Assessment of Extension of Time Claims in Hydropower Projects of Pakistan

Hashim Hanif, Yasar Saleem, Zuhaib Aslam Shahid, Abdullah Hanif, Anwar Zeb

Abstract: ***The occurrence of delay in construction industry is a regular trend all over the world which is caused by number of factors. The Hydropower projects are no exception to such delays. It is difficult to find a Hydropower project in Pakistan not experiencing delay. Construction Industry in Pakistan is transforming itself into a very well organized and scientifically managed industry over the past one decade. It is observed that Construction Management issues related to mega projects such as Hydropower Projects, still need to be addressed. First step in finding out the causes of Extension of Time Claims in Hydropower Projects is to identify the factors that significantly contribute towards the deformation of triple constraint (Cost, Scope and Time) of Construction Projects. This research has been carried out on nine (15) Hydropower Projects in Pakistan, which have been completed in last 10 years or are in execution phase of construction. Survey questionnaires were created to collect data from all project stakeholders comprising of clients, consultants and contractors. In addition, these projects were physically visited and Project Management Documents related to all phases were reviewed. The causes leading to delays have been identified and ranked with the help of these questionnaires and reviews. A variety of Techniques have been employed for the assessment of Extension of Time Claims, main purpose of this study was therefore to analyze different Techniques which are used in Pakistan and to probe the reasons for delay in the assessment and submission of EOT. The demographic data of the respondents have also been collected in order to ensure the responses were not biased and to point out the phase that is more prone to delays. They were ranked using the relative importance index (RII) as well as Pareto Analysis. Research revealed that the delay in interim payment certificates, land acquisition problems, delay in issuance of construction drawings, lack of baseline schedule and poor design were among the leading contributing factors leading to Extension of Time Claims. Based on the lessons learnt after conclusion of such projects around the world and experience of managers at all levels associated to Hydropower Projects, this study also recommends measures to curb the causes of delays so that the construction process can be optimized.***

Keywords: Extension of Time, (EOT), Delay Causes, Construction Industry and Hydropower Projects

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I. INTRODUCTION

Normally, when projects are not completed within the stipulated time and the budgeted cost, it is attributed to severe weather / climatic conditions, land acquisition problems, change is design, late issuance of construction drawings, shortage of fuel supply, material, equipment and manpower, and due to poor management. When projects are delayed, they are either extended or accelerated and therefore incur additional costs, which creates a lot of problems for the Owner/Employer. If the projects are delayed then obviously the cost of construction will increase because of the price adjustment and various fluctuations of prices, it will lead to serious problems in future upcoming project in Pakistan. The most serious concern about the delay in Construction projects is that it gives a bad impression on foreign Contractors, thereby slowing down national progress of the country. Whenever the project is delayed, it is very difficult to agree upon the extra time and its cost associated with delay. Dispute and claim arises when both the parties (Employer and Contractor) do not agree on the extra time and cost. By conducting this study, Employer, Contractor and even the general public can see the major causes of delay in Construction Projects, its effect and will avoid them in the future.

II. OBJECTIVES

To identify key factors that lead to delay and cost-overrun. Once identified and classified the remedial measures can be taken to minimize or eliminate the losses."
Main objectives are

- To study and evaluate the causes of Extension of Time Claims which lead towards delays in Hydropower Projects of Pakistan.
- To classify and rank the identified causes in accordance with the responses from a survey of Hydropower Projects of Pakistan
- To identify the most preferred technique used to substantiate and evaluate the EOT.
- To give recommendations to the parties of the project for the elimination or minimization of critical causes.

III. LITERATURE REVIEW

A. General

A lot of people have carried out research on causes of Extension of Time and cost overrun internationally but in Pakistan very little research has been done. For this research literature has been reviewed from within Pakistan and also from foreign countries. Numerous texts and journals were consulted.
This chapter presents the context related to causes of delay

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and cost overrun. The types of delays, effects of delay and cost overrun and overview of the relevant researches have also been carried out. The basic definitions and related concepts are discussed briefly.

