

CONSTRUCTION DELAYS IN HIGH RISE STRUCTURE

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Abstract : Construction delays are regular issues in structural building ventures. The culmination of ventures in a convenient way is regularly a basic factor and proportion of undertaking achievement. Delays can be characterized as time overwhelm or augmentation of time to finish the undertaking. As it were, delay is a circumstance when the real progress of a construction task is more slow than the arranged calendar. In construction industry, there is an essential objective of partners to accomplish auspicious finishing of activities inside stipulated spending plan and required quality as every day of time overwhelm in the fulfillment of any task has direct effect on the expense of venture. There are different components answerable for postpone which requires genuine regard for comprehend and address so as to accomplish effective culmination of venture on schedule. Construction delays are regularly the after effect of miscommunication between temporary workers, subcontractors and ridiculous desires are typically stayed away from using nitty gritty basic way plans, which indicate the work, and timetable to be utilized, yet above all, the legitimate arrangement of occasions which must happen for a task to be finished. Delays in construction activities are as often as possible unrestrained, since there is typically a construction advance included which charges intrigue, the board staff devoted to the task whose expenses are time subordinate, and progressing swelling in pay and material costs.

Index Terms – Questionnaire Survey, RII, IMPI.

I. INTRODUCTION

Most of construction projects suffer delays. The effects of these delays may be of considerable magnitude on the efficiency of the project. It is possible to reduce these delays through recognition of their real causes. Definitions of delays in construction can be presented in several ways. Delay could be defined as the time overrun beyond the accomplishment time in the agreement or beyond the time the contract parties agree upon for the delivery of the project [1]. Also it can be defined as the distinction between the real finish date and the estimated date [2]and [3]. Also it is defined as the period during which the project or part of it has been extended or not completed due to unexpected conditions [4]. Therefore the delay in construction project can be expressed as the time overrun or extension of time behind the date agreed upon by the contract parties.

1.1 OBJECTIVES OF PROJECT:

- i. To identify the major causes of delays in private sector industrial construction projects in India through a survey and give ranking to these causes.
- ii. To study the difference of perception of various stakeholders (Contractors, Consultants and Developers) regarding critical causes which delays industrial construction projects.
- iii. To compare two different techniques of delay analysis.
- iv. To give discussions and suggestions Delays in construction project.

II. LITERATURE REVIEW

Ahmed Taghi Multashi, Rohit R. Salgude., 2013, Author identifies that now days the planned duration is one of the main criteria when judging whether a construction project is a failure or not. Additionally, construction designing is claimed to achieve success if the project completes inside the planned duration; or if it identifies a problem well prior to, thereby alerting the project management team to resolve the problem before it causes any impact on the completion date. In this analysis of the Olympic sports stadium in Alkut delay factors investigated. Participant observations were adopted an approach has advised that from the descriptive principles of anthropology? The last Olympic game stadium construction until completion prior professional conduct as a senior design engineer major human-relations factors were discovered and known that the management and development had an impact on performance of the designing.[1]

Rahul Kolhe, Milind Darade., 2014, In this study author identifies that the construction industry is large, volatile, and requires tremendous capital outlays. Delays occur almost in every construction project and the significant of these delays varies considerably from project to project. In construction, delay could be defined as over run of a time either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. [2]

Meena. V, K. Suresh Babu., 2015, Time delay is one of the biggest problems facing in many construction buildings in India. Completing projects on time is the key factor of the project, but the construction process is subject to many variables and unpredictable factors, which result from many sources such as availability of resources, external factors, performance of parties and type of building. If there is a delay in project it leads to loss of productivity, increased cost, contract termination and disputes between contractor and owner. The aim of this project is to examine the causes and effects of delay on building construction project during construction phase and to provide control measures for time overrun in the project. In this paper a study was carried out on construction schedule delays and various delay analysis techniques and methods in order to evaluate the causes of delay and their impacts in the construction project. Then a

questionnaire survey is done to find the major causes of delay faced by Client, Contractor, Consultant and Project manager. [3]

