Delay in bridge Construction and analysis by RII method

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Abstract - *The most common problems in the construction project is delays, it's very linked to each other. Delays of a construction project can be defined as the late completion of works as compared to the planned schedule or contract schedule. Projects can be delayed due to number of reasons that may be due to the client, the contractor, acts of God, or a third party. They may occur early or later in the project development, alone, or with other delays. Delays can be minimized only when their cause are identified. The objective of this study was to identify the major causes of construction delays and the effects of delays construction delays. This study was carried out based on literature review and a questionnaire survey.*

Key Words: RII, Delay,

1. INTRODUCTION

Delay in construction projects is considered to be one of the common problems in the construction industry. Delays have adverse effect on the project in terms of performance, time and cost. Thus, it is essential to identify the types of delays that usually occur in a project. Delays occur due to so many reasons can be compensated or not; and they may appear alongside or subsequently. Further, the influence caused on the project performance may be direct or indirect. Their presence leads to additional cost generation, conflicts among project participants and, in worst-case scenario, litigation where additional costs may be generated. When dealing with the delays, it is not only important to identify delays and quantify the delay effects on project performance but also to identify and quantify the impacts of delays already occurred upon additional project development. In order to regulate responsibility and allow to learning from these undesirable events, the primary causes and source of delays should be identified as well. The mitigation of construction delays can be achieved by adopting the process of knowledge management and project learning which gives perception into the various problems and their solutions. In fact the lessons learnt response from projects is a real eye opener and helpful for others to avoid similar issues.[6]

. **A.A. Aibinu et al.** which state that delay is a situation when the contractor and the project owner jointly or severally contribute to the noncompletion of the project within the agreed contract period. Normally, delays in construction projects are expensive since there are a lot of additional cost involve in a projects because of the project delay. And this cost will increasing if the project continuously delay by the time.

Odeh and Battaineh carried out a study to determine the most significant causes of construction delays with traditional type of contracts with regard to contractors and consultants. According to the results showed that, the top ten most significant causes of delays are owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors.

Alaghbari et. al. (2007) have the slightly different conclusion with regards to factors causing delays in another research specific to building construction projects in Malaysia. The analysis of the factors causing Construction delays were based on four main categories. The four main categories are Contractor, consultant, owner and external factors. The study found that the top two

- factors for each category are:

1. Contractor's factors - financial problems and shortage of materials on site
2. Owner's factors - financial problems and slowness in decision making
3. Consultant's factors - poor supervision and delays in issuing instructions

4. External factors - materials shortage and poor site condition

5. **Abd El-Razek et al. (2008)** studied delay in building construction project in Egypt, a total number of 32 delay causes were selected grouped according to responsibility (contractor, consultant, owner and common responsibility) and categorized under 9 groups namely (financing, manpower, Changes, Contractual relationships, Environment, Equipment, Rules and regulations, Materials, Scheduling and Control).Each delay cause was measured on a Likert scale using four options: very important; important; somewhat important; and not important. On the basis of survey and overall results, they concluded that the most important causes were: financing by contractor during construction; delays in contractor's payment by owner; design changes by owner or his agent during construction; partial payments during construction; and non-utilization of professional construction/contractual management

2. METHODOLOGY

1 Process of Methodology

The Quantitative questionnaires were used to provide a large number of responses from the construction sector. The distributed questionnaire was designed to identify the construction sectors current factors causing Project delay. The main aim was to provide a detailed assessment of experience and understanding of these factors.[9]

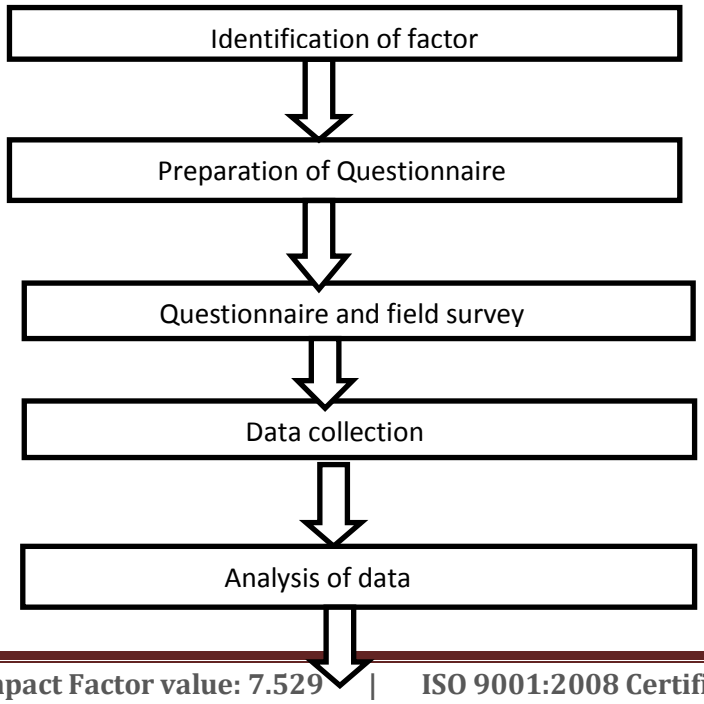
These are main three objectives fulfilled by quantitative study:

