

# Significant Factors Affecting Delays In Construction Projects In Northern Region Of India And Their Relation With Cost

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**Abstract:** Delay has been the most important issue in almost all construction projects in India. To complete the projects within the prescribed time, successful execution of activities or works of a project is foremost important. It is due to the late completion of these activities the delays occur. This research work is carried out on exploring significant factors causing delays in construction in the Northern Region of India. These delays lead to the distrust among the people and the organization and show their incapability in implementing the projects. A reasonable questionnaire was prepared for the survey based on the factors causing delays taken into consideration from literature review. The questionnaire listed the 31 factors causing the delays and was distributed among the 50 professionals working in the construction industry. The factors were rated on a scale of rating 1 to 5. The data from the questionnaire was analyzed statistically. Relative Important Index method was used to find out the most significant factors causing delays. The result obtained from the survey revealed that the major causes for delays are; delays in payments, design errors, poor site management, lack of expertise in project management, contract duration, change in material prices, corruption, and poor estimation. This research focuses on top ten factors which create a major impact on the delays in construction projects.

**Index Terms:** Significant Factors, Causes of Delay, Effects of Delays, Construction Projects, Project Management, and RII

## 1. INTRODUCTION

The contribution of Indian construction industry to GDP on an average is almost 8% in the last 5 years (Planning Commission of India 12<sup>th</sup> five-year plan, 2017). Construction sector is the second largest employment producer in India, according to the Economic Survey 2017-18. It is stated to employ over 67 million workforces by 2022. This implies that it will generate over 15 million jobs over the next five years, which will translate to about three million jobs annually. But still the employment generation and the economic importance of this sector faces tremendous issues like delays in completion of projects, low productivity and lack of professional practices in the industry. The construction industry is an important activity in any country as the country's economy and GDP is dependent largely on it. The construction industry creates a direct impact on the other sectors like education and transportation. A sector which helps in the economic development of the country and creates a positive impact on other sectors as well should be given the importance of its level to curb its hindrances. Therefore we should pay proper attention in identifying its major challenges and providing solutions. There are a number of papers and research work on the factors affecting construction industry and many are from developed countries and very less is explored in developing countries. Construction Industry has been one of the major sources of income to many developing countries. Recently Dubai's non-oil economic growth picked up in the second

quarter of 2019, reaching nearly four-year high, which would result in the emirate's economy growing faster this year as compared to 2017-18. Khatija Haque, head of Mena Research at Emirates NBD, said there was little change in Dubai Economy Tracker (DET) Index for the month of June survey relative to May, but the data for second quarter of 2019 points to a sharp acceleration in Dubai's economy, with the average DET index reading at the highest level since first quarter of 2015. A country like Dubai with no oil can prosper and develop its economy solely due to infrastructure. So productivity in the construction needs to be improved to lower down the failures of the construction projects. A project is only called a successful project if it is completed within or before scheduled time at the same time with desired quality. So, there are a lot of expectations when a construction is going to start, keeping all this in mind work should be carried by planning each and every step carefully. Any kind of deviation from the planned schedule will lead to delay and loss of productivity and so on. There is a necessity to minimize these delays to maintain the growth in the economy and safeguard this sector. Delays in construction projects are either caused by the owner or contractor or by numerous other reasons. Completion of project on specified time saves a lot of money and shows the efficiency and effectiveness in project management.

## 2. PREVIOUS STUDIES SUMMARY

Year	Author	Topic	Objective	Conclusion
2017	Manoj Sharma, Dr. A.S. Trivedi, Yash Upadhaya	Causes of Delays in Indian Construction Industries	To identify the source and effects of delays in construction projects and the methods to mitigate these delays.	The most significant factors causing delays were found out and valuable suggestions were provided on how to mitigate these delays.
2017	Saurav Dixit, Amit Kumar Pandey	A study of enabling factors affecting Construction Productivity: Indian Scenario	The purpose of the research paper to study the factor affecting construction productivity and rank them on the basis of the responses	The research study identifies the top ten attributes having a significant impact on construction productivity using relative importance index and top three of them are: Decision making, planning and logistics and supply chain management.

			given to their impact on the productivity of construction projects in India.	
2016	Dinesh Kumar R, Meenakshi Sundararajan	Causes and Effects of Delays in Indian Construction Projects	The objective was to find out the causes and effects in the construction projects in India by obtaining a list of factors which causes delays and to distribute them among the various professionals working in the construction industry.	The project must be awarded to the competent contractor who has lot of experience in the specific project type and will avoid any kind of delay in the project
2014	Anu V. Thomas and J. Sudhakumar	Factors Influencing Construction Labor Productivity: An Indian Case Study	This paper reports the results of a questionnaire survey of project managers, site engineers, supervisors and craftsmen, in the state of Kerala in India, to identify the factors influencing construction labor productivity.	Among the 44 factors explored, timely availability of materials at the worksite was identified as the most critical factor impacting productivity. Delayed material delivery by the supplier, strikes called by political parties, frequent revisions of design and unavailability of drawings at the worksite at the required time were the other major factors identified in the survey.
1998	Mohan M. Kumaraswamy & Daniel W. M. Chan	Contributors to construction delays	A questionnaire was based on 83 factors identified in previous phases of the investigation. Analysis of the responses reveals differences in perceptions of the relative significance of factors between clients, consultants and contractors.	It includes a ranking of factors and factor categories that are perceived by different groups of project participants to contribute to delays.

