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Performance Management and Performance Indicators in Construction Industry

R.Madhava Perumal*, A.J.Jeyaarthi*, S.Premkumar*, N.Mahamoodulhasan*
*Assistant Professor, Civil Engineering, Rajalakshmi Engneering College, Chennai.

Abstract:

Projects are organized to accomplish complex tasks that cannot be handled by lone individuals but by multidisciplinary teams in the construction industry. Project success depends upon how well the personnel can work effectively to accomplish objectives within scope, cost and quality constraints. Project Managers and Engineers are entrusted with the task of integrating the disciplinary and the inter-organizational efforts under changing environment for successful accomplishment of the specified objectives. They operate independently of the normal organizational chain of command, with the sole aim of achieving the specified goals within the available resources. They assume total responsibilities and accountability for the success or failure of the project. Hence the need for performance management as a system for managing and integrating organizational and employee performance. In this thesis, the key indicators regarding the performance of engineers are found. For this purpose, data was collected by conducting the questionnaire survey among the engineers and managers in site and analyzed. The factors found are following safety rules, following quality guidelines, timely completion of work, concentrating on productivity, using latest technologies for work, maintaining a good relation with client/contractor, having a proper check on environment and involving in planning and procurement of materials.

Keywords — ***Projects, performance indicators***

1 INTRODUCTION

Projects are organized to accomplish complex tasks that cannot be handled by lone individuals but by multidisciplinary teams in the construction industry. Project success depends upon how well the personnel can work effectively to accomplish objectives within scope, cost and quality constraints. Hence the need for performance management as a system for managing and integrating organizational and employee performance. In past, many researches[‟] have been done to frame an effective performance management system for construction industry based on the flaws in the existing systems adopted globally

1.1 PERFORMANCE MANAGEMENT

Performance management is a continuous process of identifying, measuring and developing performance in organizations by linking each individual's performance and objectives to the organization's overall mission and goals. Performance management is the process of creating a work environment or setting in which people are enabled to perform to the best of their abilities. It is the main vehicle by which managers communicate what is required from employees and give feedback on how well they are achieving job goals

Performance management is about directing and supporting employees to work as effectively and efficiently as possible in line with the needs of the organization. The central aim of performance management is to develop the potential of staff and improve their

performance, linking an employee individual objectives to business strategies and hence improve company‟s performance

1.2 NECESSITY OF PERFORMANCE MANAGEMENT

As a manager, you need to adopt performance management practices that will facilitate continuous review and ongoing development of your department team in order to deliver departmental objectives. The underlying assumption is that by managing the performance of the individual and team, departmental and organizational performance will follow and by raising individual and team levels of performance, organizational performance will also improve. Equally when performance of individuals is not managed, this can lead to frustration and discontent amongst team members.

1.3 OBJECTIVES OF PERFORMANCE MANAGEMENT

- To enable the employees towards achievement of superior standards of work performance.
- To help the employees in identifying the knowledge and skills required for performing the job efficiently as this would drive their focus towards performing the right task in the right way.
- Boosting the performance of the employees by encouraging employee empowerment, motivation and implementation of an effective reward mechanism.
- Promoting a two way system of communication between the supervisors and the employees for clarifying expectations about the roles and accountabilities, communicating the functional and organizational goals, providing a regular and a transparent feedback for improving employee performance and continuous coaching.

1.4 ADVANTAGES OF PERFORMACNE MANAGEMENT SYSTEM

- Motivation to perform and Self-esteem is increased
- Managers gain insight about subordinates
- The definitions of job and criteria are clarified
- Self-insight and development are enhanced
- Personnel actions are more fair and appropriate
- Organizational goals are made clear
- Employees become more competent and there is better protection from lawsuits
- There is better and more timely differentiation between good and poor performers
- Supervisors‟ views of performance are communicated more clearly

2 NEED FOR THE STUDY

In the present scenario of the construction industry it is vital to measure the performance of the engineers to check whether their work is in line with the strategies of the organization. But it is not being followed in many companies as they are expecting positive financial turn over for the company regardless of the performance of their employees. It is important to measure the performance of the employees based on the non-financial performance measures. This process will help the employees to be aware of the work nature and also he can track the performance by self. The thesis involves identifying various factors of performance of engineers which are vital for the project managers and site engineers. The project manager can also track his subordinates‟ performance using these measures.

