

# Analyzing Causes of Delay in Construction Projects

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Time overruns has been a noteworthy issue in numerous Indian construction projects. The successful execution of construction activities and keeping them within recommended plan and cost is imperative for compelling time execution and cost execution. This thesis work is done on concentrating on noteworthy factors creating Time overruns in Indian construction industry. A valid questionnaire for the overview was produced taking into account factors for time overruns recognized from writing survey. These factors are assembled into 9 groups for time overruns and disseminated among three parts in particular Real Estate, Infrastructure and Industrial of Indian Construction Industry. The information from the survey was broke down measurably. Relative vital list system was utilized to establish out the most noteworthy variables influencing Time overruns. The result accomplished from the survey revealed that the major cause for time overruns are Clearances on Delay, Drawing Revision and Clearances from Consultant/Client/PMC, Incompetency of Labour, Unrealistic Planning and not using Monitoring and controlling Tools & Technologies, lack of Leadership qualities in Managers, Procurement Planning and Procurement Process. The study discoveries highlight the noteworthy factors and a few recommendations are given to control time overruns in Indian Construction Industry.

**Keywords: Construction, Management, Delays, India, Project**

## I. INTRODUCTION

Construction Projects in India are scandalous for delays. Even the service of insights and Program Implementation (MOSPI) affirms that numerous projects are experiencing delays. In any case, the degree and the reasons behind the postponements have suggestions huge Economic and Political perspective. For one, as a rule, these activities are financed citizen's cash. In this way, individuals ought to know how productively their cash is used by the authorities while making procurements of open merchandise and benefits. Two, delays in Project execution implies that the general population and Economy need to sit tight for Construction Facilities Longer than it is vital. This thus restricts the construction capability of economy on the loose. Three, administrations gave by construction projects serve as info for some other segment of economy. Along these lines, time delays lead to increment in capital-yield –ratio for whole economy. Basically, postpones can decrease the productivity of accessible assets and limit the construction capability of whole economy. Therefore, the inadequacy of research on the subject is surprising.

### A. Need for Time Management:

A project is for the most part a non-repeating try having a perceptible start and finish, with a distinct mission and has an arrangement of goals and accomplishments. A construction project is started to make a manufactured office inside of a given time period. Time administration of the task is essential on account of the accompanying reasons:

- 1) Project might be required inside of a characterized time period for satisfying a distinguished need.
- 2) Project might be a piece of a bigger project, which can't be made operational until this task is finished. Availability of assets, for example, work force, assets, gear and offices must be coordinated with the advancement of the task.
- 3) Project is planned to be used by the concerned clients who need to likewise sort out their base in a specific time period.
- 4) It might be important to coordinate the time allotment of clients with the time allotment for fulfilment of task in stages.
- 5) To give the required bearings and to association of task capacities and to organize the exercises and obligations of different partners.

### B. Objective:

The objectives of this research are:

- 1) To identify the factors influencing time overruns in construction projects and to evaluate their relative importance.
- 2) To determine the common factors of delay in various sectors of Indian construction industry- Real Estate, Infrastructure, and Industrial sector.
- 3) To formulate recommendations for improving time performance

### **C. Scope**

The Scope of the research will be limited to the following points:

- 1) The scope of the Study will be limited to the Real Estate, Industrial & Infrastructure Projects only.
- 2) Random Sample size will be taken under study.
- 3) Contractor, Consultants & Clients for various projects will be considered as respondents during the study.

## **II. TYPES OF DELAY**

Many construction projects suffer from delay. Suspension means stoppage of work directed to the contractor by a form from the client, while delay is a slowing down of work without stopping it entirely

### **A. Critical or non-critical delays**

Delays that affect the project completion or in some cases a milestone date are considered as critical delays, and delays that do not affect the project completion, or a milestone date, are noncritical delays.

### **B. Excusable or non-excusable delays**

All delays are either excusable or non-excusable. An excusable delay is a delay that is due to an unforeseeable event beyond the contractor's or the subcontractor's control.

### **C. Compensable or non-compensable delays**

A compensable delay is a delay where the contractor is entitled to a time extension and to additional compensation. Relating back to the excusable and non-excusable delays, only excusable delays can be compensable. Compensable delays are caused by the owner or the owner's agents.

### **D. Concurrent or non-concurrent delays**

The concept of concurrent delay has become a very common presentation as part of some analysis of construction delays. The concurrency argument is not just from the standpoint of determining the project's critical delays but from the standpoint of assigning responsibility for damages associated with delays to the critical path.

## **III. CAUSES OF DELAY IN CONSTRUCTION PROJECTS**

Many reasons can be identified for different sources in delay problem. These reasons are:

### **A. Design related delay**

- 1) Possible changes in initial design.
- 2) Complexity of the project.