Aedwin Regi Varghese, Shibi Varghese., 2015, Author investigates Time, quality and economy constitute the three main factors in a construction project, of which time plays a significant role in construction. Delay in any task or operation is a time overrun which influences the completion of the work. The common problems in civil engineering projects all around the world are mainly due to delay in construction. These problems occur frequently during project duration leading to disputes and litigation. Thus it's essential to study and analyse causes of construction delays. The study is based on a list of construction delay causes retrieved from literature reviews. The feedback of construction experts was obtained through interviews. Subsequently, a questionnaire survey was prepared. The questionnaire survey was distributed to construction experts who represents consultants, and contractor's organizations. A case study is analyzed and compared to the most important delay causes in the research. Statistical analysis is carried out to test delay causes, obtained from the survey. [4]

Dr. Ashraf Samarah, Dr.Ghanim A. Bekr., 2016, Author identifies that One of the most significant economic sectors in Jordan is the construction sector. Time and cost overrun is one of most serious problems suffered by this industry. The major aim of this research is to detect the major causes of delays in public projects in this country and to find the effects of this delay on the performance of these projects. The aim was accomplished through an intensive literature review and a field study used to find the perception of major parties participating in the implementation of the construction projects in Jordan. The survey which was carried out through a questionnaire has three divisions. These are the introductory part, the causes revealed by the literature review (55 causes) categorized into four groups and the effect of causes on the performance of the project. Answers were collected from (146) participants representing clients, contractors and consultants. The analysis carried out through the determination of the frequency of occurrence, severity and importance of each of the 55 causes of delay. [5]

Anil Upadhyay, Vaishant Gupta, Dr. Mukesh Pandey., 2016, Author identifies that the Construction schedule delays may be explained by means of the late completion of construction work in comparison of designed schedule of project. If the reasons of the construction projects schedule delay are found then the project schedule delay in construction can be reduced. The aim of this thesis is to quantify the top most dangerous factors of schedule delay in Gwalior region and nearby areas by using relative importance index (R.I.I.) method so that chances of schedule delay in construction projects are minimized and reduce the effects on different parties due to project delay. This study figures out, 44 dissimilar factors of schedule delay were selected after the past review of literature then arranged them in 9 primary sets. In this study R.I.I. of all factors were computed separately using R.I.I. method. [6]

Agu. N. N1 and Ibe, B. O., 2016, Author investigate factors responsible for the delay on building construction projects in Enugu State. Delay means non-completion of project within the specified duration agreed upon in the contract. Some building construction projects in Enugu State construction experienced a wide range of delays. Developing a delay analysis system for assessing and reducing the impact of delay in Nigeria construction projects in Enugu. The method used primary and secondary data. Primary data were obtained using different Participatory Research Approaches (PRA) including, in-depth interview, focus group discussions and questionnaires. The results revealed the factors that contributed to the causes of delays in building construction project in Enugu State are delay in revising and approving design documents, delays in sub- contractors work, poor communication and coordination, change orders by owner during construction and inadequate contractor's work. Furthermore, delay in approving major changes in the scope of work, shortage of labors; ineffective planning and schedule in execution of project are among the factors with sequence. [7]

Leena Mali, Abhijit Warudkar., 2016, Construction delay is a time exceed either after the contract date or after the date that the components involved have agreed upon for the delivery of the project. In both cases, a delay is usually a costly situation or the period of amount of time during which something is delayed. There is various types of definition of delay are made in construction industry such as to wait until later to do something or to take longer than expected or planned or the amount of time that you must wait for something that is late. Delay are the major source of claim and disputes in construction industry in India. Various delayed analysis methods have been developed, there is a lot of debate was arranged on national and international level for how to minimize delays. The paper has intended to identify the causes of delays, the effects of delays and methods of minimizing construction delays. The paper study has been carried out based on literature review and a questionnaire survey. In this paper eighty-three questionnaire were made on the basis of pilot study, which were distributed on various construction site. Interviews were taken on each construction sites, also take photos of any ongoing activity on that site. Then ranked on their importance index by the data collection in Pune city. [8]

