

**ANALYSING OF DELAY FACTORS IN MULTISTOREY BUILDINGS**Praburaj.S¹, Janagan.S.S², Saravanakumar.K³P.Gstudent¹, Assistant professor², Assistant professor³^{1,2,3}Department of Civil Engineering, Gnanamani college of engineering-Namakkal, Tamil Nadu, India.

Abstract — Today in construction industry several challenges are faced by construction projects. Many of them directly affect the construction operation concluding the delay in project or affecting the performance of project. This delay negatively affects economy, growth of infrastructure and the society at large. To improve performance of project it is important to study the delay factors which affect the success of project. The purpose of this study is to logically explore the delay factors of project and how these can be avoided or controlled. This research mainly focuses on identifying the delay factors in construction. From literature review the main delay factors of construction is identify. A questionnaire survey is to be carried out in various multistory building projects and rank them by Relative Importance Index. Using that data's the major delay factors have to be identified. Finally from the results suitable suggestions was given to the companies for reducing their delays.

Keywords—delay factors, Questionnaire survey, Relative important index, rank

I. INTRODUCTION

The construction industry is a key sector in the development and economic growth of most countries across the world. However, the industry faces a number of challenges, such as project delays. Projects or construction works that are not delivered on time to the client are referred to as delayed projects. The industry which is experiencing frequent and costly delays is the building and construction industry. However, according to recent survey, 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 project parties, resources availability, environment conditions and contractual relations. However it occurs in every construction project and the significant of these delays varies considerably from project to project. Therefore delay is an important problem in the construction industry. This study is to identify the factors contributing construction delay and their importance. This paper identifies the causes from the point of view of the main project professionals. The construction delay is a universal evident reality not only in India however all the countries faced this global fact. Construction delay can be defined as execute later than intended planned, or particular period, or letter than specific time that all the concerned parties agreed for construction project. Delay in project is counted as a common problem in construction projects.

The major factor of construction problems is project's delay. Delay problems occur frequently during project life-time which may lead to conflicts, contract termination, litigation etc...Hence it is important to study & analyze causes of construction delay, as the services provided by infrastructure projects serve input for other sectors and cost overrun in these project lead to an increase in capital output ratio for the entire economy. The basic aim of the research is to identify the major factors that affect the quality of the construction projects. The factors were identified based on relative important index method.

1.1 OBJECTIVES

The objectives of the present study are

To identify the uncertainty factors that influences the planning and causes delays in construction projects in Indian scenario.
To rank uncertainty factors that causes delays by RII (relative importance Index) method and to find out the root causes for these factors.

Categorize delay factors in construction project.

Quantify relative importance of delay factors and to demonstrate the ranking of factors and categories according to their importance level on delays;

1.2 IMPORTANCE OF THE STUDY

1. The construction industry is the tool through which a society achieves its goal of urban and rural development.
2. It is one of the sectors that provides important ingredient for the development of an economy.

3. Many construction projects have faced various problems due to the complexity of project, lack of management, improper planning & scheduling etc.
4. These all problems conclude with one of the major problem delay of time.
5. In simplest the importance is that, both for owner & contractor time is money and for this construction schedule should be checked, analyzed & corrective actions should be taken in a timely manner to prevent this problem.

II. LITERATURE REVIEW

S.M.Renuga and Balasubramanian Malathi (2013) they have identified the critical factors influencing delay and their impact on project completion. In this study they have concentrated in Resource (Manpower, Material and Equipment) related delay in construction projects. For this research, a questionnaire survey method was adopted to find the impact of critical factors that leads to resource related delays in construction projects. The survey results in this literature they have identified top ten critical factors using Relative Importance Index (RII) in each of the categories (Manpower, Material and Equipment) and provided some recommendations to reduce the impact of the resource related delays in construction projects.

Shebob.A, Dawood.N and Xu.Q (2011) made a Comparative study b/w Libya and UK construction project through questionnaire survey. The delay factors were ranked using the frequency of occurrence and severity scale. The survey result exposed that the construction projects in the developing countries suffers more delay than the developed countries due to lack of technology in the developing countries.

Ahsan and Gunawan (2010) made a separate study comparing the performance of international development projects in India, China, Bangladesh, and Thailand, in which they reported that construction projects in India showed the worst schedule performance. The study found that in India average schedule overrun is the highest (55% of actual schedule) compared to the other nations.