### **B. Construction related delay**

- 1) Variations and claims
- 2) Change of scope of project

### **C. Financial/ economic- related delay**

- 1) Financial ability of the owner
- 2) Not enough funds

### **D. Management/ Administrative- related delay**

- 1) Unavailability of suitable management team.
- 2) Unspecialized subcontractors.
- 3) Lack of project management.
- 4) Lack of experience of the consultant
- 5) Lack of experience of the contractor

### **E. Regulations and code- related key delays**

- 1) New legal instructions or rules.

Table – 1  
Causes of Delay Classified

| No | Causes of delay                                                                   | Group      |
|----|-----------------------------------------------------------------------------------|------------|
| 1  | Delay in performing inspection and testing by consultant                          | Consultant |
| 2  | Delay in approving major changes in the scope of work by consultant               | Consultant |
| 3  | Inflexibility (rigidity) of consultant                                            | Consultant |
| 4  | Poor communication/coordination between consultant and other parties              | Consultant |
| 5  | Late in reviewing and approving design documents by consultant                    | Consultant |
| 6  | Conflicts between consultant and design engineer                                  | Consultant |
| 7  | Inadequate experience of consultant                                               | Consultant |
| 8  | Difficulties in financing project by contractor                                   | Contractor |
| 9  | Conflicts in sub-contractors schedule in execution of project                     | Contractor |
| 10 | Rework due to errors during construction                                          | Contractor |
| 11 | Conflicts b/w contractor and other parties (consultant and owner)                 | Contractor |
| 12 | Poor site management and supervision by contractor                                | Contractor |
| 13 | Poor communication and coordination by contractor with other parties              | Contractor |
| 14 | Ineffective planning and scheduling of project by contractor                      | Contractor |
| 15 | Improper construction methods implemented by contractor                           | Contractor |
| 16 | Delays in sub-contractors work                                                    | Contractor |
| 17 | Inadequate contractor's work                                                      | Contractor |
| 18 | Frequent change of sub-contractors because of their inefficient work              | Contractor |
| 19 | Poor qualification of the contractor's technical staff                            | Contractor |
| 20 | Delay in site mobilization                                                        | Contractor |
| 21 | Mistakes and discrepancies in design documents                                    | Design     |
| 22 | Delays in producing design documents                                              | Design     |
| 23 | Unclear and inadequate details in drawings                                        | Design     |
| 24 | Complexity of project design                                                      | Design     |
| 25 | Insufficient data collection and survey before design                             | Design     |
| 26 | Misunderstanding of owner's requirements by design engineer                       | Design     |
| 27 | Inadequate design-team experience                                                 | Design     |
| 28 | Un-use of advanced engineering design software                                    | Design     |
| 29 | Equipment breakdowns                                                              | Equipment  |
| 30 | Shortage of equipment                                                             | Equipment  |
| 31 | Low level of equipment-operator's skill                                           | Equipment  |
| 32 | Low productivity and efficiency of equipment                                      | Equipment  |
| 33 | Lack of high-technology mechanical equipment                                      | Equipment  |
| 34 | Effects of subsurface conditions (e.g., soil, high water table, etc.)             | External   |
| 35 | Delay in obtaining permits from municipality                                      | External   |
| 36 | Hot weather effect on construction activities                                     | External   |
| 37 | Rain effect on construction activities                                            | External   |
| 38 | Unavailability of utilities in site (such as water, electricity, telephone, etc.) | External   |
| 39 | Effect of social and cultural factors                                             | External   |
| 40 | Traffic control and restriction at job site                                       | External   |
| 41 | Accident during construction                                                      | External   |
| 42 | Differing site (ground) conditions                                                | External   |
| 43 | Changes in government regulations and laws                                        | External   |
| 44 | Delay in providing services from utilities (such as water, electricity)           | External   |
| 45 | Delay in performing final inspection and certification by a third party           | External   |
| 46 | Shortage of labour                                                                | Labours    |
| 47 | Unqualified workforce                                                             | Labours    |
| 48 | Nationality of labour                                                             | Labours    |
| 49 | Low productivity level of labour                                                  | Labours    |
| 50 | Personal conflicts among labour                                                   | Labours    |
| 51 | Shortage of construction materials in market                                      | Materials  |
| 52 | Changes in material types and specifications during construction                  | Materials  |
| 53 | Delay in material delivery                                                        | Materials  |
| 54 | Damage of sorted material while they are needed urgently                          | Materials  |
| 55 | Delay in manufacturing special building materials                                 | Materials  |
| 56 | Late procurement of materials                                                     | Materials  |
| 57 | Late in selection of finishing materials due to availability of many types.       | Materials  |
| 58 | Delay in progress payments by owner                                               | Owner      |
| 59 | Delay to furnish and deliver the site to the contractor by the owner              | Owner      |
| 60 | Change orders by owner during construction                                        | Owner      |

