

THE EFFECTIVE TECHNIQUES FOR RANKING OF CAUSES OF DELAY FOR RESIDENTIAL CONSTRUCTION PROJECTS IN PUNE

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ABSTRACT

The major issues in construction industry is facing today is delay. Delays have several negative effects like lawsuits between client and contractors, overstated prices, loss of productivity and revenue, and contract annihilation. The results of this research are presented by conducting survey as per questionnaires and evaluated using relative importance of the significant factors contributing construction project. To succeed in construction business it is one of the important assignments to complete the project within stipulated time. The construction project investigated in this research included residential buildings in Pune. In this research the responses are taken from client, contractor and consultant with respect to questionnaire in order to obtain the major causes of delay. The research presents the skeleton of causes of delays in residential construction projects. Total 32 causes were identified by literature survey. An approach is suggested to carry out ranking of these causes by two different techniques: Relative importance index (RII) and Importance index (IMPI) based on degree of severity and degree of occurrence. It is hoped that the findings of this paper will help the stakeholders to act on major causes and further try to reduce delay of their projects.

Keywords— Project management, Delay, Cost proficient, Survey, Relative important index (RII), Importance index (IMPI)

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I. INTRODUCTION

In construction industry delay can be defined as more time consuming to complete construction work either beyond completion date of the project which is given to the contractor, subcontractor and given to the third parties for delivery of it. Basically it is overrun of its planned schedule and which is considered as common problem in construction projects. To the owner of the project delay means loss of money through lack of productivity and rentable space. To the contractor delay means higher cost in all respect because of longer time of project, higher material cost, machinery and labor cost. The construction process is subjected to various and superfluous factors which result from many sources. These sources include availability of resources, ecological condition, performance of various parties, association of other parties and contractual relations. It is very rarely happened that project accomplished in the specified time period. Delay means more activities are pending which mentioned within the contract duration of project. The definition of delay for various parties is different like for owner delay means low income in more time, for consultant delay means more work remaining in less time period, for contractor more cost to labor for more time, so because of delay project cost, material cost,

government charges and overall cost are increases. All these factors are related to causes of delay so, it is necessary to find the major causes of delay in construction to increase the performance of project.

II. OBJECTIVES

The main objectives of this study include the following.

- To identify the various causes of delay for residential construction projects in Pune region.
- To suggest the way to work out the importance by different techniques

III. LITERATURE REVIEW

A number of studies have been carried out to determine the causes of delay in construction projects. Surveys conducted by Assaf et al. [3] outlined 56 main causes of delay in large construction projects. Delay factors are assembled into nine major groups with different levels of importance to different parties. Al-Ghafly [1] discussed the delay in public water and Sewage projects. Sixty causes were identified and classified. Al-Ghafly concluded the following: the delay occurred frequently in medium and large size projects, and considered severe in small projects. There are many important causes of delay related to owner

involvement, contractor performance, and the early planning and design of the project. Important causes are financial problems, changes in the design and scope, delay in making decisions and approvals by owner, difficulties in obtaining work permit, and coordination and Communication problems. Frimpong et. al., [4] conducted a survey to identify and evaluate the relative importance of significant factors contributing to delay and cost overruns in Ghana groundwater construction projects. Frank D.K. et al. [5], (2010) investigated the causes of delay of building construction projects in Ghana to determine the most important according to the key project participants; clients, consultants and contractors. Thirty-two possible causes of delay were identified from the literature and semi-structured interviews of 15 key players in the implementation process. These delay factors were further categorized into nine major groups. The list of delay causes was subjected to a questionnaire survey for the identification of the most important causes of delay. The field survey included 130 respondents made up of 39 contractors, 37 clients and 54 consultants. The relative importance of the individual causes and the groups were calculated and ranked by their relative importance index. The overall results of the study indicate that the respondents generally agree that financial group factors ranked highest among the major factors causing delay in construction projects in Ghana. The financial group factors were delay in honouring payment certificates, difficulty in accessing credit and fluctuation in prices. Materials group factors are second followed by scheduling and controlling factors.