1. To identify knowledge and understanding of project completion in construction organisations.

2. To explore and identify delay factors in construction industry.

Field data was collected from project owners, contractors and engineers. Present research introduced identification of delay factors .and causes of delay were identified through literature review.

A questionnaire was developed to evaluate frequency of occurrence, severity and importance of identified delay causes. Each factor was given weight according to their significance, as marked by respondents.[10]



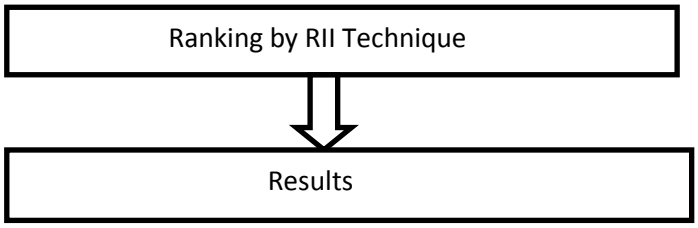


Fig. Methodology process

Based on the literature work, various factors has been identified which may delay the construction work. Among all those factors, 40 most commonly recurring factors an shown in table are identified to focus on, which generally influences performance of construction field. Some of those factors are related to equipment where as some relates to techniques and humans etc.

No	Causes of delay in bridge construction
1.	**Management Related Causes (MRC)**
	Poor project planning & scheduling
	Incompetence of key staff
	Poor decision making by management
	Poor coordination with sub contractors
	Disputes with other parties
2.	**Finance Related Causes (FRC)**
	Low profit margin
	Inadequate cash flow management
	Inefficiency in billing and collecting payments
	Poor cost controlling system
3.	**Construction Related Causes (CRC)**
	Handling of too many projects at a given time
	Faulty work
	Poor communication with other parties
	Insufficient quality control
4.	**Contractor**
	Ineffective planning and scheduling of project by contractor
	Delay in site mobilization
	Poor site management and supervision by contractor
	Disputes between labour in site
5.	**Labour**

	Personal conflicts among labours
	A labor strike
6.	**Material**
	Late procurement of materials
	Delay in material delivery
	Delay in manufacturing special building materials
	Damage of sorted material while they are needed urgently
	Late in selection of finishing materials due to availability of many types in Market
7.	**Equipment**
	Shortage of equipment
	Equipment breakdowns
	Low level of equipment-operator's skill
8.	**External**
	Changes in government regulations and laws
	Delay in obtaining permits from municipality
	Effect of social and cultural factors
	Unavailability of utilities in site (such as, water, electricity, telephone, etc.)
	Rain effect on construction activities
	Accident during construction

3. Research Methodology

The data collected to determine the most influential factors for delay of construction project was done through a survey by explorative questionnaire to the respondents involved in activities of construction firms in various sites. The questionnaire was designed so that respondents can give the rank to their answers based on their opinions. The analysis of these data was done by a method named relative importance index (RII) method.

4. Data Collection

The data was collected from civil engineers, contractors, owners, supervisors, and builder. We distributed over 50 questionnaires helped us to calculate the relative importance index and important index. We received responses from a pretty diverse group of professionals i.e. owners, contractors, site super visors, etc.

5. Relative Importance Index Technique

It is used determine the relative importance of the various causes and effects of delays. The same method is going to adopted in this study within various groups (i.e. contractors, project engineers, owner and site supervisor). The four-point scale ranged from 1 (Not Important) to 5 (Extremely Important) is adopted and transformed to relative importance indices (RII) for each factor as follows:

RII = ΣW / (A*N)

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight (i.e. 5 in this case), and N is the total number of respondents. Higher the value of RII, more important was the cause of delays. [10]

6. RESULT AND CONCLUSION

This chapter represents results of responses collected from various sites. The collected questionnaire data has been analysed and its results and conclusion have been discussed in this chapter.In this study, total surveys were carried out from various site. Various technology and equipment used for road construction is studied and factors delay for road construction is identified.