B. Delay

Undesirable events, such as problems and accidents, which cause project delays, cost overruns, or deficiencies in technical performance." (Niwa, 1989)

C. Project

"A project is a temporary endeavor undertaken to create a unique product or service
(PMBOK guide, 2000,"A guide to the project management body of knowledge")."

D. Time for Completion

Time required from the start of a project till its completion. All the activities and jobs involved in a project must be accomplished within this stipulated time. It depends on various factors.

E. Project Parties

Mostly three parties are involved in a construction project namely client, consultant and contractor. Sometimes a fourth party is involved to supervise the project for the non-technical client called as supervision consultant.

F. EOT Evaluation Techniques

Several Techniques for Evaluation of Extension of Time Claims have been used. Below are the summary of six commonly used Techniques [1,2].

1) Global Impact Approach

The Technique involves plotting all delays and disruptions, of which the claimant is not accountable for, on an as-built bar chart. Early Start and Early finish dates of each event are determined, which follows by a calculation of total delay. The total delay to the project is the sum of the durations of all delaying events without making allowance for concurrent delays.

2) Net Impact Approach

The net impact approach measures the net effective delay including concurrent delays. In this method, all delays by all the parties of the Contract are plotted on a bar chart, similarly as done in the global impact approach. However this method also don not use network programme and hence the real effect of delay is ignored.

3) Adjusted As-Built CPM Approach

In this approach As-built schedule is prepared on Critical Path Method (CPM) and delay occurred is inserted into CPM network without making difference between causes of delay.

4) Collapsed As-Built but for Schedule Approach

All the delay events that are happened due to the parties of the Project are entered in to As-built Schedule. Using CPM approach a new end date of the Project is established. Difference between the new end date and the as-planned schedule is the result of delay. Different parties of Contract may generate different "but for" their adjusted schedule, e.g Contract "but for" is caused due to Delay of the Employer/Engineer, while Employer "but for" is caused due to the delay Contractor.

5) Impacted Updated CPM Approach

Another approach to schedule impact analysis is the impacted updated CPM method. The original project schedule, as updated, is used to measure delay. The analysis will take place often during the course of construction rather than after the project is completed.

6) Time Impact Analysis Approach

Impact of all the delays are inserted on the Schedule at the relevant stage of Construction of the Project. A stop action picture" would be determined based on the impacts of before and/or after delays of the Project. An additional duration is added in to the Project Schedule. In other words, we can say that if a delay occurs, we suppose that activities are being stopped and they can only be started if we take the consideration of delay. Total delay is the sum of all the delays which occurred during the execution stage of the Project.

G. Factors causing Extension of Time in Hydropower Projects

Following Factors have been identified on the basis of experience of researcher [3, 4, 5 & 6] in Construction industry and interviews with experts of construction companies that are working on Hydropower Projects of Pakistan.

Table 1. Factors Identified from Previous Research Papers

Sr. No.	Factors causing Extension of Time
1.	Improper Project Feasibility Study
2.	Delay in Instructions from Consultants
3.	Extreme Weather Conditions
4.	Unfavorable Site Conditions
5.	Poor Professional Management
6.	Delay in Interim Payment Certificates
7.	Land Acquisition Problems
8.	Delay in Issuance of Drawings
9.	Lack of Baseline Schedule
10.	Poor Design
11.	Mistakes with Soil Investigations
12.	Improper Investigation of Foundations at Site
13.	Late Deliveries of Materials
14.	Late Variation Orders Approval
15.	Difference between Building Code & Specification
16.	Delay by Sub-Contractors
17.	Slowness in Decision Making
18.	Shortage of Fuel, Materials and Equipment
19.	Lack of Capable Representative
20.	Poor Site Supervision

H. Reasons for Delay in Submitting Extension of Time Claims in Hydropower Projects

Major reasons for delay in submitting Extension of Time Claims are briefly described as below:

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Table 2. Factors causing Delay in Submissions of Extension of Time Claims

Sr. No	Reasons of Delay
1.	Inexperienced Site Staff who needs time to understand Claim situation
2.	Consultants require excessive details for evaluation of EOT Claims
3.	Contractor's Poor paperwork Control
4.	Unavailability of Contractor's Management Resources
5.	Poor Professional Management
6	Policy to submit Claims collectively instead of regular Claims
7.	General Details missing in Claims
8.	Contractor's Staff too busy on Progress of works and no attention on EOT Claims
9.	Contractor does not want to have bad relations with Employer and Engineer.
10.	Effects of Delays are not known to Contractor

IV. METHODOLOGY

A. General

Methodology is the path followed in research work. All the activities are listed out in a chronological order. A properly designed survey questionnaire was used to collect data from selected respondents. Detailed statistical analysis was done with the help of Microsoft Excel 2010.