Majid (2006) stated that delays can be minimized when their causes are identified. Identification of the factors that contributed to the causes of delays has been studied by numerous researchers in several countries. Delay is a situation when the contractor, consultant, and client jointly or severally contributed to the non-completion of the project within the original or the stipulated or agreed contract period.

III. METHODOLOGY

Various literatures related to the projects are reviewed. Based on the review, the factors for delay of construction project are identified which helps to frame a questionnaire. Questionnaire survey is conducted among contractor, consultant and client of various multistory building project. These survey responses are analyzed using relative important index method. For the mean values, ranks are provided and this analysis gives the most significant delayfactors in construction.

3.1 ASSESSMENT METHOD

Five point scale

1 – strongly agree , 2 – Agree , 3 – moderate , 4 – disagree , 5 – strongly disagree.

3.2 ANALYTICAL TOOL

Relative important index

This method is used to find the contractor , owner and labor perceptions of the relative important of the identified quality factors.

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

Where,

RII - Relative Importance Index,

W - weighting given to each factor by the respondents
(ranging from 1 to 5)

A - highest weight (i.e. 5)

N - total number of respondents.

3.3 IDENTIFIED FACTORS

The identified factors from the literature review are

1. Client
2. Contractor
3. Consultant
4. Material
5. Labour
6. Equipment

7. Project related
8. Finance related
9. External related

IV. RESULT AND DISSCUSSION

4.1 AGGREMENT ANALYSIS

The degree of agreement reliable value done by using spearmans rank correlation method .which is commonly used to estimate agreement analysis.the spearmans rank correlation coefficient obtained for respondents.

Client and contractor	0.605
Client and consultant	0.551
Contractor and consultant	0.540

The value must be in the ranges of 0.3 to 1 if the data has to be reliable. Hence in this analysis the data values are reliable.

4.2 DATA ANALYSIS

A) Questionnaire survey is conducted through post and field survey. From this survey 55 responses were received. These data are analyzed using Relative Important Index method. Ranks are provided for the mean values analyzed using this method.

Table -1 gives the mean values and ranks provided for the analysis.
 1.Strongly disagree, 2.Disagree, 3.Moderate, 4.Agree, 5.Strongly agree.

MAJOR FACTOR	SUB FACTOR	CONTRACTOR			CONSULTANT			OWNER		
		RII	MEAN	RANK	RII	MEAN	RANK	RII	MEAN	RANK
Contractor	Frequent change of sub contractor	0.56	0.55	8	0.43	0.53	8	0.52	0.69	2
	Inadequate contractor experience	0.43			0.65			0.67		
	Ineffective project planning and scheduling	0.61			0.32			0.63		
	Compatibility of contractor with new software	0.48			0.71			0.76		
	Poor communication	0.70			0.52			0.42		
equipment	Inadequate modern equipment	0.72	0.74	1	0.65	0.78	1	0.59	0.65	3
	Equipment allocation	0.85			0.73			0.61		
	Frequent equipment breakdown	0.62			0.86			0.72		
	Lack of safety	0.93			0.71			0.80		

	Shortage of recent technology equipment	0.57			0.93			0.44		
Material	Late delivery of material	0.67	0.65	5	0.56	0.56	7	0.34	0.55	7
	Damage of sorted material	0.48			0.49			0.48		
	Escalation of material prices	0.52			0.73			0.60		
	Shortage of material	0.83			0.61			0.58		
	Poor material management	0.75			0.43			0.69		
labour	absenteeism	0.82	0.69	3	0.66	0.49	9	0.39	0.57	6
	Low motivation & morale of labour	0.59			0.49			0.62		
	Low productivity of labour	0.62			0.55			0.77		
	Shortage of labour	0.52			0.41			0.65		
	Labour strike due to revolutions	0.89			0.33			0.41		
Project related	Traffic control at site	0.40	0.47	9	0.69	0.76	2	0.53	0.52	8
	Changes in site condition	0.63			0.77			0.74		
	Unforeseen ground condition	0.44			0.80			0.62		
	Insufficient data collection & survey	0.56			0.73			0.46		
	Restricted access	0.33			0.79			0.52		
client	Change orders	0.86	0.70	2	0.44	0.58	6	0.38	0.60	5
	Conflicts between joint ownership	0.77			0.52			0.41		
	Delay in progress payment	0.65			0.68			0.65		
	Lack of owner experience in construction project	0.57			0.88			0.81		
	Delay in approving design documents	0.63			0.39			0.76		
Consultant	Slowness in approving drawing & material	0.51			0.42			0.29		