IV. RESEARCH METHODOLOGY

The research methodology contains two phases. The first phase included a literature search and interviews. The literature review was conducted through books, conference proceedings, internet and international project management journals. As the outcome of this phase, 32 causes of delays for residential construction projects were identified. These causes were categories in nine main groups as: Project related, Owner related, Contractor related, Consultant related, Design-related, Material related, Equipment related, Labour related and External factors depending on their nature and mode of occurrence. The second phase includes preparation of two type of questionnaire based on two different approach used for giving ranking to causes of delay of residential construction projects. Primary study suggests two different techniques for ranking of causes of delay. In first technique Relative Importance Index (RII) of each cause of delay can be calculated i.e. rank and in second technique Importance index is calculated as a function of frequency and severity indices.

V. DATA ANALYSIS APPROACH

The following two types of approach should be used for data analysis.

Relative Importance Index Technique: It is used to determine the relative importance of the various causes and effects of delays. The same method is going to adopted in this study within various groups (i.e. Client, Consultant and Contractor). The four-point scale ranged from 1 (Not Important) to 4 (Very important) is adopted and transformed to relative importance indices (RII) for each factor as follows:

$$RII = \Sigma W / (A * N)$$

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 4), A is the highest weight (i.e. 4 in this case), and N is the total number of respondents. Higher the value of RII, more important was the cause of delays.

Importance Index Technique -In this particular technique, for each cause/factor two questions were asked: What is the frequency of occurrence for this cause? And what is the degree of severity of this cause on project delay? Both frequency of occurrence and severity were categorized on a four-point linkert scale. Frequency of occurrence is categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly, degree of severity was categorized as follows: extreme, great, moderate and little (on 4 to 1 point scale).

Frequency index: Following formula is used to rank causes of delay based on frequency of occurrence as identified by the participants.

$$\text{Frequency Index (F.I.) (\%)} = \Sigma a (n/N) * 100/4$$

Where, a is the constant expressing weighting given to each response (ranges From 1 for rarely up to 4 for always), n is the frequency of the responses, and N is total number of responses.

Severity index: Following formula is used to rank causes of delay based on severity as indicated by the participants.

$$\text{Severity Index (S.I.) (\%)} = \Sigma a (n/N) * 100/4$$

Where a is the constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe), n is the frequency of the responses, and N is total number of responses.

Importance index: The importance index of each cause is calculated as function of both frequency and severity indices, given as follows:

$$\text{Importance Index (IMPI) (\%)} = [F.I. * S.I.]/100$$

VI. DATA ACCURACY CHECK APPROACH

Spearman's rank correlation factor is going to be used to check the accuracy of collected data. Spearman's rank correlation coefficient is a non-parametric test also referred to as distribution free tests. These tests have the obvious advantage of not requiring the assumption of normality or the assumption of homogeneity of variance. It compares medians rather than means and, as a result, if the data have one or two outliers, their influence is negated. Correlation is a relationship measure among different parties or factors and the strength and direction of the relationship.

In this research, it is used to show the degree of agreement between the different parties like client-consultant, consultant-contractor and contractor-consultant. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). It might be said that sample estimates of correlation close to unity in magnitude imply good correlation between parties, while values near zero indicate little or no correlation. The Spearman's rank correlation

coefficient r is used to measure and compare the association between the rankings of two parties for a single cause of delay, while ignoring the ranking of the third party. And it is calculated by the following formula:

$$r_s = 1 - [(6 \sum d^2) / (n^3 - n)]$$

Where r is the Spearman rank correlation coefficient between two parties, d is the difference between ranks assigned to variables for each cause, and n is the number of pairs of rank.

VII. SUMMARY

Present study outlines the major causes of delay for residential construction projects in Pune region. Based on literature study and from interview of experts, 32 causes were identified under 9 major groups. Further methodology is suggested to work out critical causes from available ones by two techniques: Relative importance index and Importance index as a function of severity index and frequency index.

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