### 3. MATERIALS & METHODS

Research methodology in this study is based upon the questionnaire survey to identify the major factors causing delays in construction. The questionnaires are been taken in consideration after consulting various literature reviews and discussions with professionals working in construction industry. The questionnaire was distributed to clients that are in charge of executing public projects, contractors and consultants that are supervising these projects. Questionnaires consisted of 31 factors causing delays. For each factor the respondents were requested to rate using five point scale of 1 to 5. It is categorized as follows 5=very high; 4=high; 3=medium; 2=low; and 1=very low. The causes of delays in construction projects in Northern Region were investigated in this study. Discussions were held with various professionals regarding the causes of delays and certain literature review were considered to find out the most common factors. Based on those factors a set of questionnaire consisting 31 factors was made and distributed among contractors, clients, consultants and owners. They rated the factors according to their effectiveness. Based on those ratings Relative Importance Index (RII) was calculated for each factor. The factor which secured the highest RII was ranked as the top most important factor in causing delays and so on the top 10 factors were listed. The top most factor being the poor site management. Almost 90% of the respondents rated this factor the most important factor for causing delays. The other important factors were lack of expertise in project management, delay in payments, poor estimation and climatic effects. A correlation was found between these top 10 factors and the cost of the projects using SPSS. This correlation

shows us how strongly these two variables are related to each other or the degree of association between the two. It is measured by the correlation coefficient.

### 4. DATA COLLECTION

To collect the data, the questionnaire was distributed to the various organizations working in the field of construction. 50 questionnaires were distributed among these officials involved in the infrastructure projects which included 31 delaying factors. It was very important that the questions were written down clearly and prepared with utmost care for the survey to be valid and reliable. Some unimportant factors were not included as they could have generated large amount of data and respondents could have felt it time consuming. The questionnaires consisted of two sections. The first gathered the basic information about the respondents profile and the second about the factors causing delays in projects. The distribution of questionnaires was done by the researcher himself and personally visited each organization. The ranking of the officials responding to the questionnaire were mainly owners, project managers, project employees, contractors, consultants and site engineers.

### 5. DATA ANALYSIS

The questionnaires are collected and analyzed using the statistical software SPSS and RII method is used. It is used to determine the relative importance of the various causes and effects of delays. The ranking of factors was calculated as follows:

$$RII = \sum_i W/A * N$$

Where;  $i$  = weight given to each factor by respondent,  $W$  = constant expression weight,  $A$  = highest weight,  $N$  = no. of

respondents, For this study, A=5 and N=50. The RII is calculated in Microsoft Excel sheet.

Based on the analyzed data top 10 factors need to be identified, and to calculate the rankings in excel sheet the formula used is [=RANK (G2, \$G\$2:\$G\$31)]. The following tables describe the analysis of the project delay based on the

collected data from different respondents. Table 1 shows data analysis of project delay based on calculated data, Table 2 shows the top 10 factors affecting delays in construction and Table 3 shows the correlation coefficients between the cost of the projects and the factors affecting delays.

**Table 1 Data analysis of project delay based on collected data**

Factors Affecting Delays	Rate Of Respondents					RII	Rank
	5	4	3	2	1		
Original contract duration is short	18	22	6	1	3	0.804	10
Complexity in projects	6	14	24	4	2	0.672	13
Defective materials provided by client	0	0	1	10	39	0.248	28
Change in orders or designs by client	18	28	0	1	3	0.828	8
Delay in payments	42	4	1	0	3	0.928	3
Climatic effects	20	26	2	1	1	0.86	6
Design errors	19	19	9	1	2	0.808	9
Unskilled labor	0	1	36	10	3	0.54	19
Poor site management	45	3	0	0	2	0.956	1
Lack of expertise in Project Management	45	3	0	0	2	0.956	2
Ongoing traffic moments	2	8	12	17	11	0.492	22
Environmental Issues	0	6	24	19	1	0.54	20
Difficulty in getting work permits	0	19	29	2	0	0.668	14
Differing site conditions	0	8	31	11	0	0.588	17
Lack of high technology	14	26	7	2	1	0.8	11
Insufficient data collection during survey	0	3	9	34	4	0.444	24
Lowest bidding selection system	15	14	7	11	3	0.708	12
Shortage of manpower	2	25	13	5	5	0.656	16
Accidents during construction	0	0	3	32	15	0.352	26
Change in govt. laws	2	2	9	33	4	0.46	23
Delay in mobilization	0	18	24	6	0	0.664	15
Change in material prices	14	31	5	0	0	0.836	7
No implementation of safety rules	1	0	6	39	4	0.42	25
Poor estimation	30	20	0	0	0	0.92	4
Corruption	25	21	3	0	1	0.876	5
Public strike	2	8	16	18	6	0.528	21
Labor strike	0	0	12	9	29	0.332	27
Terrorist attacks	0	0	1	1	48	0.212	31
Conflicts among labor	0	0	0	5	45	0.22	29
Language of labors	0	0	0	0	50	0.2	30
Beurocracy by govt. officials	5	9	18	10	8	0.572	18

Based on the calculation of RII in table 1, top 10 factors affecting the delays are observable with the highest RII of 0.956 and lowest of 0.804. It may be noted that the RII of rank

1 and 2 are same but based on certain discussions with experts and professional's poor site management is ranked 1.

