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A STUDY ON QUALITY MANAGEMENT IN CONSTRUCTION

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ABSTRACT

Quality management systems are being operated in some sectors in India. But it is rare to meet this system in construction industry. There are many hindrances that make it difficult to apply the system effectively due to the nature of construction and therefore no objective way to measure the effectiveness of this system exist in construction industry. The present research addresses three major concerns. The first is to evaluate the effectiveness of quality management system (QMS) in construction projects. The second is to identify the critical factors affecting the quality management system. The third one is to propose an implementation framework for quality management in construction projects. Through a survey questionnaire, an attempt has been made to explore the best quality management practices to be followed in construction projects. The main objective of this research work is to evaluate the critical factors that affect the quality management system on quality improvement and performance in construction projects. A total of 236 data were collected and analyzed using statistical techniques with the help of Origin Pro version8.5 software. The factors included project background aspects, general quality aspects and standard code representing aspects. All the above factors were subjected to descriptive analysis, factor analysis and regression analysis. The critical factors obtained through the above said analysis were validated with the critical factors obtained by the various previous researchers. Regression equations have been proposed to identify the strongest predictor among the independent variable which have a cause and effect relationship on dependent variable. The present research work brings out the underlying critical factors which are responsible for the implementation of quality

management in construction projects. Also suitable recommendations and suggestions for effective quality management system for construction projects are presented.

INTRODUCTION

Construction industry is a pillar of economy for every country including India. It is time bound and employs huge resources of men, material and machinery. As a result it break through has greatly influenced the construction industry. Construction sector has undergone severe cycle changes day by day. Construction contributes to the growth of many related industries such as manufacturing of construction material, cement, pipes, sanitary wares, tiles, ready mix concrete, etc. Besides from being an important asset that generates profit to the country, construction encourages the development of human resources and generates more employment than other industrial sectors.

Considering the significance of construction, it is necessary to identify major issues affecting the efficiency of this sector. The poor state of technology adopted by the construction industry in many countries as well as fragmented relation between construction cost and time delay which in turn affects the quality. Many clients now-a-price and the time of delivering a final product of required quality.Now-a-days, management of construction companies is focusing on quality issue on a competitive edge. Delivering projects that satisfied client requirement has become a main priority in order to maintain business relationships and hence the construction

industry should develop standards during every stage in order to deliver satisfactory outputs.

CONSTRUCTION QUALITY

Construction quality can be viewed as one part of a triangle as shown in Fig.1.1. The cost level as planned should be maintained by the contractor; at required level of quality schedule deadlines should meet. Balance should be maintained between the three aspects since they define the project scope. The component quality must be disregarded in favour of increased cost savings and time reductions.

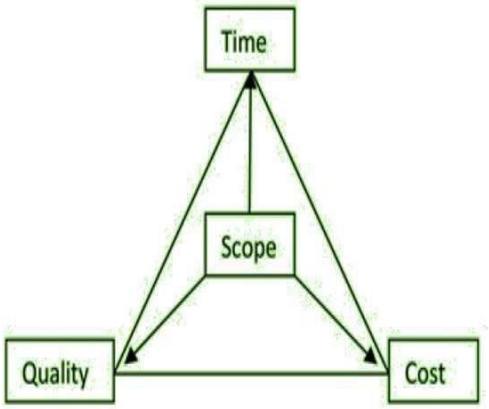

Fig. 1 Construction Triangle

ANALYSIS OF FACTORS

Most responsible factor to consider under project background aspects is the awareness about quality management.

All the project engineers in a construction team should have knowledge about codes and specifications to execute the work in right manner in order to avoid the defects. Faults and defects may overcome through knowledge about codes and specifications**.**

