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REVIEW ARTICLE

CAUSES OF DELAYS IN CONSTRUCTION PROJECTS – A CASE STUDY

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ABSTRACT

Construction delays can be defined as the late completion of work compared to the planned schedule or contract schedule. Construction delays can be minimized only when their causes are identified. The objective of this study was to identify the major causes of construction delays, the effects of delays, and methods of minimizing construction delays. This study was carried out based on literature review and a questionnaire survey. A total of eight groups were contributed to the cause of construction delays, six factors that effects delays and fifteen methods of minimizing construction delays were identified based on literature review. The questionnaire survey was distributed to the target respondent in Silppi Realtors and Contractors construction site. The objectives of the study were successfully achieved. The top three most important factors that contributed to the causes of delays were late in revising and approving design documents, delays in sub-contractors work, and poor communication and coordination change orders by owner during construction. Contractor-related delays was ranked the most significant groups that cause delays, followed by client-related delays, and consultant-related delays. Time and cost overrun were the common effects of delays in construction projects. To minimize delays in construction projects it has been identified that the top three effective methods of minimizing construction delays includes: site management and supervision, effective strategic planning, and clear information and communication channel

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INTRODUCTION

In the study of Assafand Al-Hejji (2006), delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that the parties agrees upon for delivery of a project. It is a project slipping over its planned schedule and is considered as a common problem in construction projects. Bassioni and El-Razek (2008) identified that delay in construction project is considered one of the most common problems causing a multitude a negative effect on the project and its participating parties. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. Ardit and Pattanakitchamrron (2006) stated that delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. The party experiencing damages and the parties responsible for them in order to recover time and cost. However, in general delay situations are complex in nature. A delay in an activity may not result in the same amount of project delay. A delay caused by a party may or may not affect the project completion date and may or may not cause damage to another party. A delay may occur concurrently with other delays and all of them may impact the project completion date. Delays caused by the client such as late submission of

drawings and specifications, frequent change orders, and inadequate site information generate claims from both the main contractors and subcontractors which many times entail lengthy court battles with huge financial repercussions. Delays caused by contractors can generally be attributes to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall.

Literature review

In the study of Alaghbari *et al.* (2007), delay is generally acknowledged as the most common, costly, complex and risky problem encountered in construction projects. Because of the high importance of time for both the Owner (in terms of performance) and the Contractor (in terms of money), it is the source of continuous disputes and claims leading to lawsuits. Delays caused by the client such as late submission of drawings and specifications, continuous change orders, and incorrect site information generates claims from both the main contractors and sub-contractors which many times entail lengthy court battles with huge financial problems. Delays caused by contractors can generally be concluded to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall. Under some circumstances, a Contractor may be entitled to claim delay damages if he finishes later than

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an Owner-accepted early completion schedule but is still ahead of the official contract completion date. This may occur if the Contractor establishes a direct cause-and-effect relationship between Owner's breach of a contractual obligation and the delay. In addition, the Contractor has the burden of establishing its increased costs as a result of the delay. Majid (2006) stated that delays can be minimized when their causes are identified. Identification of the factors that contributed to the causes of delays has been studied by numerous researchers in several countries. Delay is a situation when the contractor, consultant, and client jointly or severally contributed to the non-completion of the project within the original or the stipulated or agreed contract period.

Methodology

A. Defining the objective of the study

To study Causes, and Methods of Minimizing Delays in Apartment Projects

B. Research design

The survey research methodology has been adopted for this research. The target population consists of Contractors and Staffs of Silppi Realtors and Contractors.

C. Questionnaire outline

A questionnaire survey was designed based on the objectives of the study, which are causes of construction delays, and the method rectification of construction delays. A questionnaire survey was developed to get the opinion and understanding from the experienced respondents regarding to the construction delays problem. The questionnaires are all classified into 3 sections:

- Respondent Background
- Causes of Construction Delays
- Method of Minimizing Construction Delays

Respondent Background

In this section, we are trying to obtain the respondents information. The questionnaire includes:

- a) The respondent organization
- b) The position of there spondent in the company
- c) The experience of the respondent in the construction project

Causes of Construction Delays

This section is designed to evaluate the factor that contributes to the causes of construction delays from the previous literature review. There are in total of seven groups of causes for delay in construction project:

- Client
- Contractor
- Consultant
- Materials

- Equipment
- Labour
- External factors

The questionnaire is mainly based on Likert's scale of 5 ordinal measures from 1 to 5 according to level of contributing.

