

# Delays in Construction Industry: A Micro Perspective

S. Anthony Raj, B. Kalpana Sai

**Abstract:** With seven likely gateways Coimbatore is an industrial city located in the South Indian state of Tamilnadu. This is one of the leading revenue giving cities next to Chennai and Tiruppur. As urbanization is on the major rise and the city area is extended and expanded, raising of new building on its farm lands is quintessential to whistle-blow its development. This major urban revolution in the city requires optimized procurement of materials, effective material handling, prompt construction planning and an overall impeccable project management. But the delay in completion of the projects is a quirk of fate. There are 'n' number of reasons for these delays such as: (i) improper materials and financial planning by the parties and the constructing company, (ii) lack of contractor's experience, (iii) improper site management, (iv) payment problems from both parties, (v) poor communication from suppliers, (vi) vendors and other stake holders, (vii) subcontracting problems, (viii) material price hike, material shortages, (ix) labor problems, (x) faults during the stage and so on. This article unveils the top reasons for the delays happening in the construction industry in Coimbatore city.

**Index Terms:** Construction Delays, Clients, Contractors, Materials, Site Management, Vendors.

## I. INTRODUCTION

Coimbatore, the 'Manchester of South India', was once surrounded by cotton fields that cater to the need of as many flourishing textile units as possible. Now the city is getting its fame in pump manufacturing and other machinery manufacturing. The water resource, cool weather conditions and comparatively cheaper land cost has been attracting many other region people to migrate their livelihood to Coimbatore creating better scope and business for the construction companies to launch their pedals to reap more construction business in our selected city. These developments are vital for a city to grow economically. This flourishing industry too is also not a stranger to many issues arising within. In this article, the delays happening and the reasons for that are studied and furnished.

### 1.1 Construction Industry

The construction industry is very huge, unstable and demands a huge amount of capital investment. Risks in this industry are inevitable when all other related things are volatile in nature. Bramble and Callahan (1987) expressed that the delay is the time during which some part of the construction project has been extended or not performed due to an unanticipated circumstance. He stressed that delay is inseparable in construction projects and it varies considerably from one project to the other.

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### 1.2 Construction Industry in Coimbatore

Coimbatore accommodates few hundreds of big construction companies, small, medium and subcontractors. Since the city limit is extended to few kilometers, the land rates are considerably cheaper and people's desire to have their own house magnetized the construction company and other related core industries to come with many models of villas and apartments which suits the people's needs and desires. Construction industry is a collection of many sub industries and it finally connects the contractor and his clients.

### 1.3 Construction delays in Coimbatore

This electrifying economic activity requires construction materials, interior decors, aesthetic products, furnishing and modular kitchens are on the move. Since the demand is rising and numbers of projects are increasing, the industry suffers delays. There are number of reasons for these delays such as: (i) improper materials and financial planning by the parties and the constructing company, (ii) lack of contractor's experience, (iii) improper site management, (iv) payment problems from both parties, (v) poor communication from suppliers, (vi) vendors and other stake holders, (vii) subcontracting problems, (viii) material price hike, material shortages, (ix) labor problems, (x) faults during the stage and so on.

## II. LITERATURE REVIEW

There are lots of studies conducted to find out the construction delays across the globe and only a limited study is done in Coimbatore. The relevant literature is furnished in this section. Scheduling of construction projects is based on uncertainties and the project firms are very much accountable for the overall success of the project. There are certain controllable and uncontrollable activities in the construction industry. Management aspects of the project play a pivotal role in the successful completion of the construction project. The importance of project manager in liaisoning between the clients, consultants, project engineers and the builders is a must to have amicable understanding (K. Divakar and K. Subramanian, 2009). Small size companies are not implementing Total Quality Management (TQM) due to their lack of knowledge and support from the management. The medium and large companies however implement TQM and they are not using fully because of lack of knowledge, indirect costs, lack of management support, need of qualified team, time dependency for project,