7. Results of Questionnaire Survey for RII

The data collected from questionnaire survey was analysed by using Relative Importance Index and Importance index technique. Different professionals have given their respective responses on the basis of their own experience and opinions. Annexure - II shows these responses given by the respondents.

Table 5.1 represents R.I.I. and Ranking given to those selected factors. A factor whose R.I.I. is maximum has been given first rank and thus ranking has been assigned with decreasing R.I.I. Fig 5.1 represents a column diagram showing R.I.I. value for each factor as per their factor number.

Table5.1: RII and Ranking of Identified causes of delay in bridge Construction.

Sr. No.	Factors	Weightage					Total (N)	∑W	R.I.I.	Rank
		1	2	3	4	5				
1	**Management Related Causes (MRC)**									
	Poor project planning & scheduling	7	10	15	31	6	70	226	0.645	9
	Incompetence of key staff	4	36	17	13	0	70	179	0.511	25
	Poor decision making by management	3	11	31	18	7	70	225	0.648	10
	Disputes with other parties	2	6	24	21	17	70	255	0.728	4
2	**Finance Related Causes**									
	Low profit margin	34	15	11	6	4	70	141	0.402	31
	Inadequate cash flow management	4	6	14	31	15	70	257	0.734	3
	Poor estimation practices	3	18	27	14	8	70	216	0.671	13
	Poor cost controlling system	7	21	24	12	6	70	199	0.568	16
3	**Construction Related Causes (CRC)**									
	Handling of too many projects at a given time	8	24	16	12	10	70	202	0.577	15

	Faulty work	8	15	22	18	7	70	211	0.602	14
	Poor communication with other parties	10	22	18	14	6	70	194	0.554	18
	Poor supervision of work	15	22	15	10	8	70	184	0.525	21
4	**Contractor**									
	Ineffective planning and scheduling of project by contractor	6	10	16	26	12	70	238	0.68	7
	Poor site management and supervision by contractor	26	28	6	7	3	70	143	0.408	30
	Difficulties in financing project by contractor	10	8	18	26	8	70	224	0.64	11
	Disputes between labour in site	18	32	12	8	0	70	150	0.428	29
5	**Labour**									
	Low productivity level of labours	10	14	32	14	0	70	190	0.542	20
	Personal conflicts among labours	32	26	8	4	0	70	124	0.354	32
	A labor strike	10	16	26	18	0	70	192	0.548	19
6	**Material**									
	Late procurement of materials	5	16	12	28	9	70	230	0.657	8
	Delay in material delivery	12	6	16	32	4	70	220	0628	12
	Damage of sorted material while they are needed urgently	12	32	14	7	5	70	171	0.488	26
	Changes in material types and specifications during construction	16	21	18	8	7	70	179	0.511	24
7	**Equipment**									
	Shortage of equipment	7	10	12	23	18	70	245	0.7	5
	Equipment breakdowns	12	23	26	5	4	70	181	0.517	23
	Low level of equipment-operator's skill	18	28	10	8	6	70	166	0.474	27

8	**External**									
	Changes in government regulations and laws	0	2	12	24	32	70	296	0.845	1
	Delay in obtaining permits from municipality	0	4	18	36	12	70	266	0.76	2
	Effect of social and cultural factors	18	22	24	6	0	70	158	0.451	28
	Unavailability of utilities in site (such as, water, electricity, telephone,etc)	6	24	22	12	6	70	198	0.565	17
	Rain effect on construction activities	12	28	13	10	7	70	182	0.52	22
	Accident during construction	6	9	18	24	13	70	239	0.682	6