	samples by the consultant									
	Total quality management by consultant	0.63	0.66	4	0.59	0.60	5	0.55	0.46	9
	Mistakes in consultants drawing	0.79			0.67			0.49		
	Consultants less experience	0.81			0.70			0.35		
	Modification in contract	0.58			0.63			0.61		
Finance	Rapid changes in the national economy	0.72			0.74			0.83		
	Inadequate support from banking sector	0.85	0.59	7	0.48	0.69	3	0.75	0.76	1
	High inflation rate	0.62			0.59			0.69		
	High interest rate	0.93			0.86			0.93		
	Limited credited facilities	0.57			0.76			0.61		
External	Changes in government regulation and laws	0.65			0.66			0.53		
	Accident during construction	0.89			0.56			0.68		
	Delay in obtaining permit from municipality	0.72	0.63	6	0.81	0.67	4	0.73	0.62	4
	Unfavourable weather condition	0.46			0.72			0.85		
	Delay in providing service from utilities (water, electricity)	0.55			0.60			0.33		

Fig 1: MEAN RII OF CONTRACTOR

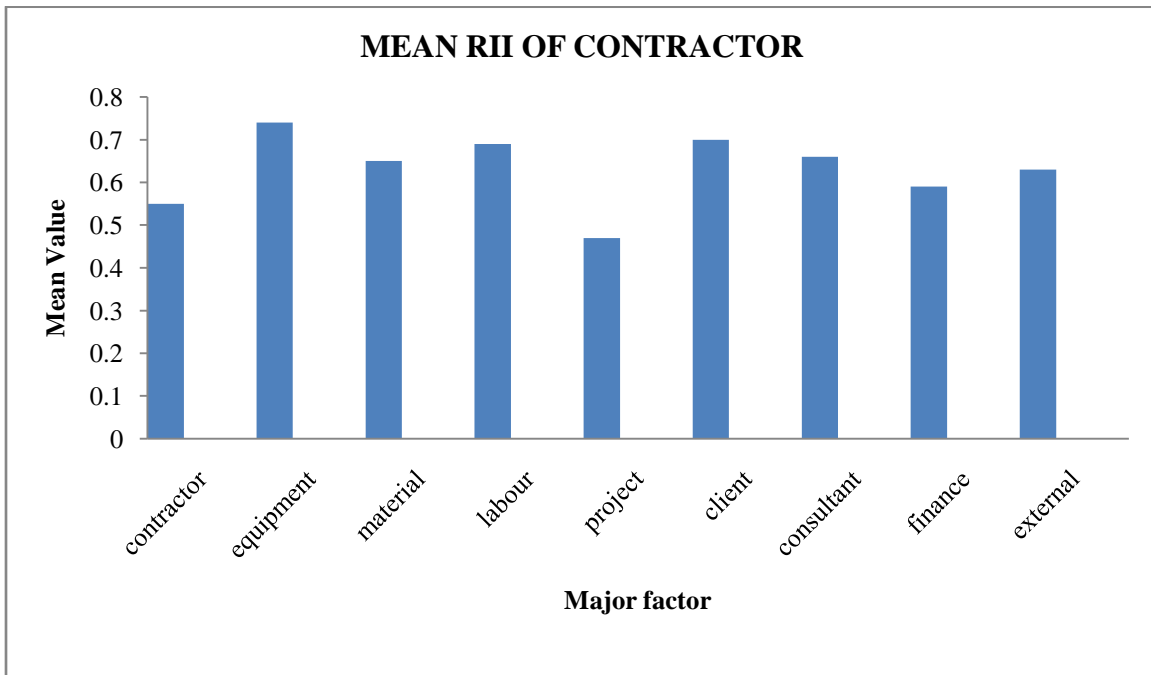


Fig 2: MEAN RII VALUE OF CONSULTANT

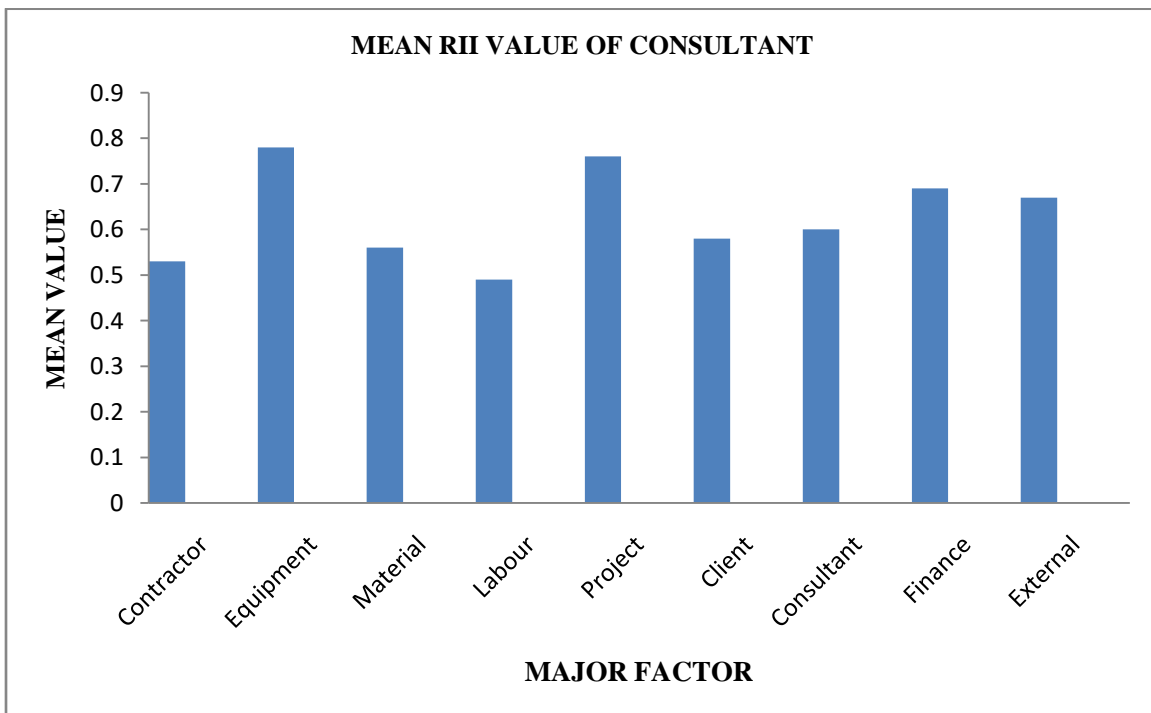
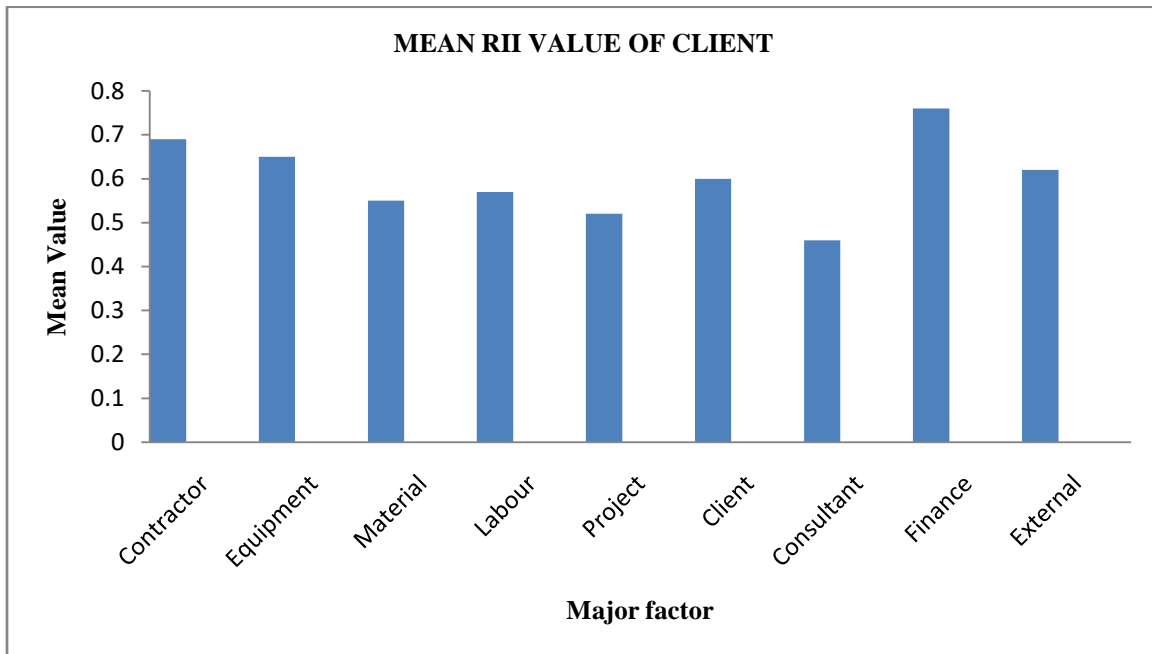


Fig 3: MEAN RII VALUE OF CLIENT



V.CONCLUSION

This report summarised the causes of delays in the construction industry and suggested some recommendations to mitigate the delays. It should be noted that the small sample size of 32 respondents to the questionnaire survey poses some limitations to the extent in which the results of the study could be generalised. Due to this limitation, the survey may not have identified all the possible factors that could cause construction delays. However, the study made a significant attempt at identifying the major causes of delay factors in the construction project based on the limited data.