## Delays in Construction Industry: A Micro Perspective

project overheads, and reduced profits. He believes that the training is a must agenda for improving the knowledge about using of TQM in construction projects to reduce cost and time and maximizes the profit. (Anantha Subramanian, 2014) Most of the problems that occur in the construction industry firms in his study are based on the financial issues. Scheduled payments should be specified in a detailed contract to facilitate implementation and encourage the contractor to finish the project (Kumar and Thirumuruga Poiyamozhi, 2016). The delays of construction of building projects in Tamilnadu and the views they gathered from the promoters, consultants, and contractors reveals that delays are because of poor quality of construction materials, low motivation and morale of labor, shortage of labor, labor injuries on site, shortage of construction materials, damage of sorted materials, poor procurement of construction materials, change in materials types and specification, low productivity of labor, and late delivery of materials (R. Yalini and S. Alan, 2015). S. Shanmugapriya and K. Subramanian (2013) found in their research that most significant factors causing time and cost overruns in Indian construction industry are material market rate, contract modification, high level of quality requirement, project location, escalation of material price, high transportation cost, frequent breakdown of construction plants and equipments and rework for cost overruns. Greeshma B Suresh and S. Kanchana (2015), found that shortage of construction materials, effect of subsurface conditions & natural disaster, delay in material delivery, low productivity labors, rework due to errors, late procurement of materials, unqualified workforce, low productivity and efficiency of equipment, delay in quality control, poor site management & supervision, poor communication between parties and lack of high technologies are the major causes of delay in construction industry. Contradicting many studies, a study conducted by M.Haseeb et al. (2011) reveals that majority of the delay factors are relevant to client factor. They figured out that overtime, disputes, negotiations, lawsuits, litigations, abandonment and over cost are the effects of construction delays. Kartik and Shakil (2016) in their study found that the most significant factors which cause the delay in all the three sectors (Industrial, Infrastructure, and Real Estate) on Indian construction industry are clearance, procurement planning and procurement process and Improper co-ordination between project contractors for the project participants. K.V. Surendran and C. Shankar (2017) found six important dimensions of delay in construction namely Design, owner, material, contractor, labor and external. They found a significant relationship between the entire dimensions. Shuruthi Sivaprakasam et al. (2017) identified some most common factors of delay such as lack of experience, poor supervision, changes in design during construction by the owner, delay in delivery, co-ordination, project management problems, weather conditions, soil condition and slow mobilization. Murali Sambasivan and Yau Wensoon (2007) found ten important causes for construction delays namely: contractor's improper planning, contractor's poor site management, inadequate contractor

experience, inadequate client's finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, equipment availability and failure, lack of communication between parties, and mistakes during the construction stage. The result of the study conducted by Stephen Oogunlana and Krit Proomkuntong (1996) reveals that the construction industry problems in developing developing economies can be nested in three layers such as: problems of shortages or inadequacies in industry infrastructure (mainly supply of resources); problems caused by clients and consultants and problems caused by contractor incompetence and inadequacies. Causes of construction delays in residential projects in Jordan were founded by G. Sweis et al. (2008) and financial difficulties faced by the contractor and too many change orders by the owner are the leading causes of construction delays. John R Baldwin et al. (1971) studied and examined seventeen construction delay causing items such as weather conditions, labor supplies, material shortages, equipment failure, finances, manufactured items, construction mistakes, design changes, foundation conditions, permits, shop drawings, sample approvals, building codes, subcontractors, contracts, jurisdictional disputes, and inspections. Abdalla Modeh and Hussien TBattaineh (2002) aimed at identifying the most important causes of delays in construction projects with traditional type contracts from the viewpoint of construction contractors and consultants. Results of their study indicate that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors are among the top ten most important factors.

B. Indhu and P. Ajai (2014) factors identified the delays are due to contractor, client and also due to nature's act like rain. The most important causes were delays in contractor's payments, shortage of material in construction, change in material, the weather condition, shortage of manpower either skilled, or semi-skilled or unskilled labors, frequent change of company staff, poor site management and improper management of the site engineers. Their study portrays that some of the delays are delay in submission of drawings, space constraints, and delay in payment by client, delay in material supply and local problems like strikes. The major effects of delay are cost impact, reduced labour productivity, postponement in work, and change in labour allocation and so on. All the reviews presented in this paper conclude the delays are classified as critical, non-critical, excusable, non-excusable, compensable, non-compensable, and concurrent delays.

### III. METHODOLOGY

The study was carried out in and around Coimbatore especially with the mega project construction companies who are engaged in constructing Apartments, villas and gated community projects.



The study period was 8 months. This study was aimed at finding the root cause of the delay happening in the construction industry in Coimbatore. Five reputed construction companies in Coimbatore was selected for the study and a questionnaire was administered to obtain the responses. Structured and unstructured interviews were also performed to obtain the figures from laborers and other skilled personnel who are instrumental in project works. The respondents are land owners, buyers of the properties, contractors, subcontractors, and laborers. 111 respondents were taken for the study among 5 builders in Coimbatore.

