputes (arbitration)	1.23	3.03	2.55
H	Contractor Factors			
52	Efficiency of contractor	1.07	2.57	2.15
53	History of works	0.75	3.29	3.00
54	Manpower	0.88	2.34	2.00
55	Choice of technology	0.93	2.89	2.53
56	Financial stability of contractor	0.70	3.46	3.15
I	Environmental Factors			
57	House-keeping of site	0.99	2.29	1.90
58	Climatic condition	0.82	2.66	2.34
59	Air quality	0.95	2.46	0.95
60	Noise pollution	0.91	2.71	2.35
61	Working atmosphere	0.89	2.74	2.39
62	Traffic issues	1.35	2.86	2.33

V. QUANTITATIVE ANALYSIS

Quantitative Analysis is the process of presenting and interpreting numerical data. It includes the measures of central tendency (averages - mean, median and mode) and measures of variability about the average (range and standard deviation). These give the reader a 'picture' of the data collected and used in the research project. It is also used for statistical tests, helping deductions to be made from the data collected, to test hypotheses set and relating findings to the sample or population. In this project, it has been done through Student's t-test.

A t-test is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. It can be used to determine if two sets of data are significantly different from each other, and is most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were known. When the scaling term is unknown and is replaced by an estimate based on the data, the test statistic (under certain conditions) follows a Student's t distribution. Here we are using the t-test formula to estimate the

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

population mean from the sample mean of the Questionnaire survey. So that we derived the population mean formula from t-test.

$$\mu = x - t [s / \text{sqrt} (n)]$$

where μ - population mean
 x - sample mean
 t - t value (calculated from t- table)
 s - standard deviation of the sample
 n - number of samples

VI. MAJOR ISSUES IN CONSTRUCTION PROJECTS

From the questionnaire survey, the major factors influencing the quality of the project are listed below. The findings are the done based on the ranking of the mean calculated in the survey results. These are the top ranked issues considered to be handled properly to achieve the good results.

1. Financial instability of the contractor
2. History of works
3. Payment of money
4. Co-ordination among designing parties
5. Conditions of contract
6. Solving disputes(arbitration)
7. Safety procedure followed by sub-contractor
8. Relationship of subcontractor with main contractor
9. Maintenance of equipment
10. Incentives or penalties

VII. CONCLUSION

The factors influencing the quality of the construction are included in the questionnaire and circulated among 35 construction companies to get their views on the major issues in the construction regarding the quality of the project. After the completion of survey, the results are analysed using the Student's t-test to find out the mean so that we can come to know about the major issues going on regarding quality of construction projects. Once we effectively handle these issues, the high degree of quality is achieved.

REFERENCES

- [1] Adnan Enshassi, Sherif Mohamed, Saleh Abushaban, "Factors affecting the performance of construction projects in the Gaza strip", Journal Of Civil Engineering And Management, pp. 269-280, 2009.
- [2] Ahmed S. Agha, "Total Quality Management in Construction Industry", Middle-East Journal of Scientific Research, 2011.
- [3] Akarakiri, Joshua Babatunde, "An Evaluation of the effects of Project Management Techniques on the Performance of the Textile industry in South-Western Nigeria", Transnational Journal of Science and Technology, 2011.
- [4] David Joaquin Delgado Hernandez, Elaine Aspinwall, "A framework for building quality into construction projects", Total Quality Management, pp. 1013-1028, 2008.
- [5] D.Ashokkumar, "Study of Quality Management in Construction Industry", International Journal of Innovative Research in Science, Engineering and Technology, pp. 36-43, 2014.
- [6] Leanne Bateman, "The Benefits of Applying Project Management in the Manufacturing Industry", Master of Science in Management of Projects and Programs, Brandeis University, pp. 1-8, 2012.
- [7] Nashwan Mohammed Noman Saeed and Awad Sad Hasan, "The Effect of Total Quality Management on Construction Project Performance Case Study: Construction Firms in Yemen", Journal of Science & Technology, pp 11-30, 2012.
- [8] Peter Hoonakker, Pascale Carayona and Todd Loushinec, "Barriers and benefits of quality management in the construction industry: An empirical study", Total Quality Management, pp 953 - 969, 2010.
- [9] Raji Al-Ani and Firas I. Al-A dh mawi, "Implementation of Quality Management Concepts in Managing Engineering Project Site", Jordan Journal of Civil Engineering, pp. 89-106, 2011.
- [10] Ying Cao, "Quality Control of Construction Projects", Thesis, Savonia University of Applied Sciences, Business and Engineering, Varkaus, 2010
- [11] A Roadmap to Quality - an e-learning Manual for Implementing Total Quality Management, United Nations Industrial Development Organization, 2007.