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# Assessment of Various Factors Affecting in Delay and Delivery

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**ABSTRACT:** Due to the inherent risks and increasing complexity of modern construction projects, delays and cost overruns have become common facts in the industry. Researchers and practitioners have used many techniques to assess project delays and apportion delay responsibility among the parties involved. Survey base delay analysis has been recognized as one of the most credible techniques for analysing construction delays. Despite its benefits, survey analysis can produce different results depending on the collected data size, it can be consider owner and contractor acceleration, as well as systematically consider the impact of several baseline updates made due to changes in the duration and logical relationships of the activities, and it can consider the impact of the progress events on resource over-allocation and its consequent delays. This study proposes a survey base on analysis model that can considers multiple factors which can be affect on construction delays. In this work we proposed a fuzzy base weighting and recommendation approach, that we can consider the multiple factors has included in survey. Finally system will recommend the different ranked factors which are responsible for delay with graph. The overall research can be applicable for any kind of construction projects.

**KEYWORDS:** Delay analysis, construction delay, factors and fuzzy base weighting.

## I. INTRODUCTION

“Delay” is the state in which any kind of work is happening without considerable stoppage but with the time more than the stipulated. Delay is the term used to refer any activity that is slowing down without stopping construction entirely and that can lead to time overrun either beyond the contract date. Delays classified into non excusable delays, excusable non compensable delays, excusable compensable delays and concurrent delays. There are too many factors that are responsible directly or indirectly for delay. Dependency of projects can be delayed due to number of reasons that may be due to client, the contractor or a third party. Delays in construction projects are quite expensive; sometimes they may result in severe damages to the involved parties. This dissertation focuses on study of core factors that are causing delays and analysing the day-to-day records to minimize delays. The purpose of this study was to identify the major causes of delays, the effects of delays, and methods of minimizing delays in construction project.

In some cases, contractors and owners pay extra charges for completion of the project. When the time exceeds than the stipulated time the delay in construction occurs. Many construction projects have faced various problems and delay of time is one of the major problems. In most of the cases studied under survey, the main cause of delay is disputes that take place between the customer and contractors. Hence it is necessary to find out the exact causes of delay and take the action accordingly to avoid further losses of the involving people. The current study focuses on various factors causing the delays:

1. To study the impact of delays in the construction projects and understand the factors which are affecting to delays based on data which is collected from different sites.
2. To identify the sources results in the delay of construction.
3. To carry out the delay analysis by using RII technique.

## II. METHODOLOGY

This section of the work, the major concern is associated with the development of the methods and the germane processes for the work that can help the work to complete the study. In this chapter, the various process of the work, paradigm, approach, and designs have been discussed with proper justification and arguments. Based on the literature findings the work has selected the parameters of the work that provide support for the consideration of the methods has



been followed by another work. Moreover, throughout the discussion, a proper justification for the selection of the appropriate work strategies has been mentioned and has been thoroughly supported by the methods and the flow chart of the project work. Based on this general form of fuzzy rules, several alternative ways of defining fuzzy rules have been used for fuzzy knowledge engineering. These several types of fuzzy rules are:

Briefly, the main steps in fuzzy system design are as follows

- Analyse and understand the problem in consideration.
- Determine the linguistic variables (the inputs and outputs). For each linguistic variable, identify the linguistic values and define the fuzzy sets (membership Functions).
- Identify and define the fuzzy rule set.
- Choose the appropriate methods for fuzzification, fuzzy inference and defuzzification.
- Evaluate the system.

#### A. Problem statement

What are different causes of delay in construction of residential building project and how it can be minimized using Relative Important Index (FUZZY) technique. Many Residential structure projects have handled various difficulties and interruption of time is one of the main difficulties. The delay in disagreement reimbursement has multiple consequences such as it will give disadvantageous to the link among owner and worker. Moreover, it will also contribute to the rate and phase overruns. It is usually said that the bond language is measured problematic to understand and they are consequently a main source of differences

#### B. Questionnaire survey

The semi-structured interview has been arranged by the work for the managers of different on-going construction projects in India that has faced the delay in the progression of the construction work. The project managers are the expertise of the construction field and are associated with dealing various kinds of issues in the project field that halts the construction work. Therefore, the work has chosen the managers as they can provide the necessary information regarding the causes and impacts of the delays in the construction industry. For this, the work has arranged a set of qualitative questions that helps to collect the feedback of the respondents in a descriptive manner and helps in the process of detailed analysis. Thus, the arrangement of the questionnaire survey can bring out the effective data for the work

### III. DATA COLLECTION FROM DIFFERENT SITES

The collection of the data in this process is mainly based on the human sources that help to elaborate the work issues and link with the objectives of the work (Tran, 2016). Primary data is attributed towards the collection of the opinions that take into the account the sake of the real-time analysis of the causes behind the delaying of the construction industry. In addition, primaries associated with quantitative data and qualitative data analysis. In this current work, quantitative data analysis is not possible as the collection process associated with large sample size and it helps to the development of graphical representations. However, in this case, the sample size is only five managers of the different construction project of India. Thus, development of numerical data is not possible in case of this work. The qualitative data is retrieved by the general feedback format that is received from the samples in a descriptive manner. In the case of qualitative work, the work strive to meet the respondents for direct data acquisition

#### A. Name of Project : COLORI Phase-2

The first site that I surveyed is named as COLORI Phase-2 by Amit Enterprises, which is located in Undari, Pune (411060). There are two buildings (H, I) that undergone delay and hence considered for survey. The buildings are G+12 storied having front margin 9M and rear margin 12M. The scheme consists of 288 flats measured as 1BHK (520 Sq. Ft.) 2 BHK ( 840 Sq. Ft) and 12 shops.