- The thesis will help the engineers to identify the roles and responsibilities.
- The factors can be used to upgrade the knowledge of engineers towards the project scenario and the same can be implemented for a successful completion of a project.

- The same factors can also be helpful for the engineers to have a track on their own performance.
- Helps the Project managers to guide the engineers under him and can bring the best out of his employees
- Effectiveness and efficiency of the employees can be increased by defining their roles via performance factors..

2.1 OBJECTIVE OF THE STUDY

The main objective of the thesis is to frame the factors required for the efficient performance of engineers in construction industry, which are vital that Project managers and site engineers should be aware of. The measures derived by taking study on various literatures collected regarding performance management. The thesis also involves study of various performance measurement methods in existence. Based on the factors of performance a questionnaire will be prepared and the same will be used to take survey on the project managers and site engineers to know whether they are aware of their work nature. The data collected will be used to interpret results and based on the results suitable suggestions will be made to improve the performance management. The questionnaire will be done in and around the city

2.2 IDENTIFICATION OF ITEMS RELATING TO PERFORMANCE OF ENGINEERS IN CONSTRUCTION INDUSTRY

• From Literature review, 24 questions have been brought out in Fig 5.1 namely Safe work procedures, importance to housekeeping, lean construction practices, using latest equipments, hiring Skilled workers, update to new construction practices, participation in planning, incentive or penalize contractor, working over time, vendor analysis, monitor the work schedule, check on fresh water consumption, rework, incentives for subordinates, preferring local supplier, check on environment, use of technology, demand on contractor for quality, safety issue awareness, monitor the productivity, inspection on materials, priority for safety, check the services of contractor, following quality checklists

3. DATA COLLECTION

The questionnaire was taken to the sites directly and the response was collected from the engineers, Quantity surveyors and managers in the site. The questionnaire was collected from 80 professionals

Table 3.1 Respondents based on designation

Designation	No of respondents
Managers	28
Quantity surveyors	11
Site engineers	41
Total	80

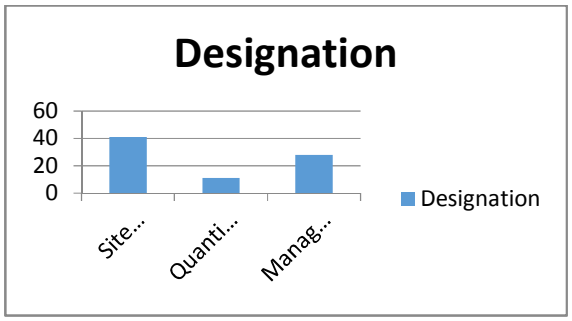
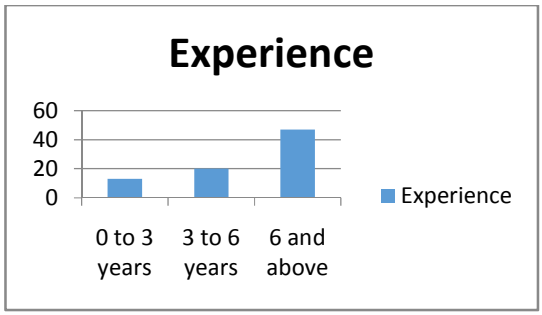


Fig 3.1 Respondents based on designation

Table 3.2 Respondents based on experience

Experience	No of respondents
0 to 3 years	13
3 to 6 years	20
6 years and above	47
Total	80

Fig 3.2 Respondents based on experience



4 FACTOR ANALYSIS

"Factor analysis is a method of grouping together variables which have something in common" (Cohen et al., 2011). It is used to reduce a set of variables into a smaller number of underlying factors which account for as many variables as possible. The reason for using factor analysis is to run a reliability test to determine whether items being measured were coded as the same construct (Churchill & Peter, 1984).