- (5) = Strongly Agree
- (4) = Agree
- (3) = Moderate
- (2) = Disagree
- (1) = Strongly Disagree

Methods of Minimizing Construction Delays

This section is to identify the effective methods of minimizing construction delays. There are in total of 15 methods are identified for this questionnaire used. The questionnaire is mainly based on Likert's scale of 5 ordinal measures from 1 to 5 according to level of contributing.

- (5) = Very high effective
- (4) = High effective
- (3) = Effective
- (2) = Low effective
- (1) = Very Low effective

D. Pilotstudy

A pilot study provides a trial run for the questionnaire, which involves testing the wording of question, identify in ambiguous questions, testing the techniques that used to collect data, and measuring the effectiveness of standard invitation to respondents (Naoum, 1998q). All questionnaires should initially be piloted; completed by small sample of respondents (Fellows and Liu, 1997). After modifying the questionnaire according to the notes of the supervisor and before collecting the final data from the whole sample, a pilot study is accomplished and five copies of the questionnaire are distributed to five employees in silppi realtors and contractors to fill them. The purpose of this step is to discover if the questions are well understand able or not, also to find out any problem that may raise in filling the questionnaire. From the pilot study it appears that questions are generally clear. However, it seems some respondents find difficulties in understanding some questions. Therefore, the questions were modified to be clearer.

The following items are summary of the main results obtained from pilot study

- Questionnaire should be started with a cover page
- The first part of questionnaire should be general information about the organization.
- Some factor sand sentences should be modified or represented with more details.
- Some factors were repeated more than one time with the same meaning. So, it should be to eliminate the serepeated factors.
- Some factors and sentences should be modified in order to give more clear meaning and understanding.

- Some local factor should be added as recommended by external guide which affect the delay in the organisation.
- There are some parts of questionnaire required to be regulated well.
- Some factors should be rearranged in order to give more suitable and consistent meaning.

Cronbach's Alpha for Reliability Statistics

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring (Polit and Hunger, 1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people two occasions and then compares the scores obtained by computing a reliability coefficient (Polit and Hunger, 1985). It is difficult to turn the scouting sample of the questionnaire—that is used to measure the questionnaire validity to the same respondents due to the different work conditions to this sample. Therefore Cronbach's Coefficient Alpha test can be applied to the scouting sample in order to measure the consistency of the questionnaire. This method is used to measure the reliability of the questionnaire between each group and the mean of the whole groups of the questionnaire. Cronbach's alpha (George and Mallery 2003) is designed a same a sure of internal consistency, that is, do all items within the instrument measure the same thing? Alpha typically varies between 0 and 1. The closer the Alpha is to 1, the greater the internal consistency of items in the instrument being assumed. Cronbach's Alpha can be written as a function of the number of test items and the average inter-correlation among the items. Below, for conceptual purposes, we show the formula for the standardized Cronbach's alpha:

$$\alpha = \frac{kr}{1+(k-1)r} \quad (3.1)$$

Here k is equal to the number of items; r is the average inter-item covariance among the items. One can see from this formula that if you increase the number of items, you increase Cronbach's alpha. Additionally, if the average inter-item correlation is low, alpha will be low. As the average inter-item correlation increases, Cronbach's Alpha increases. This makes sense intuitively—if the inter-item correlations are high, and then there is evidence that the items are measuring the same underlying construct. This is really what is meant when someone says they have "high" or "good" reliability. The normal range of Cronbach's coefficient alpha value is between 0.0 and 1.0, and the high values reflect a higher degree of internal consistency. A rule of thumb that applies to most situations is:

Data collection

The questionnaire was chosen to be the method of collecting data in this research, since the questionnaire is probably the most widely used data collection technique for conducting surveys. Questionnaires have been widely used for descriptive and analytical surveys in order to find out the

facts, opinions and views (Naoum, 1998). The questionnaire is mailed to respondents who are expected to read and understand the questions and write down the reply in the space meant for the purpose in the questionnaire itself. It enhances confidentiality, supports internal and external validity, facilitates analysis, and saves resources. Data are collected in a standardized form. The standardized form allows the researcher to carry out statistical inferences on the data, often with the help of computers. A questionnaire survey was designed based on the objectives of the study, which are causes of construction delays and effects of construction. A questionnaire survey was developed to get the opinion and understanding from the experienced respondents regarding the construction delays problem (*Annexure – I*). The data obtained from the questionnaire was analyzed and results for the major impacts were identified. Cronbach's alpha technique was used to validate the obtained data from the questionnaire.

