Non Excusable Delays in Construction Industry: A Causal Study

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***Abstract*—Delays are one of the major problems construction industry faces. Delays can lead to many negative effects such as arbitration between owners and contractors, increased cost, loss of productivity and revenue, and contract termination. Various studies have been carried out to highlight the general causes of delays and suggest possible remedial measures to minimize the effect of delays on a project. This study aims to highlight the critical factors with specific reference to non-excusable delays (NEDs) only. It also suggests possible remedial measures to minimize the effects of contractor-oriented NEDs which is a significant type of delays in the construction industry. A qualitative study has been conducted for this research. Data have been collected by the use of a set of questionnaires on numerous construction project stakeholders. Relative importance index (RII) has been used for prioritizing the factors. Results show that slow material mobilization, subcontractor unreliability and shortage of labor and materials are the most critical NED causes. This paper aims to provide a prerequisite knowledge to practitioners to make a more informed decision in managing NED.**

Keywords-delays; non-excusable delay; construction projects; project failure; mitigation

I. INTRODUCTION

Construction industry plays an essential role in a country's socio-economic development [1, 2]. However, it faces a wide range of challenges, one of which is the frequent occurrences of construction delays. Delay is one of the most common problems in the construction industry [3]. To achieve the dismal profit margins, it requires massive all-around efforts to develop a schedule and control it efficiently. With low-profit margins and the involvement of many parties, these projects have an inherent risk of schedule slippages and subsequent monetary losses [4]. It is not uncommon for a construction project to experience a delay. While contractors never want delays to happen, they do occur. Delays may occur at any time on a project. A delay means loss of profit and/or risk of facing hefty liquidated damages [5]. At 2016, the global average value of a construction delay dispute was reported to be a staggering US$46million, a trend that has been climbing upwards from 2010. Claims and disputes are the inevitable results of delays to a project [6]. Authors in [7] evaluated the records of more than 4000 projects and concluded that delays and cost overruns are common in the construction projects and the success rate of completing a project on time is poor. Authors in [8] concluded that 50% of construction delays are NEDs, delays for which the contractor is responsible. Authors in [9-11] observed the detrimental effect on a contractor's performance, particularly on a contractor's schedule. There are a number of studies in the literature that classify delays according to their nature and define various types of delays. Authors in [12-16] classify the delays into three categories, as shown in Figure 1.

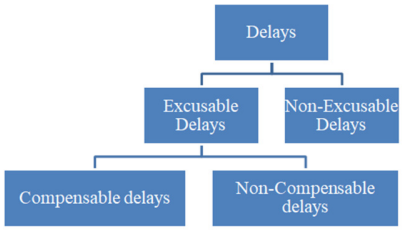

Fig. 1. Delay classification

In compensable, excusable delays, generally the owner remains responsible and a contractor may be granted the extension of time and the extra cost. Non-compensable excusable delays are earthquakes, snowfalls, heavy rains, tsunamis, wars, etc. In such cases, delays cannot be controlled either by client or contractor and normally the contractor will be granted the extension of time and money to complete the task. The third type of delays, NEDs, is purely contractor's fault: material related delays, labor-related delays, equipment related delays, financial issues etc. In this case, contractors normally have to face a financial penalty.

Construction industry is one of the leading development sectors of any country. In Pakistan, it contributes 2.74% to development, 2.65% to GDP and the 7.31% of labor force in 2017 [17]. In Pakistan, it has been observed that delay is a key reason for project failure. Very little evidence is available from previous studies regarding Pakistani construction industry on issues related to the causes of NEDs which influence contractor's performance. Hence, this research attempts to

investigate and evaluate the issues related to the causes of NEDs during the construction stage of projects, with an emphasis on critical factors.

