

# Schedule Delay Analysis

Amritha Rani George  
M. Tech,  
Dept. of Civil Engineering  
IJET, Nellikuzhy  
Ernakulam, India

Minu Anna Johny  
Assistant Professor,  
Dept. of Civil Engineering  
IJET, Nellikuzhy  
Ernakulam, India

**Abstract**— Construction industry is one of the fast growing industries in India. But there are certain factors pulling back its growth. Delay is one of those factors. Delays in construction may be caused by a variety of reasons. Like wise, it causes a number of negative effects on construction industry mainly cost and time overrun. This study aimed at finding the reasons and effects of delays in construction, and to recommend measures to mitigate them. An analysis of data collected from various sources was done to understand the various reasons and later a questionnaire survey was done to find the real reasons of delays in construction industry at present. Data collected from the contractors, clients and consultant shed light into the real situation, which was analysed using SPSS Software. The analysis result helped to understand the important factors and thus helped to recommend measures to overcome them.

**Keywords**—Scheduling, Delays, Causes, Effects, Remedies

## I. INTRODUCTION

All construction works consists of a sequence of different activities, which usually start with the preparation and setting out of the sites. After site preparation, foundation, sub structure, super structure fittings, finishing and a number of other activities are taken up. Most probably the last activity is demolishing the temporary structures, removing the construction machinery and clearing up the site. The number of activities increase with the progress of work, and decreases as the work reaches completion stage. The sequence of activities depends upon the method of construction adopted. Some of the activities may be seriously disrupted and delayed. Thus to have control over the work , different techniques are adopted.

The scope of the project was mainly to focus on the ongoing projects. This will help to understand the present situation at the sites. The questionnaire survey was helpful in identifying the causes of construction delays, effects of construction delays and thereby suggest the methods of rectification of the construction delays. It also helped to understand the opinions of the various participants of a construction project. This study is being analysed in the SPSS Software, while other softwares can be used for further studies. Also, this study is limited to the overall effects of delays and do not consider the implications of each effect. And, my project do not deal with any aspects of resources in scheduling. It purely deals with the delays factors only.

## II. OBJECTIVES OF THE STUDY

The following objectives are developed to achieve the aim of the research:

1. To identify the source of delays for construction projects.
2. To study the effect of delays for construction projects .
3. To study the differences in ideas of the three main stakeholders, including clients, contractors and consultants.
4. Analysis of data collected of live projects regarding delays of activity.
5. Give the discussion and suggestion for minimum of effects of delays for construction projects.

## III. THEORETICAL CONCEPTS

### A. Scheduling

A construction schedule is a graphic representation which shows the phasing rate of construction with the starting and completing dates of each activity and sequential relationship among various operations in a construction project. In other words scheduling can be defined as the mechanical process for setting various planned activities in order by fixing the starting and finishing dates for each activity of the work to execute the whole work in a systematic and orderly manner. Thus a schedule is a time table for the execution of a project assigning definite timings for the individual constructional activities leading to the completion of the work.

### B. Delays

Delays are one of the biggest problems facing by the construction industry. The delays in construction projects have significant financial and social impacts. It holds effects to all parties involved in the projects. In most construction projects, there are delays and their impact level varies from project to project. In general, we understand that the construction delay is the most critical factors affecting to deliver the project in time and within budget with expected quality. It can be found rarely that a project was completed within the specified time. So, to mitigate the various causes and effects of delays, it is important to understand them deeply.

## IV. METHODOLOGY

Methodology can be explained as in the following steps:

### a) Research design :

This study is descriptive as well as analytical, 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.

b) *Data collection techniques :*

Among the available methods in collecting data two methods were adopted, these are literature review and questionnaires. The first step involves general information collection, including both first-hand and second-hand data, in order to identify major themes from the literature. In the second step, with the literature review and unstructured interviews, important factors of delays were identified. With these factors, a questionnaire was formed and Survey was conducted. Questionnaires were used to gather information for the study. 50 out of 60 questionnaires returned, all were found fairly filled for the analysis.

c) *Population, Sample size and Sampling Techniques:*

The population of the study comprises of clients, architectural and consulting firms, construction firms and contractors. The sample size of 50 respondents was considered. The sampling used was simple random sampling. The main advantage of random sampling is that each element in the universe have equal chance of being included. The random sampling method can be defined as the method of sample selection which gives each possible sample population an equal probability of being picked

d) *Questionnaire preparation and content validity :*

From the above found reasons and effects of construction schedule delays, a questionnaire was prepared. It included 85 factors of causes and 30 effects of delays. To minimize the possibility of the respondents not understanding the terminology and layout of the questions, the questionnaire was piloted on two respondents based on their feedback some alterations were carried out.

e) *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 data analysis was carried out using SPSS. SPSS was used to generate the frequency (*f<sub>i</sub>*) of the response category index for the cause and effect factors. The relative importance index (RII) for each factor was calculated using the frequency data for each response categories generated from SPSS.

