

Assessment Of Significant Causes And Effects Of Delays On The Projects Completion Period

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Abstract— The growing rate of delays is adversely affecting the timely delivery of construction projects. For owner, delay means the loss of income and unavailability of facilities. For contractor, delay means the loss of money for extra spending on equipment and materials and hiring the labor and loss of time. They are almost always accompanied by cost and time overruns. Construction project delays have a debilitating effect on parties such as owner, contractor, and consultant in terms of a growth in adversarial relationships, distrust, litigation, arbitration, cash-flow problems etc. Construction delay has become endemic in Indian construction industry. Delay of a project is a main factor and the major cause of construction claims. Therefore there is acute necessity for a detailed analysis of the delay factors and chooses correct actions to minimize the adverse effect of delay on time, within cost and for high quality. This research paper present list of construction delays causes retrieved from literature. The feedback of construction experts was obtained through interviews. Subsequently a questionnaire survey was prepared .The questionnaire survey was distributed to owner, contractor, engineer, architect and consultant. Frequency index, importance index and severity index are calculated. The discussion of the results ends the paper. The findings of this research paper can be used as a reference by project owners, managers, and in various organizations in developing their project management strategies and minimizing construction delays.

Keywords— Construction delay, causes of delays, effects of delays, delay assessment, recommendations.

I. INTRODUCTION

Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders, regulators and others. In construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases. Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources .These sources, include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it is rarely happen that a project is completed within the specified time. The survey revealed differences in perceptions of the relative significance of factors between the three groups, indicative of their experiences, possible prejudices and lack of effective communication. It was found that owners had more concerns with regard to financial issues; contractors regarded contractual relationships the most important, while consultants considered project management issues to be the most important causes of delays. The results indicate that delays are very extensive in nature. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses.

II. LITERATURE REVIEW

A number of studies have been carried out to determine the causes of delay, effects of delays in construction projects. Sweis et al. studied the causes of delay in residential projects and concluded that financial difficulties faced by the contractor and too many change orders by the owner are the leading causes of construction delay.

According to Mansfield (2002), the most important causes of delay in Nigerian construction industry are finance and payments, poor handling of contract, shortages of materials and equipment, inaccurate estimations, and fluctuations in prices. Shi J, Cheung S & Arditi D. (2001), Aibinu A, Odeyinka H. (2006), cited many noteworthy causes of delays such as: weather conditions, shortages of resources, shortage of materials and equipment, financial difficulties faced by clients and contractors, poor contract management etc.

Aibinu AA, Jagboro GO. (2002) studied the effects of construction delays on completion or delivery of construction project in Nigerian large construction industry and mentioned them as: time overrun, cost overrun, dispute, arbitration and abandonment.

III. TYPES OF CONSTRUCTION DELAYS

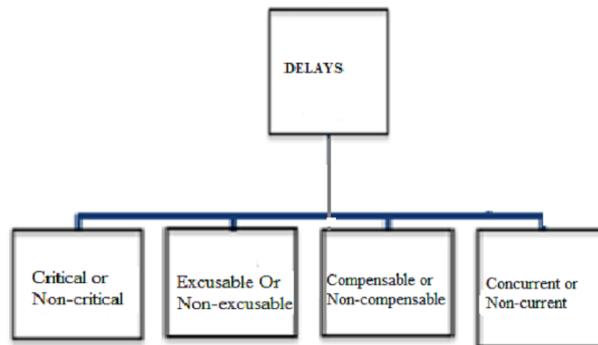


Figure 1 Types of delays

A. Critical or non-critical delays:

Delays that affect the project completion or in some cases a milestone date are considered as critical delays, and delays that do not affect the project completion, or a milestone date, are noncritical delays. If these activities are delayed, the project completion date or a milestone dater will be delayed.

B. Excusable or non-excusable delays:

An excusable delay is a delay that is due to an unforeseeable event beyond the contractor's or the subcontractor's control. For example general labour strikes, fires and acts of God. Non-excusable delays are events that are within the contractor's control or that are foreseeable. Inexcusable delays (Non- Excusable delay) are caused solely by the contractor or its suppliers.

C. Compensable or non-compensable delays:

A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Compensable delays are caused by the owner. An example of this would be the late release of drawings from the owner's architect.

Non-compensable delays mean that although an excusable delay may have occurred, the contractor is not entitled to any added compensation resulting from the excusable delay. Non compensable delays are caused by third parties or incidents beyond the control of both the owner and the contractor. Examples typically include unusual weather, strikes, acts of government etc.

