Attribute Analysis for Non Excusable Delays in Construction Industry

Shabir Hussain Khahro

Lecturer, College of Engineering, Department of Engineering Management, Prince Sultan University

Riyadh, Saudi Arabia

shkhahro@psu.edu.sa

Dr. Zubair Ahmed Memon

Professor, College of Engineering, Department of Engineering Management, Prince Sultan University

Riyadh, Saudi Arabia

zamemon@psu.edu.sa

*Abstract -*- Delays are one of the major problem construction industry fronting since a long time. Delays can lead to many negative effects such as arbitration between owners and contractors, increased cost of project, loss of productivity & revenue and contract termination. In this regard various studies have been carried out in different countries to highlight the general causes of delays and suggest possible remedial measure to minimize the effect of delays on project. This study aims to highlight the critical factors with specific reference to Non-Excusable Delays (NED) only. It also suggests the possible remedial measure to minimize the effects of contractor-oriented NED which is a significant type of delays in construction industry. Qualitative study has been conducted for this research and the data has been collected using set of questionnaires from numerous construction projects. Average Index (AI) has been used for prioritizing the factors. The results show that slow mobilization of material, subcontractor and shortage of labour and material are the most critical cause of NED. This paper will provide a prerequisite knowledge to practitioners to make more informed decision in managing NED.

Key words: Delays, Non Excusable Delay, Construction Projects, Project Failure, Mitigation

1. Introduction

Construction industry has been a busy industry in 20th century. Massive multitudes of projects have sprung up, especially since the Second World War. It plays an essential role in the socio-economic development of a country. The importance and role of construction industry in the economy of various countries has been confined by several studies [1]. The activities of the industry have great significance to the achievement of national socio-economic development goals of providing infrastructure, sanctuary and employment. However, this industry has faced a wide range of challenges, one of which is the frequent occurrences of construction delays.

Construction industry is flooded with the Fast Track Projects these days and there is always a pressure on the contractor to bid the lowest, resulting in low profit margins. To achieve the dismal profit margins, it requires massive all-round efforts to develop a schedule and control it efficiently. With low profit margins and involvement of many parties at a time, these projects have inherent risk of schedule slippages and subsequent monetary losses [2].

The word “delay” is too familiar word utilized during construction because it is not remotely uncommon for a construction project to experience delay. While contractors never want a delay to actually happen because time is money, delays unfortunately do occur. Delays may occur any time on a project, even with all sincere efforts to control a project and complete on time. Delay means loss of profit and/or risk of facing hefty liquidated damages [3].

A 2016 report on worldwide construction claims states the global average value of a construction delay dispute to be a staggering US$46million, a trend that has climbed upward from 2010. The report also indicates that claims and disputes are the inevitable result of delays to a project [4]. The subject of delays has been addressed by several researchers such [5] 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 project on time is poor. [6] concluded that 50% of construction delays as Non-Excusable Delays (NED), delays for which the contractor is responsible. [7], [8] and [9] they observed the detrimental effect on contractor’s performance, particularly on contractor’s schedule.

There are number of studies in the literature that classify delays according to their nature and define the various types of delays. [10], [3], [11] classify the delays into three categories as shown in Figure 1.

**Fig. 1: Classification of Delays**

The first type of delay, generally owner remained responsible and contractor may be granted extension of time and he will be given extra cost but based on improvement required. For Excusable delays without compensation, such type of delays normally happen due to Acts of God, such as earthquakes, snowfall, heavy rain, Tsunami, war, etc. In such cases, delays cannot be controlled either by client or contractor normally contractor will be granted extension of time to complete the task. Third type of delays is purely due to the fault of contractor such as material related delays, labor related delays, equipment related delays, financial issues etc. In this case, normally contractors have to face penalty.

Construction industry is one of the leading sectors for the development of any country. In Pakistan, it contributes 2.74 percent against the share of 2.65 percent in GDP last year and it contributed 7.31 percent for labor force [12]. Pakistan construction industry has no exemption from delays. It has been observed that delay is key reason of project failure and un-healthy relationship with project participants. Very little evidence is available from previous studies especially in Pakistani construction industry on issues related to the causes of non-excusable delays which influence contractor’s performance. Hence, this research attempts to investigate and evaluate the issues related to the causes of Non-excusable delays during the construction stage of projects, with emphasis focusing on the critical factors.

1. Research Method

Qualitative research methodology has been employed to accomplish research objectives. The research study has been undertaken in three phases. The first phase included introduction and literature review about the factors which causes the NED in construction industry of Pakistan factors pointed out from existing literature. In second phase, field data was collected about factors causes NED in constructions and analysis were done using Average Index (AI) method. [3] [9] [13] has successfully used this method for the analysis of construction delays.