Descriptive statistics was used to perform ranking to rank the delay factors. ANOVA test was performed to observe the relationship between the factors and parties involved in the construction projects. Reliability Test was performed to validate the delay factors. Relative importance index was used to determine the relative importance of the reasons and the effects of construction delays.

#### IV. PHASES OF CONSTRUCTION PROJECTS

The core objective of finding the root cause of the construction delays happens from the first stage of the project idea. So it is highly imperative to understand the process or phases involved in a construction industry. During the study time, the authors of this study spent a good volume of time with the constructing company to understand the phases involved in a construction project. The phases are as follows:



Figure 1. Phases of Construction Projects

These eight phases include many parties such as land owners, designers, contractors & sub-contractors, financiers, buyers, maintenance people, approving authorities, materials suppliers and so on. In each of these above mentioned phases delay is caused for innumerable reasons. This study reveals such factors.

#### V. DELAY FACTORS IDENTIFIED

##### A. Planning & Pre-Design Factors

- 1) Land or Site Purchase
- 2) Site proposal
- 3) Site Inspection
- 4) Site Approval / Sanction (DTCP/LCP etc)
- 5) Layout approval
- 6) Corrections
- 7) Compliances
- 8) Road Connectivity arrangements
- 9) Water, Electricity Connections, Bore well arrangements
- 10) Street planning
- 11) Draining and Sewage planning

##### B. Design Factors

- 1) Initial Design
- 2) Design Errors and mistakes
- 3) Alterations and Corrections in designs
- 4) Details missing in design
- 5) Complexities in design
- 6) Misunderstanding of requirements
- 7) Designers skills
- 8) Inadequate number of designers

##### C. Approval Factors

- 1) Panchayat
- 2) Municipality
- 3) DTCP / Township

##### D. Site Preparation Factors

- 1) Site Planning
- 2) Site cleaning and preparatory works
- 3) Site Maintenance
- 4) Compound wall or fencing
- 5) Site Segregation and Allotment
- 6) Road Facility
- 7) Site raising and Elevation

##### E. Structuring of Building

- 1) Design imposing in real-time
- 2) Model Villa or Apartment Construction

##### F. Construction Factors

- 1) Labour inadequacy
- 2) Improper scheduling of labor force
- 3) Material Supply delays
- 4) Lack of modern technology
- 5) Lack of material handling equipments
- 6) Low productivity of labors
- 7) Incompetent labors
- 8) Accidents during projects
- 9) Equipment breakdowns
- 10) Change in weather conditions
- 11) Power shutdowns
- 12) Conflicts among labors

## Delays in Construction Industry: A Micro Perspective

- 13) Conflicts with suppliers' materials
- 14) Conflicts with subcontractors
- 15) Lack of coordination between labors, site supervisors and engineers
- 16) Price hikes and other related economic factors

### G. Post Construction factors

- 1) Skilled work like plumbing, PP works, Paintings, Interiors etc
- 2) Payment from the buyers
- 3) Alterations
- 4) Sewages
- 5) Drainages
- 6) Surveillance, Street roads and lightings
- 7) Compound walls
- 8) Amenities and Recreation Facilities
- 9) Handing over

## VI. DATA ANALYSIS

The study purports 56 delaying factors under 7 main groups. The respondents belonging to land owners, contractors, site engineers, site supervisors and few personnel are given a questionnaire and interviewed to obtain their responses. Selected questions were given to rate from 1 to 5 (1 being very low and 5 being very high).

**TABLE - 1**  
**RELIABILITY TEST OF DELAY FACTORS**

Factors	Cronbach alpha
Planning or Pre-design	0.729
Design of every house / villa	0.717
Approval factors	0.700
Site preparation factors	0.757
Structuring of building	0.855
Construction	0.832
Post construction or interior	0.866
<b>Overall Cronbach Value</b>	<b>0.822</b>

*Source: Computed from Primary data*

The above table clearly indicates the data used in the analysis are reliable and can be adopted as the value is more than 0.7.