#### B. Name of Project : VTP Urban Next

The second site that I studied is named as VTP Urban Next by NIKAYA Group, which is located in Pisoli, Pune. Project comprises of eight buildings ( A1, A2, A3, B1, B2, B3, C1, C2). The buildings are G+11 storied with front margin 20M and rear margin 20M. It has 462 flats 2 BHK (820 Sq. Ft) 3 BHK (1100 Sq. Ft) and 80 shops.



**C.Name of Project :SuidhaNisarga**

The third site that I studied is SuidhaNisarga which is located at KhedShivapur, Pune. Buildings has front margin 3M and rear margin 3M. Project has G+5 storied buildings with 36 flats. 1 BHK (610 Sq. Ft.), 2 BHK (870 Sq. Ft).

**IV.DATA ANALYSIS**

The collected responses and the findings of the case studies have been arranged by the work. As the majority of the work findings is associated with descriptive findings from the respondents it has helped the work to arrange the factors according to findings from the description by the respondents. After the development of the rankings of the causes that results in the delay of the construction process has helped the work to analyze the impact of the delay in the construction industry. Proper analysis performance is associated with the appropriate connection of the findings with the understanding of the concept developed in the literature review section.

Following factors are analyzed:

- Client related factors: Finance and payments of completed work etc.
- Contractor related factors : Planning, mistakes during construction stage
- Consultant related factors :Contract management, preparation and approval of drawings, quality assurance
- Material related factors: When quality of material issues and shortage in material.
- Client related factors: Finance and payments of completed work etc.
- Contractor related factors: Planning, mistakes during construction stage.
- Consultant related factors :Contract management, preparation and approval of drawings, quality assurance
- Material related factors: When quality of material issues and shortage in material.

The RII method is used to calculate the most important factor causing the delay. The survey form consists of the scale ranging from 1 to 5. It is mathematically represented as,

$$RII = \sum W \div (A * N)$$

Where,

W= weighting given to each factor by the respondents (ranging from 1 to 5)

A = Highest weight (i.e. 5 in this case)

N =total number of respondents. Higher the value of RII, more important was the cause of delays.

**V. OVERVIEW OF FINDINGS**

After analysing Site -1 (COLORI Phase- 2) following results are obtained: Major delay causing factors for Site-1 are Client Related Factors.

Table 1 Major delay causing factors for Site-1

Client Related Factors / Respondents	Project Manager	Planning Engineer	Site Engineer	Labour	RII
Finance and payments of completed work	3	2	3	4	0.60
Owner interference	3	4	1	5	0.65
Slow decision making	4	5	5	5	0.95
Unrealistic contract duration and requirements imposed.	5	5	5	5	1
Obtaining permits from municipality	4	5	4	2	0.75

After analysing site- 2 (VTP Urban Next) following results are obtained: Major delay causing factors are Contract Related Factors.



Table 2 Major delay causing factors Site 2

Contractor Related Factors/ Respondents	Project Manager	Planning Engineer	Site Engineer	Site Supervisor	RII
Sub-Contractor	4	3	4	5	0.80
Site management	1	4	5	5	0.75
Construction methods	1	3	2	3	0.45
Preparation and approval of drawings	4	5	4	3	0.80
Mistakes during construction stage	5	4	3	3	0.75
Inadequate contractor Experience	5	5	4	4	0.90
Mistakes in preliminary stage ( Soil investigation)	5	5	4	5	0.95
Financing by contractor during construction	5	5	5	5	1

After analysing Site-3 following results are obtained:Major delay causing factors are Material Related Factors and Labour Equipment Factors.

Table 3 Major delay causing factors Site 3

Material Related and Labour Equipment Factors/ Respondents	Project Manager	Planning Engineer	Site Engineer	Site Supervisor	RII
Quality in material	4	3	4	4	0.74
Shortage in material	5	5	5	5	1
Labour supply	5	5	5	3	0.90
Labour Productivity	3	4	2	3	0.60
Equipment availability and failure	4	3	3	5	0.75

## VII CONCLUSION

This research aimed to propose a decision support tool for contractors before the bidding stage to quantify the probability of schedule delay in construction projects by using fuzzy logic incorporated with relative importance index (RII) method.

The proposed methodology in a real case study and to evaluate the probability of schedule delay for Labour and material. Probability output for the labor related delay factors was calculated as 50.6 showing a range of medium - high probability level. The most contributing factors for this category's probability were:

- "Shortage of labor"
- "Unqualified / inadequate experienced labor"
- "Low productivity of labor"

Probability output for the material related delay factors was calculated as 56 showing a range of medium - high probability level. The most contributing factors for this category's probability were:

- "Late delivery of materials"
- "Changes in material types and specifications during construction"
- "Shortage of construction materials"



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