D. Concurrent or non-concurrent delays:

The concept of concurrent delay has become a very common presentation as part of some analysis of construction delays. The concurrency argument is not just from the standpoint of determining the project's critical delays but from the standpoint of assigning responsibility for damages associated with delays to the critical path. Unfortunately, few contract specifications include a

definition of concurrent delay and how concurrent delays affect a contractor's entitlement to additional compensation for time extension or responsibility for liquidated damages. In analysed concurrent delays, each delay is assessed separately and its impact on other activities and the project duration is calculated.

IV. CAUSES OF DELAYS IN RESIDENTIAL CONSTRUCTION PROJECTS

Delays in construction can have multiple effects such as late completion, loss of productivity, acceleration cost and in some cases contract termination. Though delay in a noncritical activity may not affect the project duration significantly, a delay may occurs concurrently with other delays and all of them may impact the project completion date.

Cause of delays in construction projects are mainly as:

- Client related factors:
- Contractor related factors:
- Consultant related factors:
- Material related factors:
- Labor and equipment related factors:
- Contract related factors:
- Contract relationship related factors:
- External factors:

V. EFFECTS OF CONSTRUCTION DELAYS

Several factors cause the overall delay in the construction project such as some within contractor's liability and some are within owner's liability. It is mostly seen that delay problems are cause of dispute, negotiation, lawsuit, total desertion, litigation and abandonment. The consequences of delay are different for different parties. The general consequences are the loss of wealth, time and capacity.

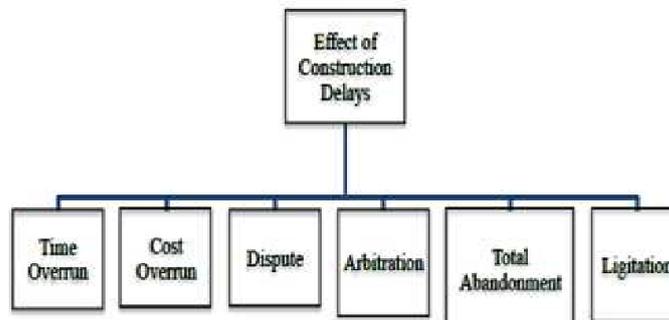


Figure 2 Effect of delays on construction projects

VI. DELAY ANALYSIS APPROACH

Data were gathered through a questionnaire. The questionnaire is divided into two main parts. Part 1 is related to general information for both the company and respondent. Both contractors and consultants were further requested to answer questions pertaining to their experience in the construction industry and their opinions about the percentage average time delay in projects they experienced. Part 2 includes the list of the identified causes of delay in construction project. These causes are classified into nine groups according to the sources of delay.

A. Frequency Index:

A formula is used to rank causes of delay based on frequency of occurrence as identified by the participants.

$$\text{Frequency Index (FI)} = (\Sigma (a n) \div N) \times (100 \div 4)$$

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 the total number of responses

B. Severity Index (SI):

A formula is used to rank causes of delay based on severity of occurrence as identified by the participants.

$$\text{Severity Index} = (\sum (a \cdot n) \div N) \times (100 \div 4)$$

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 the total number of responses.

C. Importance Index (II):

It is a function of both frequency and severity indices, as follows:

$$\text{Importance Index (I.I \%)} = (F.I \% \times S.I \%) \div 100$$

VII. RESULT AND FINDINGS

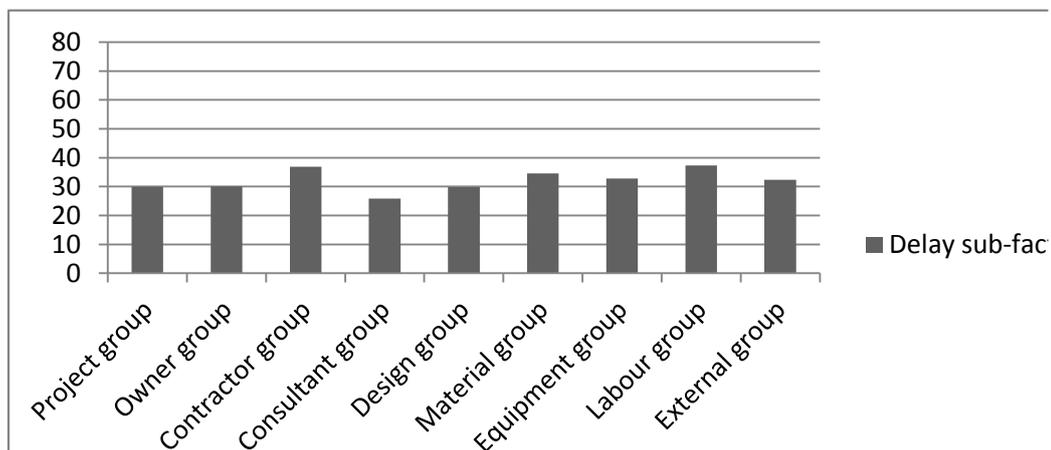
Following are the most critical causes of delays concluded from the result and analysis:

