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# Analysis of Delay Factors in Construction Projects

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**Abstract:** *Delays square measure distinctive one in each of the biggest problems construction firms face now a days. Delays can lead to many negative effects like lawsuits between homeowners and contractors, exaggerated costs, loss of productivity and revenue, and contract termination. Albeit varied studies square measure thought of into the causes touching delays, these studies seldom discuss common and general causes of delays in construction comes. Thus, comprehensive study on these delays is very important. Gift study works on identification of causes of delay in residential construction comes in Indian context. Literature review and structured interviews were meted out on construction comes in central Madhya Pradesh region of country. The paper presents the framework of causes of delays in residential construction buildings. Total thirty six causes were known below eight major teams. associate degree approach is usually recommended to hold out ranking of those causes by completely different techniques: Relative importance index and Importance index supported degree of severity and degree of frequency. it's hoped that the findings of the paper can facilitate the stakeholders to act on essential causes and more try and cut back delay of their comes.*

**Keywords:** *Delay, Causes of delay, Construction industry, Relative importance index*

## I. INTRODUCTION

In construction, delay may well be outlined because the time overrun either on the far side completion date per a contract or on the far side the date that the parties specified for delivery of a project. it's a project slippery over its planned schedule and is taken into account as common drawback in construction comes.

To the owner, delay means that loss of revenue through lack of production facilities and rentable house or a dependence on gift facilities. In some cases, to the contractor, delay means that higher overhead prices attributable to longer work amount, higher material prices through inflation, and because of labour value will increase. Finishing comes on time is associate degree indicator of potency; however the development method is subject to several variables and unpredictable factors, that result from several sources.

These sources embody the performance of parties, resources accessibility, environmental conditions, involvement of alternative parties, and written agreement relations. However, it's seldom happen that a project is completed at intervals the desired time. the development trade is giant, volatile, and needs tremendous capital outlays. Delays on construction comes area unit a universal development.

They're nearly always in the middle of value and time overruns. Construction project delays have associate degree adverse result on parties (owner, contractor, consultant) to a accept terms of a growth in adversarial relationships, distrust, litigation, arbitration, cash-flow issues, and a general feeling of apprehension towards one another. So, it's essential to outline the particular causes of delay so as to reduce and avoid the delays in any construction project.

## II. OBJECTIVES AND NEED OF STUDY

The main objective of this study is to identify the major causes of delays of building construction projects using a questionnaire survey. The primary aim is to identify the perceptions of the three main parties regarding the causes of delays and to suggest possible ways of minimizing them.

- A. To identify the causes of delay for construction projects in Indian context.
- B. To suggest the methodology to work out the importance by different techniques.

## III. METHODOLOGY

The analysis methodology contains two phases. The primary part enclosed a literature search and interviews. The literature review was conducted through books, conference proceedings, and net and international project management journals. Because the

outcome of this part, thirty six causes of delays for residential construction comes were known. These causes were classes in eight main teams as: Client, Contractors, Consultant, Material, Labour and Equipment, Contract, Contractual Relationships, External Factors. Looking on their nature and mode of prevalence. Framework of the causes is given in Table one. The second part includes preparation of 2 kind of form supported 2 completely different approach used for giving ranking to causes of delay of residential construction comes. Relative Importance Index (RII) techniques were use in research paper.

#### IV. DATA ANALYSIS

For data analysis various researchers used RII (Relative Importance Index) to determine the relative importance of the various causes of delay.

S.NO	Type of Delays
1	CLIENT
2	CONTRACTORS
3	CONSULTANT
4	MATERIAL
5	LABOUR AND EQUIPMENT
6	CONTRACT
7	CONTRACTUAL RELATIONSHIPS
8	EXTERNAL FACTORS

#### V. RESULT AND DISCUSSION

##### A. Analysis of Data

Fifteen respondents have filled up the questionnaire. Subsequently for analysis of responses following steps are followed:

- 1) Responses were converted into numerical values based on their rating attributes. A sample is shown in Table
- 2) After that mean of numerical values of all twenty eight responses is determined
- 3) Then, Standard deviation and coefficient of variation for each risk factor is determined
- 4) Afterwards, Index Score for each risk is calculated by using RI Method.

