

# Performance Management through Quality Measurement at Construction Site, Pune

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**Abstract**— Success of construction project depends on its performance, which is measured base on timely completion, within the budget, required quality standards and customers satisfaction. There are many factors that obstruct performance of construction cause delay in construction or failure in construction. An attempt is made to figure out the quality performance measures at construction sites in Pune. Site visit and personal interviews with the site supervisors, quality engineers, and project managers were done to study the quality performance of project. The objective of this paper is to study the quality aspects of performance management, to carryout questionnaire survey at different sites in Pune region and to understand RII method for performance management on site quality. The scope of study is limited to the quality part of construction in the infrastructure project, especially flyovers and railway over bridges, completed in last 3 years and on-going projects in Pune area.

**Keywords**— Performance Management, Key Performance Indicators, Performance Measures, Relative importance index(RII).

## I. INTRODUCTION

Success of construction project depends on its performance, which is measured base on timely completion, within the budget, required quality standards and customers satisfaction.<sup>[1]</sup> There are many factors that obstruct the performance of construction which causes delay in construction or failure in construction. Performance management is a systematic approach to improve their goals through an ongoing process of establishing strategic performance objectives; measuring performance; collecting; analyzing; reviewing; reporting performance data; and using that data. It aims to connect company goals and objectives to improvements and to set targets for improvement activity. An attempt is made to study the quality performance measures at construction sites in Pune. Infrastructure projects especially railway over bridges and flyover projects are focused. Site visit and personal interviews with the site supervisors, quality engineers, and project managers were done to study the quality performance of project.

## II. LITERATURE

### A. Performance measurement models

A literature study has been done to understand the various measures and methods adopted to measure the performance of the construction project. And how the Relative Importance Index method is being used to prioritize the performance measures for a construction site.

<sup>[10]</sup> Three models for measuring construction project quality are:

- ✓ project quality performance model, based on critical variables developed by Chan (2001)
- ✓ blueprint by the Quality Performance Measurement Task Force (QPMTF) of the Construction Industry Institute (CII) for measuring quality performance on engineer-procure construct (EPC) projects in the United States (Glagola et al., 1992; Stevens, 1996); and
- ✓ Quality Assessment System in Construction (QLASSIC) model developed by the Construction Industry Development Board of Malaysia to assess the contractor's performance in terms of quality of the finished product (CIDB Malaysia, 2001b).

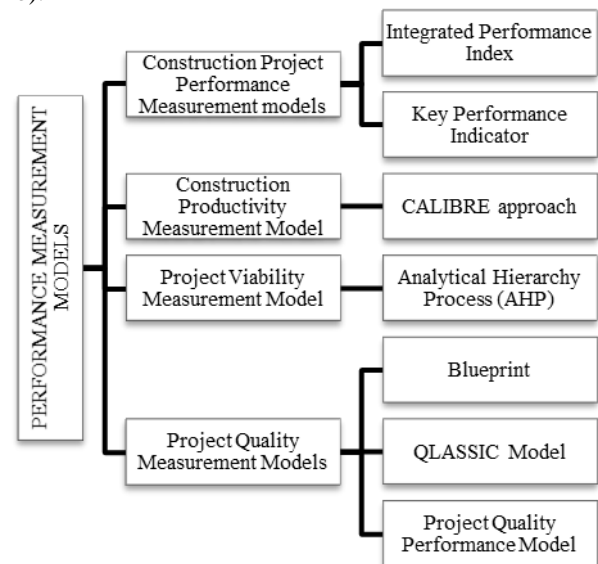


Fig. 1: Performance measurement models

A questionnaire survey was carried out for the project managers on site. Big scale Contractor firms are focused for survey. All firms are ISO-9000 certified. Following points were observed during the site visits and personal interviews:

- The organisation follows a proper ISO-9001-2015 Quality Management System.
- The quality manual is up-to -date and revised from time to time.
- Regular third party and organisational inspections are conducted for quality of the project.
- Checklist formats, pour card and other documental work is followed regularly and strictly.
- Quality control lab establishment is done at every site, and procedure is regularly followed.