Anuradha Arya Dr. Rajeev Kansal., 2016, Construction delays are common problems in civil engineering project in India. These problems occur commonly during project life-time leading to disputes and legal action. Therefore, it is necessary to study and analyzed causes of construction delays. In this study opinion of construction experts were obtained through interviews. Subsequently, a questionnaire survey was prepared. A questionnaire survey is conducted to consider the time performance of construction projects in India to identify the causes of delay and their important index for delay factors could be computed. A total 78 causes of delay were identified during the research. The delay factors were grouped into eight major groups. The top-10 list was dominated by factors related to the contractor, owner and the project group. However, three owner group factors and consultant group factors, late progress payment, financial problems of owner, and improper study of design affects estimated quantity, were the first three factors on the list, which also had a high impact on the three project objectives.[9]

Umesh Pawar, Prof. P. S. Dange., 2017, Author suggests that one of the most communal problems in the creation project is delay. Delay of a structure project can be defined as the late end of works as related to the strategic schedule or deal schedule. Projects can be late due to number of causes that may be outstanding to the consumer, the contractor, acts of God, or a third party. They may happen early or late in the plan growth, alone, or with other delays. Interruptions can be reduced merely when their cause are recognized. The objective of this learning was to classify the main reasons of interruptions, the belongings of delays, and systems of reducing delays in creation plan. This work focus on delay analysis in construction with different measures. This work also investigates the interruption of time as well as cost maximization with different factors. Author has done all the work and scheduling using MSP 2013.[10]

Tsegay Gebrehiwet, Hanbin Luo., 2017, The occurrence of a delay in the construction projects is common and significantly affects by enormous ways. In this study author investigates the typical causes of delay at different stages of construction and its effect in the Ethiopian construction projects. Using a questionnaire with 52 causes and 5 effects of delay, data were collected from 77 participants' selected based on purposive sampling from the different contracting organizations. The methodologies used in this research are relative important index (RII) and correlation coefficient. Based on the comparison, the impact of delay is found as, construction stage, pre-construction stage, and post-construction stage sequentially. The analysis of the relation in construction process shows; the average/overall is highly related, construction stage is the second related, post-construction stage is the third related and pre-construction stage is far part of all stages.[11]

Dr. P. P. Bhangale., 2017, Author identifies delays in a construction project can be regarded as a failure. This paper aims to investigate the causes of delay in high rise building projects in Pune city. Author identifies that the industry which is experiencing frequent and costly delays is the building and construction industry. However, a numbers of construction projects which had the delay problems are very significant. Construction project involves many unpredicted factors which results from many sources. These sources include the performance of contractors, resources availability, weather conditions and contract systems. However it occurs in every construction project and the significant of these delays varies considerably from project to project and hence delays are important problem in the construction sector. Research into this sensitive area is essential in order to improved administration delay conditions and to diminish their consequences. This study by the author is to diagnose the relevant factors contributing delays. [12]

Desalegn Disasa Daba1, Dr. Jayeshkumar Pitroda., 2018, Author identifies that in construction industry time is a very important measure and crucial resource in project management life cycle. In construction project context author explains the delay of time as postponement of time to finish the project progress. It is the driving force for the project success. If we didn't use time properly even it is one cause for failure. So, in Construction Project cycle delay is the greatest common problems. When the real project work duration is more than planned project duration we call it project time delay. The result of delay will cause many unwanted effects on projects; like the conflict between the project owner and contractors or claim between the project participants, overstated prices, loss of production and income, and contract closed. Delay is a very recurrent and non-planned phenomenon which is almost related to all ongoing construction projects. This review work attempts to find and investigate the main factors perceived to affect delays in projects. [13]

2.1 Literature gap: From the above literature reviews, we can conclude that the a proper and systematic study of delays in construction project can overcome the various issues regarding the construction dealys at the site during and at the commencement of project and it will provide the superior and smooth functioning of work and less time consuming system for construction project.