**Table 2** Top 10 factors affecting delays in construction

Major Factors	RII	Rank
Poor site management	0.956	1
Lack of expertise in Project Management	0.956	2
Delay in payments	0.928	3
Poor estimation	0.92	4
Corruption	0.876	5
Climatic effects	0.86	6
Change in material prices	0.836	7
Change in orders or designs by client	0.828	8
Design errors	0.808	9
Original contract duration is short	0.804	10

**Table 3** Correlation Coefficient between the cost of the projects and the factors affecting delays

Factor	Cost of Project		
	Pearson Correlation	Kendall's tau_b	Spearman's rho
Poor Site Management	0.043	0.107	0.125
Lack of Expertise in PM	0.043	0.107	0.125
Delay in Payments	-0.209	-0.093	-0.114
Poor Estimation	0.050	0.043	0.050
Corruption	-0.211	-0.116	-0.135
Climatic Effects	-0.109	-0.069	-0.082
Change in Material Prices	0.161	0.126	0.147
Change in Designs by Client	-0.176	-0.175	-0.209
Design Errors	-0.187	-0.094	-0.125
Contract Duration is Short	-.248	-0.135	-0.163

These top 10 factors are then correlated with the cost of the projects. For each factor is dependent and cost is kept as independent variable. The cost of the projects is ranked from 1-10, 1 being below 50cr, 2 in the range of 50-100cr and so on. This correlation statistical technique shows us how strongly these variables are related to each other.

## 6. Results and Discussions

From the above list of the most significant factors causing delay in the construction, Poor site management and lack of expertise in PM ranks first and second with same RII 0.956. By recognizing this fact, handling the project in the hands of a competent contractor possessing a lot of experience in the specific type of project will avoid these types of delays in the projects. The third factor delay in payments holds the third rank with RII of 0.928. The reasons for delay in payments are due to the financial difficulties of the owner or the one funding the project. This fact should be taken in consideration right before the execution of the project as with the lack of the payments the work cannot be processed in any manner, so the projects becomes vulnerable to delays. The reason for delay in payments can be related with the poor estimation also in some manner which holds fourth rank with RII 0.92. As estimation is the time when one gets to know about the approximate cost of the project and contract duration also

which is the tenth significant factor with RII 0.804. The estimation should be done properly and carefully so that if the project cost and time can't be fulfilled by the contractor he can opt out of the project at that time and the contract can be handed to the other who can afford the cost of the project. The corruption gives rise to the delays abruptly and is the most common factor of delays in every part of the world. It is considered the fifth factor with RII 0.876. Change in climate is an excusable delay but occurs frequently and can be avoided by choosing the perfect time for construction in accordance with the climate of the particular region. One more excusable delay is change in material prices as it is dependent on the market values and shares. It is better to get the materials for construction in accordance of need of the projects as the materials would be available at the right time for construction rather worrying for the prices to go down which would certainly cause delays. The designs of the project should be made from the experienced person as even the minor error can cause reconstruction leading to time and cost overrun. The top 10 factors were then correlated with the cost of the projects in order to find the relation between the two. This correlation gives us the dependence of these factors on the cost of the projects, whether the cost of the project would affect any of these factors in causing the delay. But after correlating them in the SPSS we found out that there is no correlation between these two apart from the "contract duration" which suggests if

the contract duration is short it would lead in the cost overrun and eventually the in the delay of the projects. The correlation was found in three different types viz: "Pearson Correlation, Kendall's tau b, Spearman's rho" but the results were same in each type apart from the later which was shown in Pearson Correlation.

## 7. CONCLUSION

The major reason behind all these causes is the project handling or lack of expertise in PM. The commitment towards the project drastically affects the quality and the progress of the project. The issue of delays in construction is common globally but its causes and effects vary with the region and context of the construction industry. Contractors should effectively plan the projects in advance by including all the risk factors with respect to nature and culture of the region. The owner should be well aware of the effects of change in designs during construction and delay in progress payment which affects the project to be completed at its specified time. Most of the construction projects are not implemented on time because of certain delays, so the projects fail to meet their estimated time and it negatively affects the development process, the prestige and dignity of the organization and the hopes of the people. These simultaneous delays cause a frequent rift between the organization and the government and it shows their weaknesses in the implementation of projects all over the region. Moreover these delays lead to the cost overrun leading to the financial crisis. In today's world the utmost priority is given to the infrastructure so the aim of this research is to find the significant causes of delays.

## ACKNOWLEDGMENT

The author wishes to thank the entire faculty of Civil Engineering department and especially Dr. Sandeep Singla who had been a great help and had provided me the direction throughout my entire research work.

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