1. Results & Discussion

The pilot survey questionnaire was divided into two segments; the first segment collects the general information from the respondent and second segment was regarding Non-Excusable Delays matrix. The main purpose of having general information was to identify the source which provided a useful contact point for clarifying queries on any answer given. The matrix of NED contains the information for causal area of NED and causes leading to NED. The respondents have to rank the different factors of Non-Excusable Delays that influence contractor’s performance, in construction projects.

In NED matrix, a total number of 42 different factors which causes NED in construction industry of Pakistan were placed and these factors were grouped in 14 different causal areas of NED. The second set of questionnaire was categorized in to four major segments. Segment 1 contains general information of respondent and company profile. Segment 2 and 3 contains technical questions related to indicator for contractors performance and evaluation for critical factors. In the last segment, evaluation of possible remedial measures to deal NED was done. Table 2 shows rank of causal area with causes of NED based on the respondents experience and opinion.

**Table 1: List of Critical Factors for Each Group of Causes of NED**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No** | **Causal Area of NED** | **Cause of Delays** | **Average Index Score** | **Rank** | **Average Score of Casual Area** |
| 1 | Material related delays | Poor planning | 4.467 | 1 | 4.4 |
| Unavailability of resources | 4.322 | 2 |
| Shortage of material | 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 material | 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 |

It is observed that material related delays, improper construction method and Inadequate Supervision are the most significant causal area of NED followed by others as shown in above table. Whereas, shortage of equipment/labor/material, Improper equipment, Poor planning and Shortage of labor are the significant causes for NED with higher AI score.

* 1. Critical and Non Critical Delays

Critical delays are those which cause delay to entire project completion date while Non critical delays not necessarily affect the project completion date but affects progress. In all the projects delays are considered at the project completion date. Delays can be combination of small and big delays that occurred during the whole project. Therefore critical delays are taken more into consideration then noncritical delays. Table 2 shows the core critical factors for NED.

**Table 2: List of Critical Factors of NED**

|  |  |
| --- | --- |
| **Rank** | **Critical Factors** |
| 1 | Slow mobilization/Late delivery |
| 2 | Unreliable supplier/Subcontractor |
| 3 | Shortage equipment/Labor/Material |
| 4 | Delay in manufacturing |
| 5 | Late in selection of material  |
| 6 | Delay in imported material/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 | Shortages of personnel |
| 14 | Too many responsibilities  |
| 15 | Defective work/Rework |
| 16 | Working in remote areas |

In order to achieve the last objectives of appropriate corrective action for the critical factors which affects the schedule performance of contractor Table 3 shows the result.

**Table 3: Result of selected Remedial Measure for the Critical Factors of NED**

|  |  |
| --- | --- |
| **Critical Factor of NED** | **Selected Corrective Action for the Critical Factor of NED** |
| Slow mobilization/Late delivery | Engaging an appropriate resource will influence the budgeted time and cost. |
| Unreliable supplier/Subcontractor | Where works are defective the contractor is entitled to provide for corrective actions and improvements. |
| Shortage equipment/Labor/Material | Engaging additional personnel will influence the budgeted cost. |
| Delay in manufacturing | The general observation is a proper personnel planning and provide accordingly will reduce shortage. |
| Late in selection of material  | Ideally improve job satisfaction would influence morale**/**motivation.  |
| Delay in imported material/Equipment | The general observation is a systematic monitoring and control taking into consideration the accuracy, short regular interval, effective feedback and standard procedure will minimize poor monitoring and control. |
| Poor Planning | The general perception is that benchmarking and constantly improving the practice**/**procedure will minimize the impact of inappropriate practice**/**procedure. |
| Low productivity | Engaging additional experience personnel would minimize the impact but may influence the budgeted cost.  |
| Lack of Experience | Using work sampling data, managers will be able to make accurate decisions to control the factors that positively and adversely affect job productivity.  |
| Inappropriate practices/procedures | Engaging an experience planning engineer would influence the budgeted cost.  |
| Poor monitoring and control | Ideally the contract clause for delivery may influence the delivery program |
| Low morale/motivation | The general perception is that a penalty clause stipulated by the contractor for late in selection and delivery of material would minimize the occurrence of late delivery.  |
| Shortages of personnel | The general perception is that sharing and discussions with different companies and check manufacturing details from all industries.  |
| Too many responsibilities  | The general perception is that a penalty clause stipulated by the contractor for shortage of materials/Labor/Equipment.  |
| Defective work/Rework | The general perception is that a fine clause stipulated in the contract would govern the reliability and performance of sub-contractor. |
| Working in remote areas | The general perception is that barring late workers and morning inspection would minimize the late arrival. |