III. METODOLOGY USING ERP REPORT GENERATION:

3.1 METHODOLOGIES.

- To understand the various delays causes its basic terminologies, definitions and recent research works. This will be achieved by gathering information from research magazines in construction and infrastructure, research published papers, related technical books, e-library and all other possible sources. After this Budget is worked out by Billing & contracts Department which includes Labour and Material.
- Construction projects will be selected and actual site visit will be conducted to gather the all required data. **Questionnaire** will be formed to collect the information on various factors causing overhead cost. Data will collected by all levels of personnel involved in construction project such that relevant and specific data is collected.
- The data collected will be analyzed and formulated giving ranking to each factor starting from 1 to 5 considering its role in dealys as it is done in Likert Scale.
- Determine major and minor factors as per their rank and comparative analysis of projects which would further give common factors incurred for delays in construction of high rise structures.

3.2 QUESTIONNAIRE GENERATION

QUESTIONNAIRE: A Questionnaire is a survey of various delay factors the rating of which is given by various stakeholders in a construction industry depending upon their experience.

Response Sheet for Analysis of Delays in High Rise Construction							
SECTION B: MAIN QUESTIONNAIRE (For finding Relative Importance Index)							
Please indicate by ticking (✓) the appropriate column of the relative importance of each of the following causes of private sector industrial construction delay. Please tick mark according to your point of view only in one column in each row.							
No.	GROUP	Causes of Delay	Relative Importance depending upon Importance				
			Very Important	Important	Moderately Important	Slightly Important	Unimportant
A	Project Management	Legal disputes					
		Quality assurance and controls					
		Delay in Shop Drawings					
		Poor judgement in estimating time and resources					
		Preparation of scheduling work-delay					
B	Contractor	Poor site management and supervision by contractor					
		Difficulties in financing project by contractor					
		Poor communication and coordination between owners and other parties					
		Rework due to errors during construction					
		Conflicts between contractor and other parties					
		Contractor handling work on more than one site					
C	Design	Conflicts in sub-contractors schedule in execution of project contractor					
		Complexity of Project Design					
		Unclear and inadequate details in drawings					
		Misunderstanding of owners requirements by design engineer					
		Inadequate design-team experience					
D	Material and Equipments	Insufficient data collection and survey before design					
		Delay in manufacturing special building materials					
		Changes in material types and specifications during construction					
		Postponement in assembling uncommon structure materials					
		Low profitability and effectiveness of equipments					
		Low degree of equipment operator's expertise					
		Equipment breakdowns					

Fig 1 Questionnaire Survey Snap Shot Step I (Page 1)

E	Miscellaneous	Suspension of work by owner					
		Unforeseen ground condition					
		Foundation conditions encountered on site					
		Harsh weather e.g. very cold, very hot, rain etc. on construction activities					
		Natural calamities such as flood, earthquakes etc.					
		Public Holidays					
SECTION A: Respondent's Details							
Name							
Organisation							
Designation							
Experience							
Contact Number							
SIGN & SEAL							

Fig 2 Questionnaire Survey Snap Shot Step I (Page 2)

SECTION C: MAIN QUESTIONNAIRE (For finding Importance Index)														
Please indicate by ticking (✓) the appropriate column of the importance of each of the following causes of private sector industrial construction delay. Please tick mark according to your point of view only in one column in each row.														
No.	GROUP	Causes of Delay	Frequency of Occurance [5- Always, 4- Often, 3- Sometimes, 2- Rarely, 1- Never]					Degree of Severity [5- Extreme, 4- Great, 3- Moderate, 2- Little, 1- Never]						
			1	2	3	4	5	1	2	3	4	5		
A	Project Management	Legal disputes												
		Quality assurance and controls												
		Delay in Shop Drawings												
		Poor judgement in estimating time and resources												
		Preparation of scheduling work-delay												
B	Contractor	Poor site management and supervision by contractor												
		Difficulties in financing project by contractor												
		Poor communication and coordination between owners and other parties												
		Re-work due to errors during construction												
		Conflicts between contractor and other parties												
		Contractor handling work on more than one site												
		Conflicts in sub-contractors schedule in execution of project contractor												