The Relative Importance Index (RII) is calculated as follows:

$$RII = \frac{\sum W}{A \times N} \quad (1)$$

Where, W = weight given to each factor by respondents  
A = highest weight and N = total number of respondents.  
For the purpose of this study A=4 and N=40. However, amongst 40 returned questionnaires some of the causes and effects were not ranked thus N varies. (between 37 and 40).

## V. ANALYSIS OF RESULTS

The questionnaire distributed to various companies were returned with complete responses. Out of the 50 questionnaires distributed, 16 were consultants, 8 contractors and 1 client while the rest didn't respond to that particular question. All the respondents gave a clear answer to almost all questions while a few questions were not answered.

## A. SPSS Software

Analysis of the result was done using SPSS Software. SPSS Statistics is a software package used for statistical analysis. The software name originally stood for Statistical Package for the Social Sciences (SPSS), reflecting the original market, although the software is now popular in other fields as well, including the health sciences and marketing. All the responses obtained from the questionnaires are entered in to the software. First, the variables or the questions are entered in the data view, Then, the responses are entered into the software From the various data entered into the software, frequency can be found which is used to determine the importance factor.

## B. Resulta from SPSS

From the responses obtained, 52% respondents were from Consultancies, 12% from contractors side and only 2% from client side. 4% said that they were both client and contractors, 2% said that they were both client and consultants and 14% said that they were both consultants and contractors. 44% of respondents were females and 56% were male. Considering the Educational qualifications, 4% were post Graduates in Technology, 60% were Graduates of Technology, 22% were Diploma holders and 14% were ITI certified. 4 of them were Project managers, 8 site engineers, 7 site supervisors and 1 site Incharge. 26 of them had experience between 1 to 5 years, 11 had 6-10 years experience, 4 had 11 – 15 years of experience, and 9 of them were with experience more than 15 years. From all the firms considered, 68% of them were dealing with only Private works, while only two of them exclusively handled public work. While, 10 of them handled both the kind of work.

From the results, we can conclude that

- Most Important factor of delay
  - 1) Economic ability or arrangement (factors related to Client): RII = 0.638
  - 2) Lack of communication between subcontractors (factors related to contractors): RII = 0.634
  - 3) Change of workorder (factors related to project conditions): RII = 0.615
- Most important effect of delay
  - 1) Timeoverrun (RII = 0.557)
  - 2) Disputes and claims (RII = 0.546)
  - 3) Cost overrun (RII = 0.513)

## VI. CASE STUDY

To deeply understand the various factors of delays and their effects in a specific case rather than generally, a case study was conducted. The scope of this research project is limited to a single project at Kollam. The data for this study has been gathered through detailed literature review and from concerned offices. The scope of this is mainly to focus on the ongoing project. A continuous monitoring would be helpful in identifying the causes of construction delays, effects of construction delays and the methods of rectification of the construction delays.

The project was aimed to be completed within 18 months from the date of commencement. It included the monsoon season. But it was not completed until June 30, 2016, which

is another 30 months from month of completion of the project. So this should be an apt project to study the specific reasons of delays in a project. First, the schedule of the project was obtained from the offices. Then, the various reasons of delay were found from the site engineers. Then, a rescheduling was done. From the study, we found that The main reasons for delays were:

1. Protest from the part of public was a major concern as it lead to the suspension of work for a period of 6 months from August 2012 - February 2013. The misunderstanding among public as well as the disturbances caused by construction including dust and noise added to their agitation.
2. Another major cause was the presence of utilities underground such as, water pipelines, kseb lines, telecom communication lines, etc. The absence of proper record of their position made it difficult for digging as well as a damage to any of these resulted in the wastage of money and time in their correction.
3. The third major reason for delay of the particular project was climatic condition. Heavy rain pour in the areas halted work for weeks.
4. Some other reasons for the delay are changing rules and regulations of the local self government, labour problems, problems created by people from the localities etc. Thus , various small and big reasons together lead to the delay of this project to over years. This is a typical example of a project delayed due to various reasons.

There are certain factors to be considered in this project. This was a big budget project. It was given completion time of only 18 months. From the study of this project, it can be concluded that the essence of on-time completion of a project lies in the schedule. A proper planning and scheduling of this project might have resulted in a different time of completion. More care should be given to the local nature and weather conditions while planning. An allowance should be provided in the schedule to compensate any unexpected conditions. Schedule with no float may be economical, but it may later result in a long completion time on unrepresented situations.