- Employee training is also provided to ensure the quality inputs from them.

**B. Relative Importance Index**

The proportionate contribution each predictor makes to predictor variables, considering both its direct effect (i.e., its correlation with the criterion) and its effect when combined with the other variables in the regression equation.<sup>[7]</sup>  
 The relative importance index (RII) used to indicate the relative importance of each variable contributing to factors affecting Quality performance of the project was calculated with the formula below:

$$\text{Relative Importance Index} = \frac{\sum W}{A \times N}$$

Where;

- W= Weightage given to each variable by respondent ranging from 1 to 4
- A= Highest rating
- N= Total no. of respondents

**III. METHODOLOGY**

A questionnaire approach is adopted which requires the development and distribution of a questionnaire survey. To formulate a questionnaire, literature study was done referring relevant research papers. All the factors related to quality measurement are studied and 25 factors are short listed which formed the final questionnaire for survey. Final questionnaire is then directed to the Project Managers at site for flyovers, infrastructure projects in Pune.

The Project Managers were asked to rank the following 'factors affecting the quality performance of the project'. Weightage given to each factor by the respondents ranges from 1 to 4, where '1' is less important and '4' is extremely important.

1. Unavailability of raw materials on site
2. Lack of skilled labours
3. Escalation of material prices
4. Unavailability of equipment
5. Unavailability of highly personnel
6. Lack of management commitment to continual quality improvement
7. Delays if any
8. Unavailability of highly experienced and qualified professional
9. Lack of training on quality for staff
10. Lack of Management leadership
11. Poor Planning and control techniques
12. High number of competitors
13. Poor financial control on site

14. Resource wastage on site
15. Lack of previous experience of contractor
16. Lack of technical and professional expertise and resources to perform task
17. Lack of education and training to drive the improvement process
18. Poor Monitoring and feedback
19. Lack of coordination between designers and contractors
20. Lack of team work
21. Lack of employee commitment and understanding
22. Project managers competence /experience
23. Coordination between client & consultant & owner
24. Inefficient team work among stakeholders
25. Management policies for Employees for motivation

The relative importance index (RII) is used to indicate the relative importance of each variable contributing to factors affecting quality performance of the project was calculated. While evaluating the importance of the factors, all those factors having RII greater than or equal to 0.800 have been considered more important. Conclusion are derived from the findings from the RII calculations.

**IV. FINDINGS**

The 25 factors that affects the quality performance at construction site are ranked (Refer table. II) and top 6 of them are listed below in the order of their RII ranking. (Refer table. I)

TABLE I: Top ranked factors with RII ≥ 0.800

Rank	Factors which affects the quality performance	RII
1	Coordination between client & consultant & owner	0.900
2	Project managers competence /experience	0.875
3	Lack of training on quality for staff	0.850
4	Lack of skilled labours	0.825
	Lack of management commitment to continual quality improvement	
5	Unavailability of highly experienced and qualified professional	0.806
6	Lack of team work	0.800
	Management policies for Employees for motivation	

Table No. II: RII calculations table for quality measures.