Fig 3 Questionnaire Survey Snap Shot Step II (Page 1)

C	Design	Complexity of Project Design												
		Unclear and inadequate details in drawings												
		Misunderstanding of owners requirements by design engineer												
		Inadequate design-team experience												
		Insufficient data collection and survey before design												
D	Material and Equipments	Delay in manufacturing special building materials												
		Changes in material types and specifications during construction												
		Postponement in assembling uncommon structure materials												
		Low profitability and effectiveness of equipments												
		Low degree of equipment operator's expertise												
E	Miscellaneous	Equipment breakdowns												
		Suspension of work by owner												
		Unforeseen ground condition												
		Foundation conditions encountered on site												
		Harsh weather e.g. very cold, very hot, rain etc. on construction activities												
		Natural calamities such as flood, earthquakes etc.												
		Public Holidays												

Fig 4 Questionnaire Survey Snap Shot Step II (Page 2)

IV. PREPARE YOUR PAPER BEFORE STYLING

IV. RESULTS AND DISCUSSION

4.1 Questionnaire Survey Response Analysis by RII technique.

Overall Ranking by RII				
Rank	Group	Causes of Delay	ΣW	RII=
1	Contractor	Poor site management and supervision by contractor	154	0.88
2	Contractor	Difficulties in financing project by contractor	151	0.86
3	Miscellaneous	Natural calamities such as flood, earthquakes etc.	149	0.85
4	Project Management	Poor judgement in estimating time and resources	148	0.85
5	Design	Unclear and inadequate details in drawings	146	0.83
6	Contractor	Poor communication and coordination between owners and other parties	144	0.82
7	Design	Inadequate design-team experience	141	0.81
8	Materials & Equipments	Changes in material types and specifications during construction	139	0.79
9	Miscellaneous	Suspension of work by owner	137	0.78
10	Design	Misunderstanding of owners requirements by design engineer	136	0.78
11	Project Management	Delay in Shop Drawings	134	0.77

12	Project Management	Legal disputes	131	0.75
13	Project Management	Quality assurance and controls	129	0.74
14	Project Management	Preparation of scheduling work-delay	127	0.73
15	Contractor	Conflicts between contractor and other parties	125	0.71
16	Miscellaneous	Unforeseen ground condition	123	0.70
17	Miscellaneous	Harsh weather e.g. very cold, very hot, rain etc. on construction activities	121	0.69
18	Contractor	Rework due to errors during construction	119	0.68
19	Design	Insufficient data collection and survey before design	116	0.66
20	Materials & Equipments	Delay in manufacturing special building materials	114	0.65
21	Design	Complexity of Project Design	112	0.64
22	Materials & Equipments	Equipment breakdowns	110	0.63
23	Materials & Equipments	Low degree of equipment operator's expertise	107	0.61
24	Materials & Equipments	Low profitability and effectiveness of equipments	10.5	0.60
25	Contractor	Conflicts in sub-contractors schedule in execution of project contractor	102	0.58
26	Contractor	Contractor handling work on more than one site	100	0.57
27	Materials & Equipments	Postponement in assembling uncommon structure materials	96	0.55
28	Miscellaneous	Foundation conditions encountered on site	92	0.53
29	Miscellaneous	Public Holidays	90	0.51

Table 1 Questionnaire Survey Response Analysis by RII Technique

4.2 Questionnaire Survey Response Analysis by IMPI technique.

Overall Ranking by IMPI				
Rank	Group	Causes of Delay	ΣW	IMPI=
1	Miscellaneous	Natural calamities such as flood, earthquakes etc.	156	445.71