B. Identify and Filter Causes

Identified several causes from previous research and filtered them with the help of experienced personnel. Total twenty causes were filtered and presented in the questionnaire for data collection. These causes were directly or indirectly related to all the parties of the project i.e. Client, Consultant, Contractor. The scope of the study was limited to only Hydropower Projects directly related to construction industry.

C. Questionnaire

The questionnaire was divided into three sections, Section A (Respondent Background), Section B (Reasons used to Claim for Extension of Time) and Section C (Reasons for delay in submitting the details of Claims for Extension of Time) and Section D (Preferred Technique used in Assessing Extension of Time Claims). It was established to assess the insights of Employer, Consultants, and Contractors on the causes of delay of Hydropower Projects in Pakistan Construction industry. The questionnaire focuses on causes of Extension of Time delays. Most of the people were requested to specify their understanding on delay factors related to construction occurred prior to construction and during the construction of the project.

D. Data Collection

The process of calculating the data consists of two phases. The 1st stage of this process was related literature search and to determine the causes of delay from their past experience of construction delays in Hydropower Projects of Pakistan. 1st Stage includes the identification of twenty (20) causes of delay. Total of 70 Questionnaire were Distributed to Employer, Consultants and Contractor. 15 were returned from Employer and Consultants, while 10 questionnaires were returned from Contractor. It took 4 weeks to complete this process. 40 questionnaires (57%) were received for analysis. The 2nd stage includes the development of questionnaire including all the 10 causes of delay in submission of Extension of Time Claims in Hydropower Projects. An importance scale was developed to rank the causes of Extension of Time delays in construction of Hydropower Projects. All the participants Client Contractor and Consultants were asked to indicate by ticking an appropriate column of the relative importance of each of the causes of Construction delay. "4" was rated as very important, "3" was rated as important, "2" was rated as somewhat important, and "1" was rated as not important.

E. Data Analysis

The data includes 20 causes of delays and the reasons for delayed submission of Extension of Time Claims were analyzed. The Relative Importance Index (RII) is a technique to compute the strength of index familiarity, frequencies and agreements of the specific question. This method transforms the five-point Likert scale to determine the ranking of each factor using the following expression [3]:

$$RII = \frac{\sum P_i U_i}{N(n)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where Pi is a constant expressing the weight of the ith response, Ui is the frequency of the ith response of the total responses for each cause, i is the response category index where n = highest score on cause of delay and N is the total number of respondents.

V. RESULTS AND DISCUSSION

According to different opinions of Clients, Consultants and Contractors, 20 delay factors were analyzed based on the indices calculated in above Tables. The importance of all the indices and overall ranking of all the factors that contribute towards the delays are presented in Table 3 below.

Table 3. Overall Ranking of Factors of Delay

Factors of Delay	Overall	
	RII	Rank
Delay in Interim Payment Certificates	2.49	1
Land Acquisition Problems	2.48	2
Delay in Issuance of Drawings	2.51	3
Lack of Baseline Schedule	2.29	4
Poor Design	2.26	5
Improper Project Feasibility Study	2.24	6
Delay in Instructions from Consultants	2.21	7
Extreme Weather Conditions	2.10	8
Unfavorable Site Conditions	2.06	9
Poor Professional Management	2.04	10
Delay by Sub-Contractors	2.03	11
Slowness in Decision Making	2.02	12
Shortage of Fuel, Materials and Equipment	1.95	13
Lack of Capable Representative	2.00	14
Poor Site Supervision	1.94	15
Mistakes with Soil Investigations	1.87	16
Improper Investigation of Foundations at Site	1.86	17
Late Deliveries of Materials	1.80	18
Late Variation Orders Approval	1.68	19
Difference between Building Code & Specification	1.50	20