Table 2: Conversion of response into numerical values (Questionnaire 1)

DELAY FACTORS		NA	Very Small	Small	Normal	Large	Very Large
S.NO	CATEGOREY	0	1	2	3	4	5
<b>A</b>		<b>CLIENT</b>					
1	Finance and payments of completed work					0.8	
2	Owner interference				0.6		
3	Slow decision- making by owners			0.4			
4	Unrealistic imposed contract duration				0.6		
<b>B</b>		<b>CONTRACTORS</b>					
1	Subcontractors		0.2				
2	Site management				0.6		
3	Construction methods					0.8	
4	Improper Planning				0.6		
5	Mistake during construction						
6	Inadequate contractor experience	0					

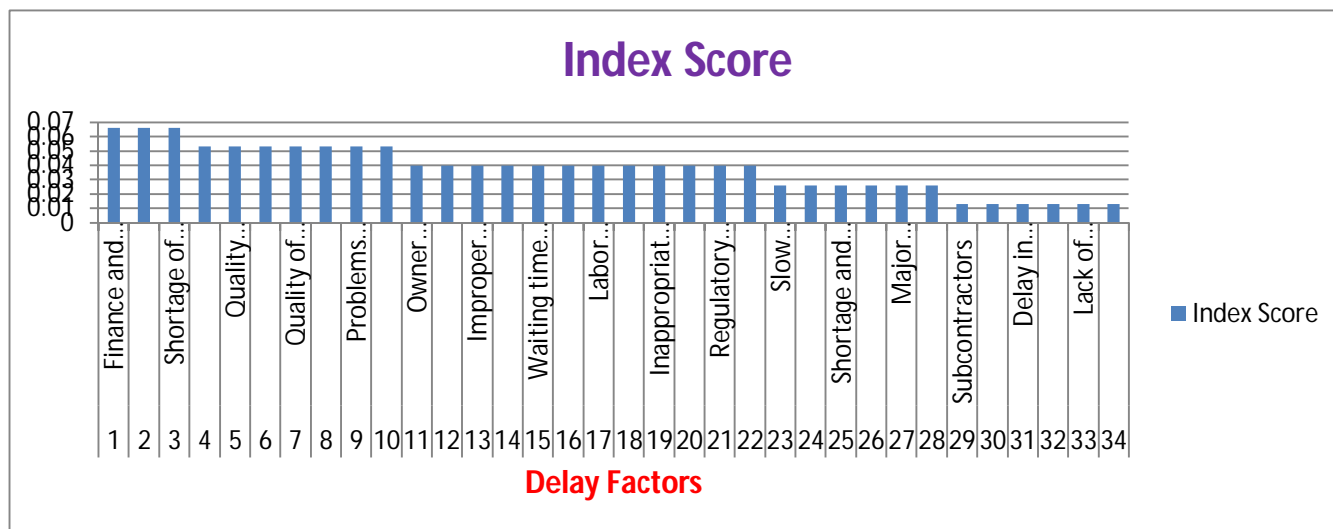
C	CONSULTANT						
1	Contract Management				0.6		
2	Preparation and approval of drawing		0.2				
3	Quality assurance/ control					0.8	
4	Waiting time for approval of tests and inspections				0.6		
5	Delay in the approval of contractor submission by the engineer					0.8	
D	MATERIAL						
1	Quality of material					0.8	
2	Shortage and material	0					
3	Materials Price fluctuations				0.6		
4	Delay in materials delivery				0.6		
E	LABOR AND EQUIPMENT						
1	Shortage of Labour Supply						1
2	Labor productivity	0					
3	Equipment availability and failure				0.6		
4	Presence of unskilled labour				0.6		
F	CONTRACT						
1	Change Order		0.2				
2	Mistake and discrepancies in contract documents				0.4		
G	CONTRACTUAL RELATIONSHIPS						
1	Major dispute and negotiations	0					
2	Inappropriate overall organization structure linking all parties to the project				0.6		
3	Lack of communication between the parties					0.8	
4	Lack of contractor administrative personnel		0.2				
5	Delay in mobilization				0.6		
H	EXTERNAL FACTORS						
1	Severe weather condition			0.6			
2	Regulatory changes and building code				0.8		
3	Problems with neighbors		0.2				
4	Unforeseen ground condition				0.6		
5	Legal dispute between project participants					0.8	
6	Problems with neighbors				0.6		