1. Conclusions & Suggestions

The objective of this study was to identify the most important causes of NED and suggest the remedial measures for the critical factors of NED which affect the performance of contractor within the construction industry of Pakistan. Intensive management involvement is needed to prevent and alleviate problem that can delay projects. The results showed that financial problem, followed by material, equipment, manpower shortage and inadequate communication between the key players are the major causes of NED and penalize contractor. The entire respondent agreed that contractors’ performance can be easily judged and verified through the schedule performance. In normal practice contractors’ have planned schedule work before the construction work start and daily or weekly basis the actual performance on site is updated to check the progress of work.

It is suggested that remedial manager, project managers can save the cost for the contractor and also bring the successful project completion and bring positive impact on construction industry. The success or failure of a commercial construction project depends largely on the construction schedule and whether that schedule is met or not. Delays in the construction schedule negatively impact both owners and contractors. Delays negatively impact construction contractors by driving up the costs of construction resulting from pay for workforce and/or equipment that stands ideal as the delay continues.

Construction industry is flooded with the Fast Track Projects these days and there is always a pressure on the contractor to bid the lowest, resulting in low profit margins. To achieve the dismal profit margins, it requires massive all-round efforts to develop a schedule and control it efficiently. In addition to saying "you may delay, but time will not," Benjamin Franklin also said "time is money." While it is doubtful that Ben 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 the bottom line for 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 the late completion of the project.

1. Acknowledgement

The authors like to forward deepest gratitude to the administrative staffs and study participants in this study. The authors are also thankful to Mehran University of Engineering & Technology, Jamshoro for providing platform to conduct this research. The authors are also grateful to experts from College of Engineering, Prince Sultan University, Riyadh, Saudi Arabia for their scholarly advice and suggestions throughout this research.

1. Reference

[1] F. A. M. Tauha Hussain Ali, Shabir Hussain Khahro, “Occupational Accidents: A Perspective of Pakistan Construction Industry,” Mehran University Research Engineering Technology, vol. 33, no. 3, 2014. (Journal)

[2] Projcon, “Importance of Schedule Delay Analysis on Construction Projects – A Contractor’s Perspective,” 2017.

[3] Z. A. Memon, “Remedial Measure for Delays at Construction Stage,” Mehran University Research Engineering Technology, vol. 23, no. 1, 2004. (Journal)

[4] M. Lepage, “Types of Schedule Delays in Construction Projects,” Top Primavera P6 Educators, 2017. (Book)

[5] P. Morris and H. Hough, “The Anatomy of Major Projects,” 1988.

[6] M. Z. A. Majid and R. McCaffer, “Factors of Non-Excusable Delays That Influence Contractors’ Performance,” Journal of Management Engineering, vol. 14, no. 3, pp. 42–49, 1998. (Journal)

[7] S. A. H. Tumi, “Causes of Delays in Construction Industry in Libya,” in The International Conference on Economics and Administration, Faculty of Administration and Business, University of Bucharest, Romania ICEA – FAA Bucharest, 14-15th November, 2009, pp. 265–273. (Conference Proceedings)

[8] M. E. A. El-Razek, H. A. Bassioni, and M. and A. M., “Causes of Delay in Building Construction Projects in Egypt,” Journal of Construction Engineering & Management, vol. 134, no. 11, pp. 831–840, 2008. (Journal)

[9] S. A. Assaf, M. Al-Khalil, and M. Al-Hazmi, “Causes of Delay in Large Building Construction Projects,” International Journal Project Management, vol. 24, no. 4, pp. 349–257, 2006. (Journal)

[10] M. Sambasivan and Y. K. Soon, “Causes and effects of delays in Malaysian construction industry,” International Journal Project Management, vol. 25, no. 5, pp. 517–526, 2007.

[11] N. Hamzah, M. A. Khoiry, I. Arshad, N. M. Tawil, and A. I. Che Ani, “Cause of construction delay - Theoretical framework,” Procedia Engineering, vol. 20, no. Kpkt 2010, pp. 490–495, 2011. (Conference Proceedings)

[12] A. YUSUFZAI, “propakistani,” 2017.

[13] O. T. Ibironke, T. O. Oladinrin, O. Adeniyi, and I. V. Eboreime, “Analysis of non-excusable delay factors influencing contractors’ performance in Lagos State, Nigeria,” Journal of Construction in Developing Countries, vol. 18, no. 1, pp. 53–72, 2013. (Journal)