**TABLE - 2**  
**RANKING OF CONSTRUCTION DELAYS**

Delay factors	RII %	Rank	Group
Material Supply Delay	62.10	1	F
Price hikes & Economic factors	61.81	2	F
Initial design	61.62	3	B
Alterations and corrections	61.52	4	B
Low productivity of Labor	60.35	5	F
Incompetent labor	60.25	6	F
Conflicts with material suppliers	60.07	7	F
Conflicts among labors	59.97	8	F
Labor inadequacy	59.83	9	F
Model villa / apartment construction	59.42	10	E
Land or site purchase	59.37	11	A
Site proposal / sanction	59.24	12	A
Site inspection	59.03	13	A
Layout approval	58.81	14	A

Site approval / sanction	58.75	15	A
Corrections in the plan	58.74	16	A
Compliances of the authorities	58.72	17	A
Road Facility	56.00	18	D
DTCP / Township planning	55.82	19	C
Panchayat Approval	55.60	20	C
Municipality Approval	55.01	21	C
Road Connectivity arrangements	54.90	22	A
Water, Electricity Connections	54.82	23	A
Street Planning	53.25	24	A
Design Errors and mistakes	52.25	25	B
Misunderstanding of requirements	52.11	26	B
Conflicts with subcontractors	52.00	27	F
Lack of modern technology	51.99	28	F
Improper scheduling of labors	51.78	29	F
Lack of material handling equipments	51.70	30	F
Lack of coordination between labors, site supervisors and engineers	51.50	31	F
Skilled works like PP etc	51.25	32	G
Site segregation and allotment	50.89	33	D
Payment from buyers	50.65	34	G
Alterations	50.50	35	G
Surveillance, Street Roads and Lightings	50.22	36	G
Compound walls	49.99	37	G
Sewages	49.79	38	G
Drainages	49.23	39	G
Amenities & Recreation facilities	48.66	40	G
Handing over	48.28	41	G
Design imposing in real time	48.20	42	E
Compound walls or fencing	47.50	43	D
Site maintenance	47.29	44	D
Inadequate number of designers	47.08	45	B
Designer skills	47.00	46	B
Drainage and sewage planning	46.99	47	A
Site planning	46.83	48	D
Site cleaning & Preparatory work	46.80	49	D
Site raising and elevation	44.09	50	D
Complexities in design	44.01	51	B
Details missing in design	43.55	52	B
Power shutdown	43.05	53	F
Change in weather conditions	43.25	54	F
Equipment breakdowns	43.07	55	F
Accidents during projects	42.88	56	F

*Source: Computed from Primary data*

The study aims to identify the delay factors in completing construction assignments among the builders in Coimbatore. The most important factors that cause the delays in construction projects across Coimbatore are "Material Supply delay". The least important factor influencing construction delays is "Accidents during the projects". Table 2 clearly shows the ranking of other factors based on the Relative Importance Index.



TABLE – 3  
RANKING THE DELAY FACTORS BY GROUPS

GROUPS	SCORE S	Rank	Group
Construction Factors	56.6	1	A
Approval factors	55.5	2	C
Structuring of building	53.8	3	E
Planning or Pre-design	53.5	4	F
Design Factors	51.4	5	B
Post construction or interior	49.8	6	G
Site preparation factors	48.5	7	D

Source: Computed from Primary data

The delay factors are linked group-wise and ranked. The first group that highly impacts construction delays are 'Construction factors' followed by 'Approval Factors', 'Structuring of building', and 'Planning or Pre-design Factors'. These four factors contribute to more than 80 percent of the construction delays.

## VII. CONCLUSION

This study focus on many factors causing construction delays for projects happening in Coimbatore, Tamilnadu. From the view of promoters, consultants, contractors, sub-contractors and customers, the relative importance of the factors that cause delay in construction was studied. The study showed that the top five influencing factors in causing delay are (i) material supply delay, (ii) price hike and economic factors, (iii), Initial design, (iv) Alterations & Corrections and (v) low productivity of labor. The 56 factors were categorized into seven major groups and were ranked. The results showed that contractors, promoters, consultants, customers and sub contractors all agreed that the planning or pre-designed group of delay factors was the most influential factor.

## VIII. FUTURE RECOMMENDATIONS

The study included only 56 factors under 7 groups, so the future researchers can widen up the scope by increasing factors and groups based on their own region of study. The construction industry is dynamic in nature and that is inevitable that conflicts will arise. The challenge to construction managers is to resolve conflicts amicably with the cooperation of all stake holders. Training or skill development programme can be imparted to the labor force.

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