

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 2, February 2018

A Qualitative Analysis on Scheduling Performance in Indian Construction Projects

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ABSTRACT: Delay in construction projects is one of the foremost concerns in the Indian construction industry. The delays to the projects are affecting the economies throughout the world. Delay to projects mean the slowdown of development in all other related fields. Over 40% of Indian construction projects are facing time overrun ranging from 1 to 252 months (Source: MOSPI) the reasons for which are being studied by researchers to suggest possible remedial measures. There is strong evidence of inconsistent performance of the Indian construction projects and the trend is growing rapidly, and projects are reportedly failing across all the key performance measures, including cost, time, and quality performances. This paper identifies 35 attributes responsible for impacting performance of the projects. These attributes were then presented to Indian construction professionals in the form of a questionnaire. This study aims to identify the factors affecting construction projects scheduling and incorporating the critical factors to improve the schedule performance.

KEYWORDS: India, construction industry, delays, scheduling, performance.

I. INTRODUCTION

The Indian construction industry forms an integral part of the economy and a conduit for a substantial part of its development investment, is poised for growth on account of industrialization, urbanization, economic development, and people rising expectations for improved quality of living. This study aims to identify the attributes that causes delay in construction projects which are responsible for schedule performance. Construction industry contributes towards 40% to 50% of India's capital expenditure on projects in various sectors such as highway, roads, railways, energy, airport etc., and is the second largest industry in India. The construction industry is a major contributor towards 8% of India's GDP, both directly and indirectly. Management is the science and art of planning, organizing, leading and controlling the work of organization members and of using all available organization resources to reach stated organizational goals. Construction management deals with economical consumption of the resources available in the least possible time for successful completion of construction project. Men, materials, machinery and money are termed as resources in construction Management.

Majority of infrastructure projects in India are affected by time overruns. These overruns vary from a few months to as high as five or more years, placing the project viability at risk. Survey respondents identified the bottlenecks which affect their projects and the challenges they face in conquering them. These bottlenecks, as enlisted below, are divided into two phases:

- I. Pre-execution phase.
- II. Execution and closing phase.

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II. LITERATURE REVIEW

Sadi A. Assaf *et al.* (1995) identifies the main causes of delay in large building projects in Saudi Arabia and their relative importance. A survey of a randomly selected sample of 24 contractors, 15 architectural engineering firms (A/E), and nine owners was undertaken. The survey included 56 causes of delay and the delay factors were grouped into nine major groups. It was also shown that contractors and A/Es substantially agree on the ranking of the groups of delay factors, whereas contractors and owners, and A/Es and owners do not agree. It was also shown that the financing group of delay factors was ranked the highest by all three parties and that environment was ranked the lowest.

Chua *et al.* (1999) seeks to distinguish the success factors according to the project objectives of budget, schedule, and quality. The analytic hierarchy process is adopted to determine the relative importance of success related factors. A questionnaire was developed to facilitate systematic data collection in this study. Critical success factors addressing budget performance, schedule performance, quality performance, and overall project success are identified. Comparisons with findings of previous studies using neural network approach are also presented.

Iyer and Jha (2006) studied the critical factors affecting scheduling performance, evidence from Indian construction projects. They identify 55 attributes responsible for impacting performance of the project. These attributes were then presented to the Indian construction professionals in a form of questionnaire. Statistical analysis of response of response on the attributes segregated them into distinct success and failure attributes. Factor analysis of sets of success attributes and failure attributes separately grouped into six critical success and failure attributes. In order to understand the extent of contribution these factors were have on the outcome of a construction projects, a second large questionnaire survey was undertaken. This leads to conclude with two success factor and one failure factor.

III. METHODOLOGY AND DEMOGRAPHIC DATA

The research methodology of this is to identify the schedule performance in construction projects. This study is done by extensive literature reviews and to ensure the accuracy of results a questionnaire is prepared for analysis. To evaluate the study the following sequential methodology is created.

1. Literature Review
2. Questionnaire preparation
3. Company Identification
4. Questionnaire Survey
5. Data Collection and Analysis
6. Suggestions and Conclusions

The Relative Important Index (RII) was used herein to determine the respondent's perceptions of the relative importance of the identified performance factors. The RII (venkatesh et al. 2012 and Enshassi et al. 2009) was computed as:

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

Where,

RII = Relative Important Index, W = weightage given to each factor by Respondents, A = the highest weight, N = the total number of Respondents.

Thus, the Relative Important Index (RII) for all the performance factors and groups was calculated using the above equation. The indexes were ranked for experiences below 4 years, 5-10 years, and 11-20 years and above 21 years. The group index is the average of overall relative importance index of the performance factors in each group.