II. RESEARCH METHODOLOGY

Qualitative research methodology has been employed. The research has been undertaken in three phases. In the first phase the candidate factors were selected from the existing literature. In the second phase, field data were collected about these factors causing NEDs in constructions in Pakistan and analysis was done using the RII method:

$$\text{RII} = \frac{\sum_{i=1}^{5} W_i X_i}{A \times n} \quad (1)$$

where Wi=the weight given to the ith response: i=1, 2, 3, 4, 5, X_i=frequency of the ith response, A=the highest weight (5 in this study), and n=the number of respondents. Authors in [5, 11, 18] successfully used this method for the analysis of construction delays. In the third phase, a list of corrective actions for critical factors was generated.

III. RESULTS AND DISCUSSION

The questionnaire was divided into two segments: the first segment was for collection of general information from the respondents and the second segment regarded NED matrix which contains information about NEDs and causes leading to NEDs. The respondents have to rank the different factors of NEDs that influence a contractor's performance in construction projects. In the NED matrix, a total number of 42 different factors which cause NEDs in the construction industry of Pakistan were placed and these factors were grouped in 14 different NED causal areas (Table I).

A second questionnaire set was categorized into four major segments. Segment 1 contained general information and company profile. Segments 2 and 3 contained technical questions, related to the respondent, regarding contractor's performance and evaluation of critical factors. In the last segment, evaluation of possible remedial measures to deal with NED was done. Table II shows the rank of the causal area with causes of NED based on the respondents' opinion. It is observed that material related delays, improper construction methods and inadequate supervision are the most significant NED causal areas. Whereas, shortage of equipment/labor/material, improper equipment, poor planning and shortage of labor are the significant causes for NED with the highest RII score. Critical delays are those which cause delay to the entire project completion date while non-critical delays do not necessarily affect the project completion date but affect progress. In every project, delays are determined regarding their effect at the project completion date. Delays can be a combination of small and big delays that occurred during the whole project. Therefore, critical delays are taken more into consideration than noncritical delays. Table II shows the core critical factors for NEDs. The last objective of this study is to point appropriate corrective actions for the critical factors which affect the schedule performance of contractor. Table III shows the suggested remedial measures.

TABLE I. CRITICAL FACTORS FOR EACH GROUP OF NED CAUSES

	Causal Area	Cause of Delays	RII	Rank	Avg. Score
1	Material related delays	Poor planning	4.467	1	4.4
		Unavailability of resources	4.322	2	
		Shortage of materials	4.29	3	
2	Labor related delays	Shortage of labor	4.419	1	3.9
		Strikes	3.935	2	
		Low productivity	3.37	3	
3	Equipment related delays	Improper equipment	4.338	1	4.2
		Unskilled equipment operator	4.225	2	
		Poor planning	4.064	3	
4	financial related delays	Improper equipment	4.5	1	4.3
		Unskilled equipment operator	4.209	2	
		Poor planning	4.177	3	
5	Improper planning related delays	Poor planning	4.29	1	4.3
		Slow mobilization/late delivery	4.258	2	
		Defective work/rework	4.225	3	
6	Lack of control related delays	Defective work/rework	4.354	1	4.3
		Poor quality	4.354	2	
		Poor planning	4.209	3	
7	Subcontractor related delays	Poor planning	4.274	1	4.1
		Subcontractor bankruptcy	4.08	2	
		Shortage of labor	4	3	
8	Technical personnel shortages	Poor planning	4.387	1	3.9
		Poor qualification	4.161	2	
		Shortage of personnel	3.032	3	
9	Poor coordination	Shortage of equipment/labor/material	4.516	1	4.3
		Poor planning	4.145	2	
		Slow mobilization/late delivery	4.129	3	
10	Inadequate supervision	Defective work/rework	4.354	1	4.3
		Poor quality	4.354	2	
		Poor monitoring and control	4.322	3	
11	Improper construction method	Wrong method statement	4.387	1	4.3
		Inappropriate practices/procedures	4.338	2	
		Defective work/rework	4.322	3	
12	Poor communication	Poor planning	4.37	1	4.3
		Shortage of materials	3.967	2	
		Damaged materials	3.322	3	
13	Improper Scheduling	Poor planning	4.161	1	4.0
		Inappropriate practices/procedures	4.096	2	
		Shortage equipment	3.79	3	
14	Slow decision making	Lack of experience	4.096	1	4.0
		Poor planning	4.032	2	
		Shortage equipment	3.79	3	