Q.NO.	Factors affecting Quality performance of the project	Frequency of "4" responses	Frequency of "3" responses	Frequency of "2" responses	Frequency of "1" responses	no answer	Total respondents (N)	Weighted total	RII	Item Mean	Rank
1	Unavailability of raw materials on site	1	5	2	1	1	9	24	0.667	2.667	12
2	Lack of skilled labours	6	2	1	1		10	33	0.825	3.300	4
3	Escalation of material prices	1	2	5	2		10	22	0.550	2.200	15
4	Unavailability of equipment	3	4	2	1		10	29	0.725	2.900	9
5	Unavailability of highly personnel	3	3	3	1		10	28	0.700	2.800	10
6	Lack of management commitment to continual quality improvement	4	5	1	0		10	33	0.825	3.300	4
7	Delays if any	2	2	2	2	2	8	20	0.625	2.500	14
8	Unavailability of highly experienced and qualified professional	3	5	1	0	1	9	29	0.806	3.222	5
9	Lack of training on quality for staff	5	4	1	0		10	34	0.850	3.400	3
10	Lack of Management leadership	3	5	2	0		10	31	0.775	3.100	7
11	Poor Planning and control techniques	3	4	2	1		10	29	0.725	2.900	9
12	High number of competitors	0	3	6	1		10	22	0.550	2.200	15
13	Poor financial control on site	0	6	2	1	1	9	23	0.639	2.556	13
14	Resource wastage on site	2	3	5	0		10	27	0.675	2.700	11
15	Lack of previous experience of contractor	2	5	2	1		10	28	0.700	2.800	10
16	Lack of technical and professional expertise and resources to perform task	2	7	1	0		10	31	0.775	3.100	7
17	Lack of education and training to drive the improvement process	1	7	1	0	1	9	27	0.750	3.000	8
18	Poor Monitoring and feedback	0	9	0	1		10	28	0.700	2.800	10
19	Lack of coordination between designers and contractors	3	6	0	1		10	31	0.775	3.100	7
20	Lack of team work	5	3	1	1		10	32	0.800	3.200	6
21	Lack of employee commitment and understanding	2	5	2	0	1	9	27	0.750	3.000	8
22	Project managers competence /experience	6	3	1	0		10	35	0.875	3.500	2
23	Coordination between client & consultant & owner	6	4	0	0		10	36	0.900	3.600	1
24	Inefficient team work among stakeholders	0	5	5	0		10	25	0.625	2.500	14
25	Management policies for Employees for motivation	3	6	1	0		10	32	0.800	3.200	6

## V. CONCLUSION

- The Coordination between client & consultant & owner  
The Coordination between client & consultant & owner is highest ranked and very critical to maintain the quality of the project. Lack of co-ordination affects the decisions which in turn brings problems like rework, revisions at last minutes, demolition of completed job, etc. lack of coordination of services leads to missing of some services, haphazard placement of services, crossing of different services; which affects the quality of the project.
- Project managers competence /experience  
The Project managers should have ability to determine proper quality measures. He should have highly competence to control the project in all aspects, especially when it comes to quality. Without these qualities a manager would not be able to determine the loop holes in

- Lack of training on quality for staff  
Lack of adequate training on quality for staff can cause ineffective management, low production, unhappy employees and high turnover, increased expenses and loss of customers. Without training, employees are not clear how to do their jobs. Untrained employees cannot produce high-quality products.
- Lack of skilled labours  
Unskilled employees could spend considerable time seeking help to perform their jobs or they could perform tasks to their understanding, to the damage of the work process. This could lead to errors and work needing to be repeated or corrected. When more experienced employees spend time monitoring unskilled workers, it detracts from their work and affects their production as well.

5. Lack of management commitment to continual quality improvement  
Standard are set for the company for quality control and quality assurance. It is the responsibility of the management to enforce it to the organisation to follow the procedure strictly. Many times, these procedures are neglected and quality is compromised. It affects the quality of the project.
6. Unavailability of highly experienced and qualified professional  
Unavailability of highly experienced and qualified professional can mess up the project. The member of the construction team whether a manager or an engineer, should have enough expertise to handle the project and must be well experienced and qualified to tackle each and every problem faced at site.
7. Lack of team work  
Lack of teamwork leads to inefficiency in work by poor communication, disorganisation, arguments, improper work distribution, stagnation which finally affect the quality of work. It also affects the time period and budget of the project.
8. Management policies for Employees for motivation  
Management policies for Employees for motivation indirectly helps to achieve quality of the project. Giving recognition for good work, incentives for good performance, such policies motivates the employees to give their best for the project, where quality is achieved at the best level for performance credits.

Quality of the work delivered to the client is very important in an infrastructure project in the construction industry. It helps the company to develop a good reputation in the market and attracts potential clients. A good quality of work minimizes errors and reworks, thus saves money, saves time and saves customer and serves public as per the commitment, avoiding any inconvenience to them.

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