Meanwhile, there are no specific procedures to overcome delays in the projects, but it depends mainly on the causes and appropriate actions taken. Based on the delay factors identified in this research, discussions and recommendations have been made to minimise their causes.

From the above list of most significant factors causing delay in the construction, many literatures are reviewed and the major delay factors of construction is identified. Based on that questionnaire are prepared and distributed to the 43 companies and 32 were successfully received. From that data by using relative important index method RII is identified and ranking were provided to the major factors.

From that result we conclude that the major top 5 factors of delay in construction, in the view of respondents like contractor, consultant and owner are equipment, Financial problems, slowness in taking decision of client/contractor, Problems in contractor side, and also labour side.

5.1 RECOMMENDATION

The following recommendations are made based on the results and discussions of the study. These recommendations are very helpful to improve to finish the project at correct time construction.

1. Proper communication and coordination system between owner and contractor should be developed. Payments should be done on time so that project performance will not get affected.
2. Communication as well as document system should be developed so that drawings and their mistakes (if any) can be corrected as soon as possible.
3. Implementation of practical knowledge also for junior consultant's proper training course should be developed. The role of this training programme should include leadership skill development, co-ordination system improvement.
4. Decision and steps taken during project life cycle should be beneficial for project performance. As the construction projects include huge number of participants, team approach should be developed. Contractor should employ different teams like, technical team; finance team; research team etc and each team will have their specific goal or purpose. Technical staff should be assigned to project according to their area of expertise or capability. This will be helpful to reduce the rework as well as overcome the problem of inadequate handling of project progress. Meeting between all teams should be arranged to build up effective management between project teams.

5. For the implementation of material management and quality assurance a dedicated team should be deployed. The role of this team should be material procurement, vendor selection, inspection. Thus it will be helpful in stores management as well as overcome the factor of untimely delivery. In project cost estimation this team will be helpful for alerting the factor of price escalation.
6. To improve labor productivity and skill, training programme should be developed and implemented. To avoid accidents on construction site, safety tools, safety training programme as well as safety plan should be prepared.
7. In order to generate safety awareness of different safety gadgets to workers and employees, Construction Company should plan for safety budget.
8. During selection of construction equipment by contractor due consideration should be given to its owning cost, its operating cost, operating fuel cost and maintenance cost. To assist equipment selection process optimization model, graphics model, artificial intelligence based model must be used depending upon project.
9. To avoid unavailability and shortage of construction equipment a proper equipment vendor database should be maintained by contractor.
10. Another critical factor is 'poor site management and supervision by contractor'. There is a need for contractor in improving abilities of managers, engineers which is a vast demand in successful completion of projects. Thus, the contractors have to adapt some essential innovative management techniques, including organizing and controlling, and team building and value engineering that may be more efficient and effective. Having applied these techniques, it would guarantee to reduce the risk of such critical factors.
11. Ineffective planning and scheduling has also a major impact on construction delays. Effective planning and programming of a project is a must to secure early completion of the project. The planning process should be developed from start of the project until completion of a project. The planning stages should be devised very carefully, starting from strategic, tactical and operational planning.
12. Delay in progress payment by client is a critical cause of delays, and as a result many projects are behind schedule. There is a serious need for the clients to devise an explicit mechanism to speed up the payment process. The qualified consultants and quantity surveyors, who are often responsible for issuing the calculating and payment certificates, should be employed to ease the process. On the other hand, Bureaucracy in government agencies also suspends the payment progress. Therefore, it is advised that the government should find a way how to narrow down the process.
13. Pay progress payment to the contractors on time as it weakens the contractors ability to finance the work
14. Minimize changes in order during construction so as to avoid delays
15. Speed up reviewing and approving of design documents
16. Improve the knowledge and skills of technical staff
17. Manage the financial resources and plan cash flow by utilizing progress payment
18. Avoid delays in reviewing and approving design documents
19. Build up the knowledge and skills of technical staff
20. Improve coordination between parties

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