Data processing and analysis

The research utilizes two separate methods to analyze the respondent's data to identify the critical attributes among all seven categories, owner, consultants, contractor, labor, equipment, external and methods to minimize delay. The first is a descriptive approach with direct interpretation of the survey results to identify the most critical 'based on their relative importance index (RII) (Doloi, 2008).

Descriptive analysis based on relative importance index

Relative Importance Index

The relative index technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Several researchers such as Odusami and Onukwu (2008), Elhag *et al.* (2005), Madi (2003), and Akintoye (2000) used the relative importance index in their analysis of factors affecting the accuracy of cost estimate. Likert scaling was used for ranking questions that have an agree-disagree level. Respondents were required to rate the importance of each factor on a 5-point Likert scale using 1 for strongly disagree, 2 for disagree, 3 for no opinion, 4 for agree and 5 for strongly agree. Then, the relative importance index was computed using the following equation

$$RII = \frac{\sum W_i n_i}{AN} = \frac{5n_1 + 4n_2 + 3n_3 + 2n_4 + n_5}{5N} \quad (33)$$

Where W is the weighting given to each factor by the respondent, ranging from 1 to 5, (n_1 = number of respondents for strongly disagree, n_2 = number of respondents for disagree, n_3 = number of respondents for no opinion, n_4 = number of respondents for agree, n_5 = number of respondents for strongly agree). "A" is the highest weight (i.e. 5 in the study) and N is the total number of samples. The relative importance index ranges from 0 to 1 (Tam and Le, 2006).

Conclusion

Based on the results obtained from this research, the following conclusions of the research are drawn:

An exploration off actors affecting delay of construction was conducted in order to find the degree of importance for each factor. The result of analysis of 46 factors considered in the questionnaire filled by representative sample of employees in Silppi Realtors And Contractors.

1. The five least important factors as agreed by the respondents are Delay in obtaining permits from municipality; Number of floors; Location of Site; Migration of Labour and Unclear perception of demand. The results show that these factors have a little affecting on the delay in Silppi Realtors And Contractors. However, it is preferable to be considered by the People in Silppi Realtors during preparing schedule.
2. The construction delay occurs mostly during the construction phase. The right methodology of construction is to be adopted. Proper co-ordination with all the contractors involved in work is a must. In addition to this, the contractors should be aware that delays are mostly caused by the poor labor's skill, supervisor not able to coordinate the project very well and also low quality of material used in the construction projects. Therefore, contractor needs to give awareness on these three factors stated above in order to minimize the construction delays' problems.
3. Low technical and managerial skills of contractors are the problems that faced by contractors which might cause construction delays. Therefore, contractors should organize some training programs for their workers in order to update their knowledge and improve their management skill. Due to the dynamic nature of project environments, it is inevitable that conflicts among the project team will arise. All project participants should recognize that conflict are inevitable and actually can be beneficial if resolved in an appropriate manner.
4. The three most critical factors of the contractor-related factors affecting the delay in Silppi Realtors are: - Ineffective planning and scheduling of project, Delays in site mobilization and Delay in sub-contractors work.
5. The two most critical factors related to client group Delay to furnish and deliver the site, Late in revising and approving design documents.

Recommendation to the organization

The following recommendations are the most important ones that can be deduced by this research:

1. Frequent progress meeting
2. Use up-to-date technology utilization
3. Use proper and modern construction
4. Proper emphasis on past experience
5. Effective strategic planning

6. Clear information and communication channels
7. Complete and proper design at the right time
8. Site management and supervision
9. Collaborative working in construction
10. Frequent coordination between the parties involved
11. Compressing construction durations
12. Proper project planning and scheduling
13. Proper material procurement
14. Use appropriate construction methods
15. Accurate initial cost estimates

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