|    |                                                                             |         |
|----|-----------------------------------------------------------------------------|---------|
| 61 | Late in revising and approving design documents by owner                    | Owner   |
| 62 | Delay in approving shop drawings and sample materials                       | Owner   |
| 63 | Poor communication and coordination by owner and other parties              | Owner   |
| 64 | Slowness in decision making process by owner                                | Owner   |
| 65 | Conflicts between joint-ownership of the project                            | Owner   |
| 66 | Unavailability of incentives for contractor for finishing ahead of schedule | Owner   |
| 67 | Suspension of work by owner                                                 | Owner   |
| 68 | Original contract duration is too short                                     | Project |
| 69 | Legal disputes b/w various parties                                          | Project |
| 70 | Inadequate definition of substantial completion                             | Project |
| 71 | Ineffective delay penalties                                                 | Project |
| 72 | Type of construction contract (Turnkey, construction only,)                 | Project |
| 73 | Type of project bidding and award (negotiation, lowest bidder,)             | Project |

#### IV. RESEARCH METHODOLOGY

The research methodology for present study has adopted questionnaire survey to identify significant factors influencing time overruns in Indian construction projects. To identify time overruns factors, literature reviews, books, conference proceedings and discussion with practitioners of all parties involved in construction industry were carried out. Questionnaire for the survey was developed based on 73 factors of time overruns and grouped in to 9 major groups. For each factor the respondents were requested to rate using five-point scale of 1 to 5 is adopted. It is categorized as follows 5=very high; 4=high; 3=medium; 2=low; and 1=very low. Prior to formulating questionnaire, a field study was carried out to get feedback from experts in construction industry on the factors identified from literature reviews.

##### A. Questionnaire Survey

The questionnaire was separated into two noteworthy segments. The principal segment contains general data about the respondents such as, (1) Name of respondents; (2) Name of organization; and (3) Type of project (4) Location of work; (5) Designation; (6) Relevant experience in years.

The second area addresses causes prompting delays. A rundown of significant postponement causes as read from the writing is displayed, and the respondent is solicited to express the seriousness from event of these reasons in his tasks. Most continuous reasons compare to "high impact," though the minimum regular relates to "low impact" which prevents presence from claiming the condition as a reason.

The survey addresses the ordinarily embraced controls of postponement in construction projects and the managerial techniques set to minimize their effects, and an audit of these controls is shown. The configuration rationality of the survey depended on the way that they must be straightforward, clear, and justifiable for respondents, and in the meantime, they ought to have the capacity to be translated well by the scientist.

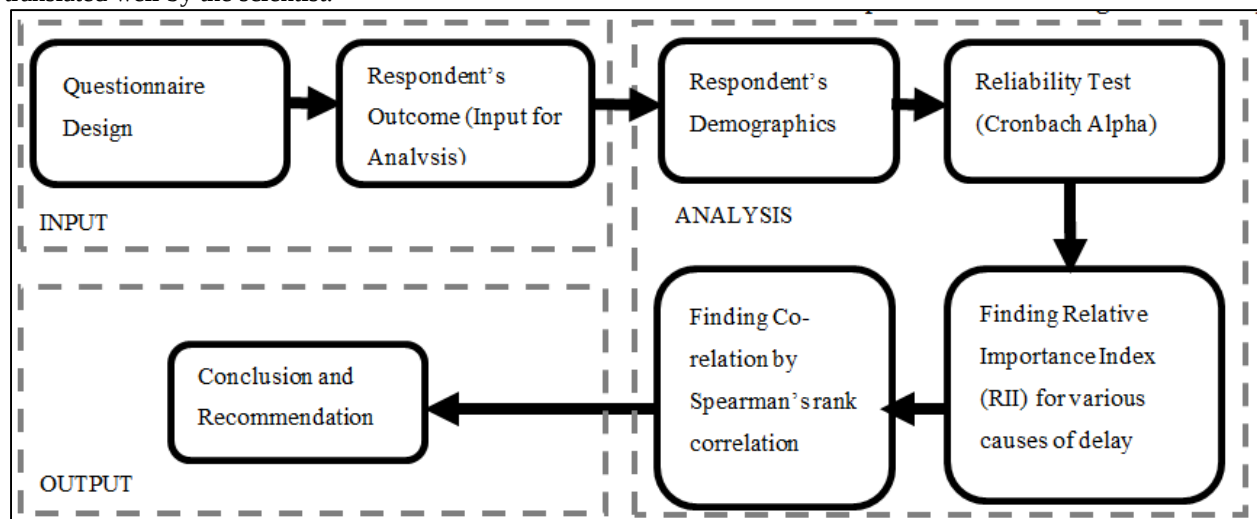


Fig. 1: Research Process

The survey has an unmistakable favorable position of requiring littler time to be reacted and is more exact in the last result. Factors bringing about postponement in construction projects were distinguished through the writing taking into account past examines together with data, update, and alterations by nearby specialists where an aggregate of seventy-three (73) factors at nine (9) noteworthy groups were recognized. The members were required to rate the factors in the way they influence delay in construction projects utilizing their own particular encounters on building locales. The questionnaire required the respondents to

rank these on a scale with the rating of “1” representing very low effect; “2” low effect; “3” medium effect; “4” high effect; and “5” very high effect according to the degree of importance on delay in construction projects. The numbers taken out to the agreement scale (1–5) don't show that the interims between the scales are equivalent, nor do they demonstrate supreme amount.