INTERVIEW NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Mean(m)	SD(s)	C.O.V=(s/m)
Finance and payments of completed work	0.8	0.6	0.8	0.8	0.4	0.8	1	0.8	0.2	0.8	0.8	0.2	0.6	0.8	1	10.4	0.066667	0.1	1.5
Owner interference	0.6	0.8	0.6	0.4	0.6	0.4	0.6	0.6	0.6	0.6	0.6	0.2	0.4	0	0.6	7.6	0.04	0	0
Slow decision- making by owners	0.4	0.2	0.4	0.6	0.6	0.6	0.8	0.8	0.4	0.4	0.4	0.2	0.6	0.4	0.4	7.2	0.026667	0	0
Unrealistic imposed contract duration	0.6	0.6	0.6	0.6	0.4	0.6	0.6	0.8	0.8	0.8	0.6	0.2	0.4	0.6	0.6	8.8	0.04	0	0
Subcontractors	0.2	0.4	0.2	0.6	0.6	0.6	0.4	0.6	0	0.4	0.8	0.2	0.4	0.2	0.2	5.8	0.013333	0	0
Site Management	0.6	0.6	0.8	1	0	1	0.6	0.6	0.6	0.6	1	0.2	0.8	1	0.6	10	0.04	0	0
Construction Methods	0.8	0.8	0.6	0.8	0.6	0.8	0.4	0.8	0.4	0.8	0.6	0.2	0.6	0.6	0.8	9.6	0.053333	0	0
Improper Planning	0.6	0.4	1	0.8	0.8	0.8	0.8	1	0.2	0.8	0.4	0.6	0.4	0.4	0.6	9.6	0.04	0	0
Mistake During Construction	0	0.8	0.6	0.2	0.4	0.2	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.6	1	8.2	0.066667	0.5	7.5
Inadequate Contractor Experience	0.6	0.6	0.4	0.6	0.6	0.6	0.8	0.8	0.4	0.8	0.4	0.2	0.4	0.8	0.4	8.4	0.026667	0.1	3.75
Contract Management	0.2	0.8	0.2	0.8	0.8	0.8	0.4	0.6	0.8	0.8	0.8	0.2	0.6	0.6	0.6	9	0.04	0.2	5
Preparation and approval of drawing	0.8	0.2	0.6	0.8	0.8	0.8	0.4	0.8	0.6	0.2	0.8	0.2	0.4	0.8	0.2	8.4	0.013333	0.3	22.5
Quality assurance/ control	0.6	0.6	0.6	1	0.6	1	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.4	0.8	10	0.053333	0.1	1.875
Waiting time for approval of tests and inspections	0.8	0.4	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.4	0.6	0.2	0.4	1	0.6	7.8	0.04	0.1	2.5
Delay in the approval of contractor submission by the engineer	0.8	0.4	0.8	0.6	0.4	0.6	0.4	0.8	0.4	0.4	0.6	0.2	0.6	0.8	0.8	8.6	0.053333	0	0
Quality of Material	0	0.6	0.8	0.8	0.8	0.8	0.6	0.6	0.8	0.6	0.4	0.2	0.2	0.4	0.8	8.4	0.053333	0.4	7.5
Shortage and Material	0.6	0.4	0.6	0.4	0.6	0.2	0.4	0.8	0.6	0.4	1	0.2	0.2	0.6	0.4	7.4	0.026667	0.1	3.75
Materials Price Fluctuations	0.6	1	0.4	0.6	0.4	0.6	0.6	0.8	0.6	0.8	0.6	0.2	0.6	0.2	0.6	8.6	0.04	0	0
Delay in Materials Delivery	1	0.8	1	0.4	0.8	0.4	0.4	0.6	0.2	0.6	0.2	0.2	0.2	0	0.2	7	0.013333	0.4	30
Shortage of Labour Supply	0	0.8	0.4	0.2	0.2	0.2	0.8	0.8	0.4	0.8	0.6	0.6	0.4	1	1	8.2	0.066667	0.5	7.5
Labor Productivity	0.6	0.4	0.2	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.2	0.6	0.8	0.6	0.6	8.2	0.04	0	0
Equipment Availability and Failure	0.6	0.4	0.6	0.6	0.6	0.6	0.4	0.8	0.2	0.6	0.6	0.6	0.6	0.4	0.4	8	0.026667	0.1	3.75
Presence of Unskilled Labor	0.2	0.8	0.6	0.2	0.2	0.2	0.4	1	0.4	0.8	0.4	0.2	0.8	0.4	0.6	7.2	0.04	0.2	5
Change Order	0.4	0.6	0.6	0.6	0.6	0.4	0.6	0.6	0.6	0.8	1	0.2	0.6	0.4	0.2	8.2	0.013333	0.1	7.5
Mistake and Discrepancies in Contract Documents	0	0.6	0.6	0.4	0.6	0.2	0.4	0.8	0.6	0.6	0.2	0.2	0.2	0.6	0.4	6.4	0.026667	0.2	7.5
Major Dispute and Negotiations	0.6	0.8	0.6	0.6	0.6	0.6	0.4	0.8	0.6	0.8	0.4	0.2	0.4	0.4	0.4	8.2	0.026667	0.1	3.75
Inappropriate Overall Organization Structure Linking all Parties to the Project	0.8	0.6	0.2	0.4	0.4	0.4	0.6	0.8	0.8	0.6	0.6	0.2	0.6	0.8	0.6	8.4	0.04	0.1	2.5
Lack of Communication Between the Parties	0.2	0.2	0.8	0.6	0.4	0.6	0.4	0.8	0.6	0.6	0.8	0.2	0.6	0.8	0.8	8.4	0.053333	0.3	5.625
Lack of Contractor Administrative Personnel	0.6	0.6	0.6	0.6	0.6	0.6	0.8	0.6	0.4	0.4	0.6	0.2	0.4	0.6	0.2	7.8	0.013333	0.2	15
Delay in mobilization	0.6	1	0.4	0.4	0.6	0.4	0.6	0.6	0.2	0.6	0.4	0.2	0.4	0.6	0.6	7.6	0.04	0	0
Severe Weather Condition	0.8	0.6	0.4	0.6	0.8	0.6	0.6	0.6	0.2	1	0.2	0.6	0.8	0.4	0.4	8.6	0.026667	0.2	7.5
Regulatory Changes and Building Code	0.2	0.6	0.6	0.4	0	0.4	0.6	0.4	0.6	0.6	0.4	0.2	0.6	0.6	0.6	6.8	0.04	0.2	5
Problems with Neighbors	0.6	1	0.2	0.2	0.6	0.2	0.4	0.4	0.8	0.4	0.8	0.2	0.6	0.2	0.8	7.4	0.053333	0.1	1.875
Unforeseen Ground Condition	0.8	0.4	0.8	0.6	0.8	0.6	0.4	0.6	0.4	0.6	0.6	0.2	0.2	0	0.2	7.2	0.013333	0.3	22.5
Legal Dispute Between Project participants	0.6	0.2	0.4	0.8	0.6	0.8	0.2	0.6	0.6	0.6	1	0	0.4	0.8	0.6	8.2	0.04	0	0
Problems with Neighbors	0.4	0.2	0.6	0.4	0.6	0.4	0.4	0.4	0.6	0.4	0.4	0	0.8	0.6	0.8	7	0.053333	0.2	3.75