2	Contractor	Poor site management and supervision by contractor	152	434.29
3	Project Management	Legal Disputes	148	422.86
4	Contractor	Poor communication and coordination between owners and other parties	147	420.00
4	Project Management	Poor judgement in estimating time and resources	147	420.00
6	Contractor	Difficulties in financing project by contractor	146	417.14
7	Project Management	Delay in Shop Drawings	145	414.29
8	Material and Equipments	Changes in material types and specifications during construction	144	411.43
9	Miscellaneous	Suspension of work by owner	141	402.86
10	Project Management	Quality assurance and controls	140	400.00
10	Design	Unclear and inadequate details in drawings	140	400.00
10	Miscellaneous	Harsh weather e.g. very cold, very hot, rain etc. on construction activities	140	400.00
13	Design	Inadequate design-team experience	138	394.29
14	Design	Misunderstanding of owners requirements by design engineer	135	385.71
15	Contractor	Conflicts between contractor and other parties	134	382.86
16	Project Management	Preparation of scheduling work-delay	131	374.28
17	Miscellaneous	Public Holidays	128	365.71
18	Miscellaneous	Unforeseen ground condition	125	357.14
18	Contractor	Rework due to errors during construction	125	357.14
20	Material and Equipments	Low degree of equipment operator's expertise	124	354.29
21	Design	Insufficient data collection and survey before design	123	351.43
22	Materials & Equipments	Equipment breakdowns	122	348.57
23	Materials & Equipments	Delay in manufacturing special building materials	121	345.71
23	Materials & Equipments	Low profitability and effectiveness of equipments	121	345.71
25	Design	Complexity of Project Design	116	331.43
26	Contractor	Contractor handling work on more than one site	115	328.57
27	Miscellaneous	Foundation conditions encountered on site	114	325.71

28	Contractor	Conflicts in sub-contractors schedule in execution of project contractor	113	322.86
29	Materials & Equipments	Postponement in assembling uncommon structure materials	110	314.29

Table 1 Questionnaire Survey Response Analysis by IMPI Technique

4.2 Comparison of Top 10 factors by both Techniques.

Comparison of Top 10 causes by both techniques						
Sr. No.	Causes of Delay	RII	Rank	Causes of Delay	IMPI	Rank
1	Poor site management and supervision by contractor	0.88	1	Natural calamities such as flood, earthquakes etc.	445.71	1
2	Difficulties in financing project by contractor	0.86	2	Poor site management and supervision by contractor	434.29	2
3	Natural calamities such as flood, earthquakes etc	0.85	3	Legal Disputes	422.86	3
4	Poor judgement in estimating time and resources	0.85	4	Poor communication and coordination between owners and other parties	420.00	4
5	Unclear and inadequate details in drawings	0.83	5	Poor judgement in estimating time and resources	420.00	4
6	Poor communication and coordination between owners and other parties	0.82	6	Difficulties in financing project by contractor	417.14	6
7	Inadequate design-team experience	0.81	7	Delay in Shop Drawings	414.29	7
8	Changes in material types and specifications during construction	0.79	8	Changes in material types and specifications during construction	411.43	8
9	Suspension of work by owner	0.78	9	Suspension of work by owner	402.86	9
10	Misunderstanding of owners requirements by Design Engineer	0.78	10	Quality assurance and controls/ Unclear and inadequate details in drawings/ Harsh weather e.g. very cold, very hot, rain etc. on construction activities	400.00	10

Table 3 Comparison of both RII and IMPI Techniques.

V. CONCLUSIONS

Now and again backing of various networks of individuals, where work reason is allocated, is irrelevant. So it is difficult to handle and achieve the work in stipulated timeframe, henceforth in the end delay may prone to happen the extent that the finishing of work is concern. Getting earlier consent from government and city office by owner and contractor can stay away from task delay. Visit gatherings between contractor, owner and consultant with respect to the issues looked in undertaking execution and helping each other to tackle those issues can decrease task delays impressively. General reasons of project

delays are missing of employment learning, lacking of experienced faculty, additional things, vague designing drawings, and so forth. To lessen the deferrals, assets preparation ought to be orchestrated before 3 months, all building drawings ought to be clear and satisfactory, preparing focus ought to be given to laborers to create profitability.

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