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Generally, all the parties of the Project were of the opinion that the top ten (10) most significant factors causing Extension of Time in Construction of Hydropower Projects of Pakistan are:

1. Delay in Interim Payment Certificates
2. Land Acquisition Problems
3. Delay in Issuance of Construction Drawings
4. Lack of Baseline Schedule
5. Poor Design
6. Improper Project Feasibility Study
7. Delay in Instructions from Consultants
8. Extreme Weather Conditions
9. Unfavorable Site Conditions
10. Poor Professional Management

The respondents were asked to provide reasons for delays in submitting EOT Claims, which were analyzed based on the indices calculated in below Table. The importance of all the indices and overall ranking of all the factors that contribute towards the delay in submission of Extension of Time Claims are presented in Table 4.

Table 4. Overall Ranking of Factors of Delay in Submission of Extension of Time Claims

Factors of Delay	Overall	
	RII	Rank
General Details missing in Claims	2.44	1
Inexperienced Site Staff who needs time to understand Claim situation	2.39	2
Consultants require excessive details for evaluation of EOT Claims	2.35	3
Contractor's Staff too busy on Progress of works and no attention on EOT Claims	2.26	4
Policy to submit Claims collectively instead of regular Claims	2.23	5
Effects of Delays are not known to Contractor	2.13	6
Contractor does not want to have bad relations with Employer and Engineer.	2.05	7
Unavailability of Contractor's Management Resources	2.02	8
Contractor's Poor paperwork Control	2.00	9
Poor Professional Management	2.04	10

Then respondents were also asked in the Survey Questionnaire, that what was the most preferred Technique used to evaluate the Extension of Time Claims. The results of all the respondents are tabulated in Table 5 as given below:

Table 5. Preferred Technique used in Assessing Claims for Extension of Time

Factors of Delay	Overall	
	RII	Rank
Adjusted As-Built CPM Approach	2.55	1
Time Impact	2.49	2
Impacted updated CPM Approach	2.27	3
Net Impact	2.20	4
Collapsed As-Built But for Schedule Approach	2.23	5
Global Impact	1.95	6

VI. RECOMMENDATIONS

The recommendations are entirely based on the results and no assumptions are taken into account. Ambiguous results are omitted and proper consideration has been paid to the viability of these recommendations in field. A research was carried out on the assessment of Claims for Extension of Time in construction of Hydropower Projects of Pakistan. The main findings of this research help in reducing the delays that occurs during the construction of the project and minimizing the delays in submission and assessment of Extension of Time Claims. It is recommended that each organization should develop its own procedures to expedite an efficient and reliable EOT substantiation and evaluation. In this context, the authors have made following recommendations:

- Extension of Time is one of the important clause in standard form of Contract. When the delays occur, EOT allows Contract to agree upon completion date. The most common reason for EOT is non-availability of funds, the Employer must confirm that adequate funds are available before the start of the project so that no delay occurred during the execution stage of the Project. The long-lasting procedures involved in payments to Contractors in Pakistan must be shortened so that the payments should be made within the due time as described in the Contract. Secondly, Client should acquire land before the start of the Project, because it creates a lot of problems during the execution phase, as work can be stopped for a long period of time and it incurs huge costs and ultimately Employer suffers. Thirdly, late Issuance of Drawings by the Consultants is also the main factor contributing towards the Extension of Time in Construction of Hydropower Projects, Late issuance of drawings are because of improper Project feasibilities, poor soil investigations and mistakes with Foundation conditions encountered on Site.
- The major reasons for delay in submitting of Extension of Time Claims are that general details are missing in the Claims, so more effort is required by the Engineer to substantiate the Claims, Moreover due to the in experienced site staff by the Contractor, Contractor is unable to provide notices for Extension of Time Claims and hence suffered from huge losses.
- Adjusted as built CPM is the most preferable Technique used to evaluate time extension, where.

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