Table 6.3 Ranking of Delay

S.No	Delay Factors	Index Score	Rank order
1	Finance and payments of completed work	0.066	1
2	Mistake During Construction	0.066	1
3	Shortage of Labour Supply	0.066	1
4	Construction Methods	0.053	2
5	Quality assurance/ control	0.053	2
6	Delay in the approval of contractor submission by the engineer	0.053	2
7	Quality of Material	0.053	2
8	Lack of Communication Between the Parties	0.053	2
9	Problems with Neighbors	0.053	2
10	Problems with Neighbors	0.053	2
11	Owner interference	0.04	3
12	Site Management	0.04	3
13	Improper Planning	0.04	3
14	Contract Management	0.04	3
15	Waiting time for approval of tests and inspections	0.04	3
16	Materials Price Fluctuations	0.04	3
17	Labor Productivity	0.04	3
18	Presence of Unskilled Labor	0.04	3
19	Inappropriate overall organization structure linking all parties to the Project	0.04	3
20	Delay in mobilization	0.04	3
21	Regulatory Changes and Building Code	0.04	3
22	Legal Dispute Between Project participants	0.04	3
23	Slow decision- making by owners	0.026	4
24	Inadequate Contractor Experience	0.026	4
25	Shortage and Material	0.026	4
26	Mistake and Discrepancies in Contract Documents	0.026	4
27	Major Dispute and Negotiations	0.026	4
28	Severe Weather Condition	0.026	4
29	Subcontractors	0.013	5
30	Preparation and approval of Drawing	0.013	5
31	Delay in Materials Delivery	0.013	5
32	Change Order	0.013	5



## VI. CONCLUSION

Present study outlines the major causes of delay for residential construction projects in Indian context. Based on literature study and from interview of experts, 36 causes were identified under eight major groups. Further methodology is suggested to work out critical causes from available ones by Relative importance. Survey Questionnaire is prepared based on these techniques. It is proposed to carry out ranking of causes of delay from two different techniques in the next phase of research.

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