

PRESTRESSED CONCRETE BRIDGE GIRDER DESIGN

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Abstract—This paper presents the construction industry is one of the main sectors that provide important ingredients for the development of an economy. The construction is the tool through which a society achieves its goals of urban and rural development. However it is becoming more complex because of the sophistication of the construction process itself and the large number of parties involved in the construction process, i.e., clients, users, designers, regulators, contractors, suppliers, subcontractors, and consultants. Modern construction projects are characterized by new standards, advanced technologies, multiparty participation, and frequent owner-desired changes. Coupled with this state are inherent uncertainties and complexities in the physical, financial, and economic environment in which most projects are performed. Such conditions have made completing projects on schedule and on budget a difficult task to accomplish, often leading to claims on cost compensations and time extensions. This eventually leads to delay in the completion of the project. Delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that parties agree upon for delivery of a project. It is slipping over its planned schedule and is considered as common problem in construction projects. The objective of this study is to identify the major causes of construction delays, its effects, and minimizing delays in construction projects. This study is carried out based on literature reviews and questionnaire survey.

Keywords—Construction Management, Causes of Delays, Effects of Delays, Construction Industry, India.

I. Introduction

The construction industry is one of the main sectors that provide important ingredients for the development of an economy. The construction industry is the tool through which a society achieves its goals of urban and rural development. However it is becoming more complex because of the sophistication of the construction process itself and the large number of parties involved in the construction process, i.e., clients, users, designers, regulators, contractors, suppliers, subcontractors, and consultants. Modern construction projects are characterized by new standards, advanced technologies, multiparty participation, and frequent owner-desired changes. Coupled with this state are inherent uncertainties and complexities in the

physical, financial, and economic environment in which most projects are performed. Such conditions have made completing projects on schedule and on budget a difficult task to accomplish, often leading to claims on cost compensations and time extensions. This eventually leads to delay in the completion of the project. Delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that the parties agree upon for delivery of a project. It is slipping over its planned schedule and is considered as common problem in construction projects. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. 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 generates claims from both the main contractors and subcontractors which many times entail lengthy court proceedings with huge repercussions. Delays caused by contractors can generally be attributed to poor managerial skills. Lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall.

II. LITERATURE REVIEW

[1] According to Chan and Kumaraswamy (1997), the most important causes of delay in Hong Kong construction industry are poor supervision and management, unpredictable site conditions, slow decisions, variations by client, and variations of work. 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.

[2] Manavazhia MR, Adhikarib DK. (2002) has conducted a survey to for the investigation of the delay in the delivery of materials and equipment to the large construction sites and found important effect such as cost overruns in Nepal.

III. METHODOLOGY OF STUDY

This study is descriptive, designed to obtain views from clients, consulting firms, regulatory boards and construction firms in regard to causes and effects of delays and disruptions in construction projects. The population of the study comprises of clients, architectural and Quantity surveying consulting firms, construction firms and regulatory boards. The sample size of 60 respondents was estimated comprising of 33 construction firms, 10 quantity surveying, 10 architectural consulting firms, 5 clients and 2 statutory bodies.

Analysis and Findings

The sample for this study is relatively small. As a result, the analysis had combined all groups of respondents (clients, consultants, contractors and regulatory boards) in order to obtain significant results. Data was analysed by calculating frequencies and Relative Importance Index (RII). The Relative Importance Index (RII) is calculated as follows:

$$RII = \frac{\sum W}{A \times N}$$

Where; W = weight given to each factor by respondents

A = highest weight

N = total number of respondents.