Table 1 Causes of delays concluded from the result and analysis

Sr.no	Group	Delay Causes	F.I (%)	S.I (%)	I.I (%)
1	Project group	Contract duration is too short	70	55	38.5
2		Types of construction contract	62.5	47.7	29.82
3		Type of project building awarded	53.4	39.8	21.25
4	Owner group	Delay in payment by owner	70.4	59	41.54
5		Change order by owner	59	54.5	32.16
6	Contractor group	Rework	47.3	57.5	27.20
7		Difficulties in financing	60	58	34.8
8		Subcontractors conflicts	53.2	53	28.20
9	Consultant group	Poor communication	60.2	50	30.1
10		Delay in performing inspection	42	42	17.64
11		Inflexibility of consultant	61.3	48.7	29.86
12	Design group	Mistakes and discrepancies	57	60	34.2
13		Inadequate details in documents	52.2	52.1	27.20
14		Complexity of project design	51.2	55	28.16
15	Material group	Shortage of construction material	59	66	38.94
16		Delay in material delivery	66	63.6	41.98
17		Damage of sorted material	45.5	50	22.75
18	Equipment group	Equipment breakdown	62.5	59	36.88
19		Shortage of equipment	61.3	52.3	32.05
20		Low level of operators skill	50	59	29.5
21	Labour group	Shortage of labour	71.6	67	47.97
22		Unqualified workforce	60	67	40.2
23		Personal conflict among labours	50	47.7	23.85
24	External group	Delay in obtaining permits from municipality	64.8	64.8	42
25		Rain effect on construction activities	50	56.8	28.4
26		Hot weather effect	54.6	48.7	26.60

VIII. DISCUSSION OF THE RESULT

This section discusses the results obtained in the earlier section. First, we discuss the results obtained by analyzing the causes of delays. Second, we discuss the results obtained by analyzing the causes of the delays. The ten most important causes of delays are analyzed with the help of chart shown below. It is shown from the graph that contractor group is most influencing factor for causes of delay with high value of average I.I as 36.85 while consultant group least influencing factors for causes with I.I as 25.81.



A. Contractors improper planning

Local contractors often fail to come out with a practical and workable “work program” at the initial planning stage. This failure is interrelated with lack of systematic site management and inadequate contractor’s experience towards the projects.

B. Contractors poor site management

Contractor’s poor site management is one of the most significant causes in causing the construction delays. The results of this research indicate that local contractors face difficulties in financing, rework and subcontractors conflicts.

C. Inadequate contractor’s experience

A contractor with inadequate experience cannot plan and manage the projects properly and this can lead to disastrous consequences.

D. Shortage in material

Shortages in basic materials like sand, cement, stones, bricks, and iron can cause major delays in projects.

E. Labor supply

The quality and quantity of labor supply can have major impact on the projects. The low quality and productivity of the foreign workers have impact on the project progress and efficiency.

F. Lack of communication between parties

Since there are many parties involved in a project (client, consultant, contractor, sub-contractors), the communication between the parties is very crucial for the success of the project. Proper communication channels between the various parties must be established during the planning stage.

IX. CONCLUSIONS

The study investigates firstly the significant causes of construction delay, effects of these delays on construction delay and then secondly analyzed causes of delays by F.I, S.I and I.I.

1. Construction delay is a critical function in construction projects. In practice, this phenomenon is expected to continue unless management takes action to control these causes right from design stages. And adequate planning; coordination; and proper monitoring of the

construction projects by an experience and qualify professionals will reduce the impact of delay.

2. Cost overrun and time overrun (elongation of project duration) were the two most frequent effects of delays which significantly affects the construction projects.
3. Delay had significant effects on actual project duration. The model relating delay and actual project duration provide a benchmark for future research work in the study of project management and also facilitate comparison with other countries.

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