Three main steps were followed in conducting factor analysis namely; assessment of the suitability of the data; factor extraction, and factor rotation and interpretation (Pallant, 2007).

Before running a factor analysis, the data must be tested for its suitability of being factored. Bartlett test of sphericity and Kaiser- Meyer-Olkin(KMO) measure of sampling adequacy were conducted on the data. Bartlett test of sphericity should be significant at the 0.05 level and the Kaiser- Meyer-Olkin (KMO) measure of sampling should be at 0.6 or above (Cohen et al., 2011). Table 4.1 presents the overall KMO and Barlett's test score for all the scales of the study and it can be observed that Bartlett test of sphericity is significant at 0.05 level while KMO measure of sampling adequacy is well above 0.6 for all the scale values.

Table 4.1 Overall KMO and Barlett's Test Score

Scale	No. of Items	Kaiser-Meyer-Olkin Value	Bartlett's Test of Sphericity Sig. Value
Performance Management	24	.623	.000

The exploratory factor analysis was conducted with principal components analysis as extraction method to explore previously unknown groupings of variables, to seek underlying patterns, clusterings and groups (Cohen et al., 2011). The Varimax rotation method was employed to simplify factors by maximizing the variance of the loadings within factors, across variables. The spread in loadings is maximized, loadings that are high after extraction become higher after rotation and loadings that are low become lower. Cross loading score of <0.40 were deleted, as they were not considered to be adding to the measure.

Tables 4.2 shows the rotated component matrix of the scale of the study. A rotated component matrices shows that items which were designed to measure a particular factor are loaded on the respective factor and clustered together.

Table 4.2 shows that the factor analysis of Performance Management factors yielded 8 factors such as Quality(3 items), Safety (3 items), Use of Technology (3 items), Supply Chain Management (3 items), Productivity Management (3 items), Client Contractor Relationship (3 items), Time Management (3 items) and Environmental Management (3 items).

Table 4.2 Rotated Component Matrix derived from factor analysis

Qn no	Items	Factor values	Factors
Q24	Rework	.643	Quality (Factor1)
Q7	Inspection On Materials	.721	
Q13	Quality Checklists	.754	
Q8	Follow Safe Work Procedures	.797	Safety (Factor 2)
Q5	Safety Issues	.817	
Q1	Priority For Safety	.734	
Q19	New Construction Methods	.754	Use Of Technology (Factor 3)
Q4	Use Latest Equipments	.748	
Q14	Using techniques for better Output	.705	
Q10	Take Part In Planning	.838	Supply Chain Management (Factor 4)
Q22	Vendor Analysis	.722	
Q12	Prefer Local Supplier	.724	
Q3	Monitor The Productivity	.690	Productivity Management (Factor 5)
Q17	Working Extra Hours	.779	
Q6	Lean Construction Practices	.802	

Q23	Check The Services Of The Contractor	.867	Client Contractor Relationship (Factor 6)
Q11	Demand On Contractor	.800	
Q18	Incentives/Penalize Contractor	.869	
Q2	Monitor The Work Schedule	.723	Time Management (Factor 7)
Q16	Incentives For Subordinates	.753	
Q21	Hire Skilled Workers	.754	
Q15	Importance To Housekeeping	.874	Environmental Management (Factor 8)
Q20	Check The Rate Of Fresh Water	.914	
Q9	Check On Environment	.889	

5 RELIABILITY ANALYSIS

"Reliability in quantitative research is essentially a synonym for dependability, consistency and replicability over time, over instruments and over groups of respondents" (Cohen et al., 2011). There are three different techniques for assessing reliability in data. These are test-retest method, split-half method and internal consistency test. In this study, internal consistency method was used to measure reliability of the scales. Cronbach‟s alpha is the most common form of internal consistency as an estimate for reliability (Ary et al., 2002).