For the purpose of this study A=4 and N=40. However, for the purpose of this study, amongst 40 returned questionnaires some of the causes and effects were not ranked thus N varies between 40 and 37. Relative Importance Indices (RII) comparison table

was used to rank the results by taking into account the average scores and the RII as follows:

Table 1: Relative Importance (RII) Table

Average Score	RII	Ranking
4.0 to 5.0	0.80 to 1.00	High (H)
3.0 to 4.0	0.60 to 0.80	Medium (M)
1.0 to 3.0	0.20 to 0.60	Low (L)

Source: Ileshe, Haupt and Fester (2007)

Table 2 Effects of project delays identified for investigation

Effect	Description
Time overrun	When the stipulated completion time is pushed forward, the project is said to have experienced time overrun
Budget overrun	When a project is completed at a cost higher than what was budgeted, it is said to experience a budget overrun
Poor quality completed project	As highlighted in the previous section inferior workmanship and/or inferior quality materials, can lead to issues of project quality
Bad Public Relations	When projects are delayed, contractors, consultants and clients could put their public reputations at risk
Litigation	Disputes can lead to court cases for resolution especially when large penalties are at stake
Arbitration	The cost and time related to the engagement of professional arbitrators
Disputes and claims	Disputes and claims arise against for the losses incurred through delays
Total abandonment	Delays in project execution could lead to total abandonment if issues leading to the delays are not resolved timeously

IV. RESULTS AND DISCUSSIONS

4.1 Research findings and results

Questionnaire will be distributed to 40 respondents and will be collected

4.2 Ranking of delays

The causes, effects and minimisation of construction delays will be ranked by using relative important index. The top affecting causes of delays category wise are late in revising and approving design documents by owner, ineffective planning and scheduling by contractor, mistakes and discrepancies in design documents by consultant, changes in material types and late procurement of materials, equipment breakdowns, personal conflict among labors, and rise in prices of materials. When the causes will be ranked overall, the main causes for delay are ineffective planning and scheduling by contractor, rise in prices of materials, late in revising and approving design documents by owner. The top effects of delay are time overrun and cost overrun. The top means of minimisation of construction delays are effective strategic planning, frequent progress meeting, accurate initial cost estimates, proper project planning and scheduling, site management and supervision.

4.3 Questionnaire design

The questionnaire is divided into four sections. Section A is related to general information for both the company and respondent. Both the contractors and consultants were further requested to answers pertaining to their experience in the construction industry and their opinions about the average time overrun in construction projects that they have experienced. Section B is related to the causes of construction delays. It is classified into owner, contractor, consultant, materials, equipment, labour and external factors. Section C consists of effects of construction delays. Section D consists of means to minimise construction delays. They are categorised into five-point scale.

Relative Importance Index method is adopted to determine the relative importance of the various causes of delays. In this case, four-point Likert scale were adopted which ranges from 1 (not important) to 4 (extremely important) and transformed to relative importance index (RII) for each factors using the formula shown below: Relative Importance Index, $RII = \frac{W}{A \cdot N}$ where W = weighting given to each factor by the respondents which ranges from 1 to 4 where '1' is 'not important' and '4' is 'extremely important', A = highest weight (i.e. 4 in this case), and N = total number of respondents (i.e. 40 in this case).

V. CONCLUSION

Communication and coordination plays vital role in the effective progress of the construction. The company which is not up to date with the information communication technology will be lagging in the progress and can't survive in the competitive market. Latest information communication technology will boost up the productivity of the communication which reduces the chances of getting delayed. The major reason behind all these causes is lack of commitment and coordination within the project participants. The commitment of the project participants drastically affects the quality and the progress of the project. Issue of delay in construction is common globally, but its causes & effects varies with respect to native, context and culture of the construction industry. Contractors should effectively plan and schedule the project in advance by considering all possible risk factors with respect to the nature and culture of the locality.

Commitment from top to bottom level management is more important in which periodic review and correction should be made in all aspects (safety, quality, material, equipment) to avoid unnecessary delays and cost overruns. Unskilled workers are inefficient, in which labours and supervisors should

be well trained with effective training program to improve their knowledge. Delivery of construction materials should be dealt carefully with the vendors which affects the progress of the project utmost. Owner should be well aware about the effect of changing orders during construction and delay in progress payment, which affects the project completion on predefined time.

VI. REFERENCES

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