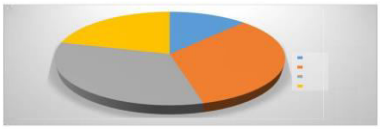

Fig. 2. Most Important Factors under Project Background Aspects

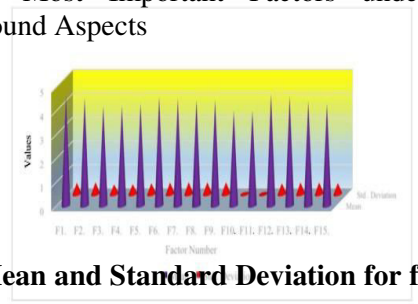

Fig.3 Mean and Standard Deviation for factors F1 to F15

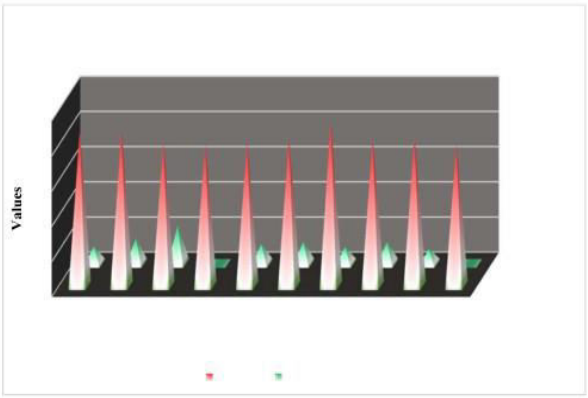

Fig.4 Mean and Standard Deviation for factors F36 to F45

FACTOR ANALYSIS

factor analysis was done to get factor reduction or dimension reduction. Through this analysis minimum numbers of factors were extracted from the most important factors identified through descriptive analysis and one way ANOVA. Factors under general quality aspect and the factors under standard code representing factors The method adopted was principal component analysis method for factor extraction or dimension reduction. As the initial components extracted were orthogonal,the analysis using this extraction is vague. Hence it was decided to rotate the axis to extract good number of components. Varimax rotation with Kaiser normalization criterion used for the method of rotation. The initial extracted component includes more number of trials with the final extracted components including very few numbers of factors.

As a result scree plot with component numbers on horizontal axis and eigen values on the vertical axis

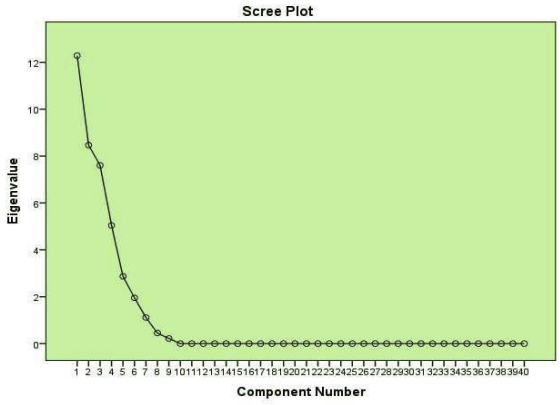

Fig. 5 Scree Plot showing the Extracted Components against Eigen value (For Factors under General Quality Aspect)

To select the best number components the number of components on the steeper slope of the scree plot gives fairly good result and indicates the factors which are to be closely monitored. The scree plot indicated that 7 components lying on the steeper slope may be sufficient to predict good result.

The factor analysis with varimax rotation with Kaiser normalization criterion 7 factors with eigen values more than 1 explaining a cumulative variance under rotated sum of squares loading of 98.32%.

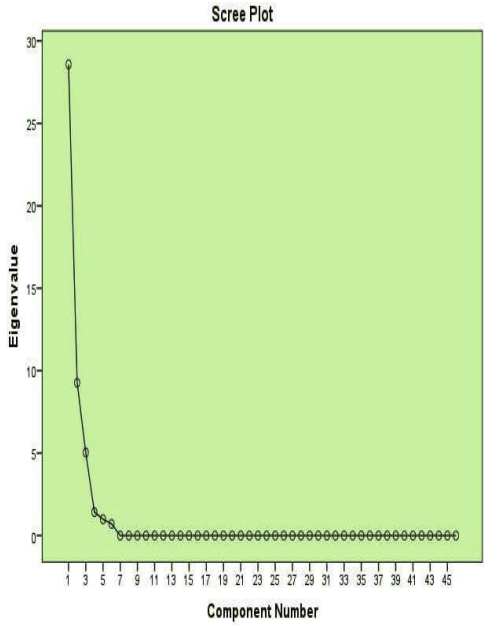

Fig. 6 Scree Plot showing the Extracted Components against Eigen Value

To select the best number components the number of components on the steeper slope of the scree plot gives fairly good result and indicates the factors which are to be closely monitored. The scree plot indicated that 4 components lying on the steeper slope may be sufficient to predict good result.

The factor analysis with varimax rotation with Kaiser normalization criterion 4 factors with eigen values more than 1 explaining a cumulative variance under rotated sum of squares loading of 96.32%.

RESULTS

In total 236 responses obtained through questionnaire survey were directly entered into an excel spreadsheet and then imported to the Orginpro data file. Each factor was dealt separately in order not to lose the significance of any factor while doing descriptive analysis and one way ANOVA. Through which 86 important factors were identified.

From these important factors, 11 underlying factors were identified through factor analysis. Regression analysis was done to get a relationship between dependent variable and the extracted underlying factors. A result at regression analysis identifies the strongest predictor among the independent variable which have a cause and effect relationship on dependent variable.

6 factors were highly critical in both factors under general quality aspect and standard code representing aspect. 4 factors were highly critical in general quality aspect and 2 factors were highly critical in standard code representing aspect.

CONCLUSIONS

The critical factors which are likely to affect the implementation of total quality management in construction projects have been identified. They are grouped under three categories based on their significance as highly critical, significant and less significant. The highly critical factors are to be given top priority in the real time monitoring. The significant factors are also to be addressed with equal importance management team members have a crucial role to play. The site engineers otherwise known as engineers also have an equal role to play.

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