The values of Cronbach‟s alpha reliability coefficients for the instruments employed in the current study are displayed in Table 5.1. In social science research .70 is often used as the lower limit for an acceptable Cronbach‟s alpha coefficient for a set of items (Garson, 2008). Thus, the measures of reliability for the instruments were considered acceptable

Table 5.1 Cronbach alpha reliability coefficients for Modified FIT Choice Scale

Variables	No. of Items per Variable	Reliability Coefficient Alpha
Factors of Performance Management	24	0.731
Quality	3	0.631
Safety	3	0.760
Use of Technology	3	0.629
Supply Chain Management	3	0.723
Productivity Management	3	0.613
Client Contractor Relationship	3	0.745
Time Management	3	0.611
Environmental Management	3	0.684

6 DESCRIPTIVE STATISTICS

The mean and standard deviation of the factors are found. The results shows that the factors Safety, quality, time management and productivity management are ranked as top factors. Showing that in Table 6.1 the mean rating of Safety (4.8) is highest whereas the supply chain management (3.8) being lowest

Table 6.1 Descriptive statistics

Factor	Mean	Std. Dev.
Safety	4.8	0.42
Quality	4.7	0.38
Time Management	4.4	0.50
Productivity Management	4.2	0.64
Use of Technology	4.1	0.61
Client Contractor Relationship	3.9	0.91
Environmental Management	3.9	0.81
Supply Chain Management	3.8	0.86

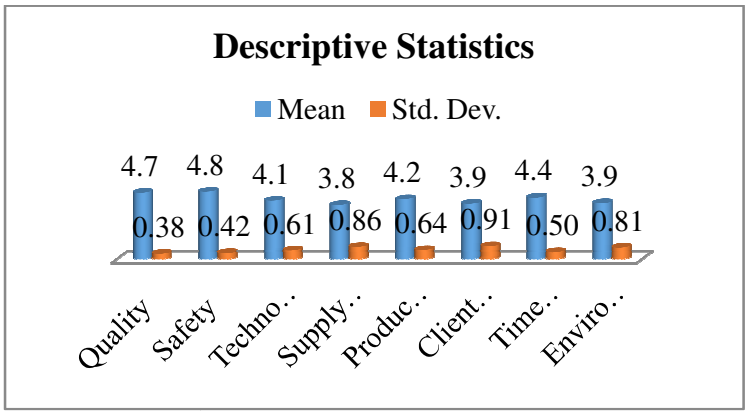


Fig 6.1 Descriptive statistics

7 SETTING OF HYPOTHESIS

In this thesis an attempt was made to find the significance difference among the experience groups based on the factors namely Safety, Quality, Time management, Productivity management, Use of technology, Client contractor relationship, Environmental management and Supply chain management. So the following hypothesis was set.

Null Hypothesis, Ho: There is no significant difference in the mean rating between the respondents from different experience group on all the factors of Performance Management Scale.

8 TESTING OF HYPOTHESIS

ANOVA analyses were conducted to test this hypothesis and the results are shown in Table 6.5. ANOVA testing is employed to determine if the mean scores of each factors in the Performance Management Scale differed among different experience groups. The analysis

revealed significant mean differences among the experience groups of respondents for the factors: Quality (F (2, 80) = 4.65, p < .05), Safety (F (2, 80) = 5.69, p < .05), Supply chain management (F (2, 80) = 5.46, p < .05), Client Contractor Relationship (F (2, 80) = 3.24, p < .05).