IV. CONCLUSIONS AND SUGGESTIONS

The objectives of this study were to identify the most important causes of NED and to suggest corrective measures for NED critical factors that affect the performance of a construction contractor in Pakistan. Intensive government involvement is needed to prevent and mitigate an issue that may delay projects. Results showed that financial problems, followed by equipment problems, lack of equipment,

manpower and insufficient communication between the main actors are the main causes of NEDs.

TABLE II. NED CRITICAL FACTORS

Rank	Critical Factors
1	Slow mobilization/Late delivery
2	Unreliable supplier/Subcontractor
3	Shortage of equipment/Labor/Materials
4	Delay in manufacturing
5	Delay in material selection
6	Delay in importing materials/Equipment
7	Poor planning
8	Low productivity
9	Lack of experience
10	Inappropriate practices/procedures
11	Poor monitoring and control
12	Low morale/motivation
13	Shortage of personnel
14	Too many responsibilities
15	Defective work/Rework
16	Working in remote areas

TABLE III. SELECTED REMEDIAL MEASURES

NED critical factor	Selected corrective action
Slow mobilization/Late delivery	A penalty clause for delay in material selection and delivery would minimize the occurrence of late delivery.
Unreliable supplier/Subcontractor	A fine clause would govern the reliability and performance of sub-contractor.
Shortage of Equipment/Labor/ Materials	A penalty clause stipulated by the contractor for shortage of Materials/Labor/Equipment.
Delay in manufacturing	Engaging additional personnel will influence cost.
Delay in material selection	Engaging an appropriate resource will influence time and cost.
Delay in imported material/equipment	Ideally a contract clause for delivery may influence the delivery program
Poor planning	Engaging additional experienced personnel would minimize the impact but may influence the cost.
Low productivity	Using work sampling data, managers will be able to make accurate decisions to control the factors that positively and adversely affect job productivity.
Lack of experience	Engaging an experienced planning engineer would influence the cost.
Inappropriate practices/procedures	Benchmarking and constantly improving the practices/procedure will minimize the impact.
Poor monitoring and control	Systematic monitoring and control taking into consideration accuracy, short regular intervals, effective feedback and standard procedures will minimize poor monitoring and control.
Low morale/motivation	Ideally, improving job satisfaction would influence morale/motivation.
Shortage of personnel	Proper personnel planning and provision will reduce shortage
Too many responsibilities	Sharing with different companies and checking manufacturing details from all industries.
Defective work/Rework	Where works are defective the contractor is entitled to provide for corrective actions and improvements.
Working in remote areas	Barring late workers and morning inspection would minimize late arrival.

All respondents agreed that the contractors' performance can be easily judged and verified by the scheduled performance. Usually the contractors have planned the works before their start and, daily or weekly, the real performance of a site is updated to check the work progress. It is suggested that remedial and project managers can save the cost for the contractor and bring successful project completion and positive impact on the construction industry. The success or failure of a commercial construction project depends largely on the construction schedule and whether it is met or not. Delays in the construction schedule impact negatively both owners and contractors. Construction industry is flooded with fast track projects nowadays and there is always a pressure on the contractor to bid as low as possible, resulting in low profit margins. To achieve these dismal profit margins, requires massive all-round efforts of developing a schedule and efficiently controlling it. In addition to "you may delay, but time will not", Benjamin Franklin also said that "time is money". While it is doubtful that he was thinking about construction delays when he coined these phrases, his words are spot-on. Delays incurred during a construction project can have severe negative impacts on owners and contractors alike. Care must therefore be taken during the drafting and negotiation of construction contracts to ensure that the parties' financial interests are adequately protected in the event delays result in late project completion.

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