#### VII. REMEDIAL MEASURES

From the results obtained, we can say that considering the importance factor labour supply problems., communication problems, late deliveries of materials, site management problems, changes during construction payment, weather etc are the reasons behind delays. Thus, they should be considered with care while scheduling a project.

So the recommendations that can be given are:

1. There should be a clear understanding of the budget of the project as well as economic ability of the client. They should also have an idea about the probable future hike in prices.
2. Payments should be made on time, without affecting the flow of materials and ongoing work.
3. There should be good communication between the various participants of the project. Any changes in the plan or drawing should be communicated to all.
4. There should be communication from top-tier to bottom and vice versa.

5. Not only an understanding of the causes of delays is needed, but an awareness of its effects is also important.
6. Time and cost overrun are to implicit effects of delays. Other effects are also present such as, claims, disputes, arbitration etc.
7. There should a trained and experienced team to handle these.

#### VIII. CONCLUSIONS

The various conclusions of the project study are:

- A number of reasons causes schedule delays
- While a few of them cannot be avoided, most of them can be through proper planning and scheduling.
- Reasons that may lead to delays in construction must be understood before planning and proper planning along with float should be provided while scheduling. Thus, a proper plan can avoid delays to a certain limit.
- From my study. The most important factors that need to be attended while planning are: economy, communication and workorder.
- This findings are limited to certain extend due to the locations of the sites. So, they may vary for a different location.
- From the study, it is concluded that timeoverrun is the most common effect of a delay, which leads to many other problems.
- This study do not consider the interrelationships of various factors or the extend of their effects. This can be made subject to address in another study.

#### ACKNOWLEDGMENT

I would like to express my gratitude to God almighty who has given me the strength to complete this work. My project was possible only because of the encouragement I received from all quarters.

I take this opportunity to thank and wish to express my sincere gratitude to my guide Ms. MINU ANNA JOHNY, (Assistant Professor and Head of the Department of Civil Engineering) for her valuable encouragement, support and motivation to carry out this work.

I would like to extend my special thanks to my parents and friends.

#### REFERENCES

- [1] Ashwini Arun Salunkhe, Rahul S. Patil, "Identification of Critical Construction Delay Factors", International Journal of Latest Trends in Engineering and Technology (IJLTET), Vol. 3, Issue 4, March 2014, pp 543-547
- [2] Rahul Kolhe, Milind Darade, "Detail Analysis of Delay in Construction Projects", IJISSET - International Journal of Innovative Science, Engineering & Technology, Vol. 1, Issue 10, December 2014, pp 256-261
- [3] Owolabi James D, Amusan Lekan M., Oloke C. O, Olusanya O, Tunji- Olayeni P, OwolabiDele, PeterJoy ; OmuhIgnatious, "Causes and Effect of Delay on Project Construction Delivery Time" , International Journal of Education and Research, Vol. 2, No. 4, April 2014, pp 197-201
- [4] Ashwini Arun Salunkhe, Rahul S. Patil, "EFFECT OF CONSTRUCTION DELAYS ON PROJECT TIME OVERRUN: INDIAN SCENARIO", IJRET: International Journal of Research in Engineering and Technology, Volume: 03, Issue: 01, Jan-2014, pp 543- 547

- [5] Towhid Pourrostam and Amiruddin Ismail, "Causes and Effects of Delay in Iranian Construction Projects", IACSIT International Journal of Engineering and Technology, Vol. 4, No. 5, October 2012, pp 598-601
- [6] Mulenga Mukuka, Clinton Aigbavboa, Wellington Thwala, "Effects of construction projects schedule overruns: A case of the Gauteng Province, South Africa", Procedia Manufacturing, 2015, Vol 3, pp 1690 – 1695
- [7] M. Haseeb, Xinhai-Lu, Aneesha Bibi, Maloof-ud-Dyian, Wahab Rabbani, "Problems Of Projects and Effects of Delays in The Construction Industry Of Pakistan", Australian Journal of Business and Management Research, Vol.1 No.5 , September-2011, pp 41-50
- [8] Abdalla M Odeh, Hussein T Batteineh, "Causes of construction delay: Traditional contracts", International Journal of Project Management, Vol 20,2002, pp 67-73
- [9] Marco A. Bragadina, Kalle Kähkönen, "Safety, space and structure quality requirements in construction scheduling", Procedia Economics and Finance, 2015, Vol 21, pp 407-414
- [10] Li Heng, Neo Chan, H.L. Guo, Weisheng Lu, and Martin Skitmore, "Optimizing construction planning schedules by virtual prototyping enabled resource analysis", Automation in Construction, 18(7), pp 912-918.