Table 8.1One way ANOVA of Performance Management Scale by Experience

Factors	Experience (Years)						F - value	P
	EG1 (0 – 3)		EG2 (3 – 6)		EG3 (>6)			
	M	*SD*	*M*	*SD*	*M*	*SD*		
Quality	4.4	0.56	4.7	0.43	4.8	0.25	4.65	.012*
Safety	4.4	0.75	4.8	0.30	4.8	0.28	5.69	.005*
Use of Technology	3.9	0.42	4.0	0.73	4.3	0.58	2.98	.056
Supply chain management	3.1	1.02	3.9	0.81	4.0	0.76	5.46	.006*
Productivity management	4.2	0.58	4.3	0.62	4.2	0.67	0.10	.908
Client Contractor Relationship	3.3	0.68	4.0	1.00	4.0	0.89	3.24	.045*
Time management	4.3	0.51	4.3	0.55	4.4	0.47	0.44	.645
Environment management	3.6	0.58	3.8	0.79	4.1	0.85	2.30	.107

p< .05*. EG1 – Experience Group 1(0 – 3 years); EG2 - Experience Group 2(3 – 6 years); EG3 – Experience Group 3(>6 years)

In summary, the NULL HYPOTHESIS, Ho that there is no significant difference in the mean rating between the respondents from different experience group on all the factors of Performance Management Scale is accepted for four factors of the scale viz Use of technology, Productivity management, Time management and Environment management. Alternately the hypothesis is rejected for the factors: Quality, Safety, Supply chain management and Client Contractor Relationship.

9 DISCUSSION

From the analysis the factors namely following safety rules, following quality guidelines, on time completion, concentrating on productivity, using latest technologies for work, maintaining a good relation with client/contractor, having a proper check on environment and involving in planning and procurement of materials are derived as key for the enhancement of performance of engineers.

Safety is an important factor. If the engineers does not follow safety rules it results in the accidents and it may lead to stoppage of projects, if any lives are lost. So following safety procedures will be useful for both the management and the labors working. Following quality guidelines helps in the reduced rework of activities and its associated cast and reduces wastage of materials. As the quality is the only factor which is expected by the clients in the output of any project. On time completion plays a major role as delay in work will lead to penalties from clients. For timely finish of work, the higher authorities should provide the schedule of activities and it's time to complete to the engineers. By timely finishing the works the engineers will come to know how to execute a work at a faster rate without compromising the quality. Productivity is a cost related factor. The engineers‟ should produce maximum productivity at low cost with minimum labor. Monitoring the productivity will lead to efficient usage of men and machineries.

The engineers‟ should upgrade his construction according to latest techniques, which are successful. The use of techniques will lead to timely completion of work, increased quality and productivity. Learning new techniques will also provide interest as the engineer will learn new apart from typical techniques. Maintaining a smooth relationship with client/contractor helps to run the project smoothly. As an understanding will be created among them, and so they can come to know each other‟s problems related to work and help mutually to sort it out. The engineers also should take care of the environment. Maintaining a good environment will also avoid the neighborhood and his labors getting affected from anti environment activities like noise, dust, etc, and affecting their health and resulting to absenteeism. Sometimes the government authorities may stop the project, if the project is found to evade environment guidelines. So it also helps organization to run a project successfully. The engineers should involve in procurement of materials. As technically, the engineers will know the quality of materials being supplied than by the purchase department of the company. The involvement should be from the experienced engineer. This involvement makes him to feel that he has a responsibility and it will in turn make him to perform well. These eight factors play a key role in the performance of engineers.

CONCLUSION

This study has identified the factors of performance of engineers. Based on these factors, questionnaire survey has been circulated. Through Factor analysis, the questions are compressed to 8 factors namely Safety, Quality, Time management, Productivity management, Use of technology, Client contractor relationship, Environmental management and Supply chain management. Also from the descriptive statistics the factors safety, quality, time management and productivity management has high mean value. This study hence concludes that following safety rules, following quality guidelines, timely completion of work and concentrating on productivity, using latest technologies for work, maintaining a good relation with client/contractor, having a proper check on environment and involving in planning and procurement of materials are the basic factors for manager/engineer to perform well.. The 8 factors derived, if followed will lead to an enhanced knowledge and also adds value towards work. If the organization indulges their engineers to concentrate on these factors it will indirectly improve its financial development as well as an enhanced knowledge of engineers. Enhancement in performance of engineers will be the key to success of an organization.

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