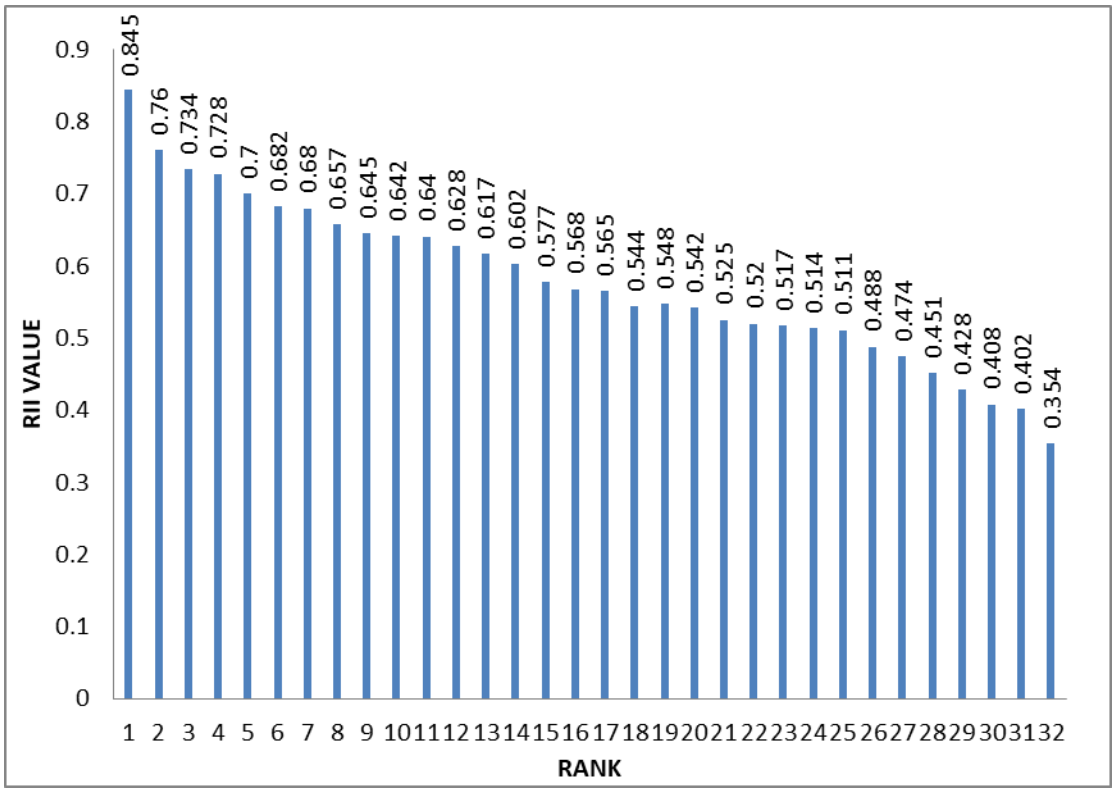


Fig. 5.1: R.I.I. against Factor Number

The factor change in government regulation and law has been ranked highest i.e. first with RII of 0.845.because of the change in rule and regulation time to time the construction project are adversely affected

Second rank is obtained delay in obtaining permits from municipality with RII of 0.76. Generally the delay in the sanctioning of the plan affect the work

Inadequate cash flow management has been ranked on third position with RII of 0.734 Sometimes the cash many not be available for long duration which may also the reason of delay. Dispute with parties has been ranked at

fourth position by respondents with RII equals to 0.728 there may be difference in opinion between parties .shortage of equipment has been ranked at position fifth with RII of 0.7 equipment are necessary for the construction which save time and if there shortage of equipment then it may cause delay . Thus, above have been found as top five factors that are responsible for delaying of construction work according to their importance.

Accident during construction has been ranked sixth with RII equals to 0.682 by the respondents. Major accident at the site may lead to cause may problem at site shortage of equipment has been ranked at seventh position with RII of 0.68 Sometimes due to shortage of equipment project also delay. If proper maintenance is not done it affects the output of equipment. Inefficiency in billing and collecting payment has been ranked at eighth position by respondents with RII of 0.671. poor planning and scheduling at ninth position with RII equals to 0.668 .this also one of the reason of delay. Late procurement of material has been ranked at position tenth with RII of 0.657. This are top ten reasons which cause delay in construction which is taken out form questioner survey.

8. CONCLUSIONS

From the above study and studying various literature we have recognize the certain delay factor from which we can conclude and they are as follows.

1) Field investigations are under way to investigate delays in bridge construction in India. According to the research, there are many factors that affect the completion time of the project, and its impact has a great impact on the projects that affect the project construction. These include payment of contractor delays, delays in information, poor project management, compensation issues, design changes, weather effects, labor strikes and more

2) The impact of these delays is cost overruns, overtime, disputes and negative social impacts. Hopefully the results of this article will help stakeholders address important causes and further reduce project delays.

3) In general, the number of time delays and cost increases with increases the total project cost.

4) Claims for losses and reimbursements due to delays and fluctuations in claims during the extension period have a significant impact on cost overruns.

5) We should work on faster commination between government and contractor there show be single window program which grant the permission in faster way.
6) The labour and the equipment should be maintain in stock to overcome the need whenever necessary which will reduce the delay in time.

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