Surveys methodology of gathering information was utilized; included subsequent phone calls and ensuing visit to firms and work destinations, the majority of information were gathered by this strategy. Structures were given to respondents to finish, and finished structures were gathered later. In numerous occurrences, structures were finished at the meeting; this system had the added advantage of making elucidations to respondents about inquiries in structures; it additionally allowed to the specialist to investigate further project delay administration hones and concerns. Google form was generated and the responses were collected at accelerated pace due to ease of Spreading the Questionnaire and easy to summarise the responses.

## V. THEORY OF ANALYSIS

### A. Reliability analysis

Theory for Cronbach Alpha; Reliability test is conducted to check the stability and consistency of data by using cronbach alpha method. Reliability of the data is considered at low level when cronbach alpha is less than 0.3 which means the data is not reliable and cannot be adopted. Reliability is at high level when cronbach alpha is more than 0.7 (Wong and Cheung (2005).

### B. Relative Important Index (RII)

The RII was used to evaluate the ratings of the respondents. This approach was recommended in past studies as the appropriate analytical approach to group ratings of the variables in a given set. The analysis involved the computation of the RII, which is the representative rating point for the collective ratings made for each variable in the subset

$$RII = \frac{\sum W}{A * N}$$

Where RII = relative importance index; W = weighting given to each factor by respondents (ranging from 1 to 5); A = highest weight (i.e., 5 in this case); and N = total number of respondents.

The RII value had a range of 0 to 1 (0 not inclusive); the higher the RII, the more important was the cause of delays. The RIIs is then ranked, and the results are shown in Table.

### C. Correlation between the common factors of delay in construction industry

Spearman's rank correlation

Spearman's rank correlation is a non-parametric test. Non-parametric tests are also referred to as distributions free Tests. These tests have the obvious advantage of not requiring the assumption of normality or the assumption of homogeneity of variance. They compare medians rather than means and, as a result, if the data have one or two outliers, their influence is negated. In this research the Spearman's Correlation is used. Correlation is a relationship measure among different parties or factors and the strength and direction of the relationship. In this research it is used to show the degree of agreement between the different parties. The correlation coefficient varies between +1 and -1, where +1 implies a perfect positive relationship (agreement), while -1 results from a perfect negative relationship (disagreement). It might be said then that sample estimates of correlation close to unity in magnitude imply good correlation, while values near zero indicate little or no correlation. The Spearman's rank correlation coefficient  $r_s$  is used to measure and compare the association between the rankings of two parties for a single cause of delay, while ignoring the ranking of the third party. And it is calculated by the following formula:

$$r_s = 1 - \frac{6 \sum d^2}{n^3 - n}$$

Where,

$r_s$  is the Spearman rank correlation coefficient between two parties

d is the difference between ranks assigned to variables for each cause

n is the number of pairs of rank

## VI. CONCLUSION

Time over run is a severe problem faced by construction industry in India from ages. It resulted from various factors identified in our study. There were 73 causes of delay considered in our study which were classified into 9 groups. By adopting Questionnaire response gathering technique the responses received were 100% reliable. Further, the most significant factors which cause the delay in all the three sectors of Indian construction industry (Industrial, Infrastructure and Real Estate) are Clearance, Procurement Planning and Procurement Process and Improper co-ordination between project contractors for the project participants.

And also, the common factors causing delay between two sectors as Industrial-Real Estate, Real Estate-Infrastructure and Infrastructure-Industrial were found which are stated in Venn Diagram (Fig 6.6)

Further, the most critical groups amongst the nine groups which are responsible for delay of construction projects are identified. These groups are Labour, Contractor, Consultant and Economic Condition. So this implies that a need of urgent attention is to be put on these factors to avoid time and cost overruns.

## VII.RECOMMENDATIONS

- Regular progress meeting
- Proper emphasis on past experience
- Effective strategic planning
- Proper coordination between the parties involved
- Realistic project planning and scheduling
- Proper material procurement
- Detailed procurement planning
- Accurate initial cost estimates
- Clear information and communication channels
- Detailed and proper design at the right time
- Use up-to-date technology utilization
- Collaborative working in construction
- Providing labour training camps

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