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Based on the extensive literature reviews and experts' advice, a questionnaire is developed by holding 35 attributes related to schedule performance. Responses on the extent of effects of these attributes on schedule were sought on a five point ordinal scale. The extent of their contribution has, however, been observed to vary for a given level of project performance. The analyses results are expected to help project professionals to focus on a few factors and get the optimum results rather than giving attention to all the factors and not getting the proportionate results.

ITEM	Very Low	Low	Moderate	High	Very high
SCALE	1	2	3	4	5

Table 3.1 ordinal scale used for data measurements

Demography of Experience:

All the data were collected based on the demography of respondent's designations and experience. Data were collected based on extensive literature reviews, pilot studies and questionnaire preparation. Project participants who comes under experience such as below 4 years, between 5-10 years, between 11-20 years and above 21 years and organizations which includes owners, contractors and consultants and their corresponding agencies in which the respondents are involved in this survey.

On designation, 7% of the respondent's executive engineer, 23% is of assistant engineers, 70% is of site engineers.

Among the organisation of respondents 26% are owners, 67% of contractors and 7% are of consultants. Majority of the respondent's contractors.

Among the respondents 63% are less than 4 years, 20% of 5-10 years, 13% of 11-20years and 4% are above 21 years. Majority of the respondents are with the experience between less than 4 years.

IV.RESULTS AND DISCUSSIONS

The questionnaire comprised of totally 35 questions under 10 sub divisions such as support by project managers (10 factors), owner and top management support (2 factors), support on projects by monitoring(3 factors), feedback and coordination (3 factors), support by favourable working conditions (3 factors), owners competence (2 factors), conflicts among project participants (4 factors), project managers ignorance (3 factors), doubts of project participants (2 factors) and harsh climatic conditions at site (3 factors). They are given below:

Sl. No.	FACTORS	LABEL
	<i>A. Support by project manager</i>	
1	Coordinating ability and involvement with other contractors at site	A1
2	Leadership quality of PM	A2
3	Coordinating ability and involvement of PM with owner representatives	A3
4	Authority to take day to day decision by PM team at site	A4
5	Regular budget update	A5
6	Project manager's technical capability	A6
7	Project manager authority to take final decision, selecting key team members etc.,	A7

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8	Coordinating ability and involvement of PM with his team members and subcontractors	A8
9	Effective monitoring and feedback by PM	A9
10	Commitments of all parties to the project	A10
	<i>B. Owner and top management support</i>	
11	Top management plan and identifying critical activities	B11
12	Top management support to PM and project team at site	B12
	<i>C. Support on projects (monitoring , feedback and coordination)</i>	
13	Effective monitoring and feedback by project team members	C13
14	Positive attitude of PM and project participants	C14
15	Understanding of responsibilities by various project participants	C15
	<i>D. Support by favourable working condition</i>	
16	Scope and nature of work well defined in tender	D16
17	Favourable climatic conditions at site	D17
18	Monitoring and feedback by client	D18
	<i>E. Commitment of all project participants</i>	
19	Favourable political and economic environment	E19
20	Commitment of all parties to project	E20
2	<i>F. Owner's competence</i>	
21	Timely decision by the owner or his engineers	F21
22	Monitoring and feedback by client	F22
	<i>G. Conflicts among project participants</i>	
23	Tendency to pass on the blame to others	G23
24	Conflicts between PM and outside agency i.e., owner, subcontractor etc.,	G24
25	Conflicts between PM and top management	G25
26	Conflicts among team members	G26
	<i>H. Project manager's ignorance</i>	
27	Ignorance of appropriate planning tool and techniques by PM	H27
28	Unwillingness in timely decision by top management	H28
29	Lack of understanding of operating procedures by the PM	H29
	<i>I. Doubts of project participants</i>	
30	Negative attitude of PM and project participants	I30

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31	Size and value of project being large	I31
	<i>J.Harsh climatic conditions at site</i>	
32	Harsh climatic conditions at site	J32
33	Aggressive competition at tender stage	J33
34	Accidents at site	J34
35	Overall schedule performance rating	J35

Table 4.1 Performance Factors and Their Labels

Consolidation of Relative Importance Index between All Respondents with Experience:

This table provides an adequate information about the consolidation of relative importance index between all respondents with experience:

Sl.NO	BELOW 4 YEARS EXPERIENCE	BETWEEN 5-10 YEARS EXPERIENCE	BETWEEN 11-20 YEARS EXPERIENCE	ABOVE 21 YEARS EXPERIENCE
1	0.578	0.566	0.8	1
2	0.747	0.8	0.65	0.6
3	0.736	0.733	0.8	1
4	0.747	0.833	0.85	0.6
5	0.726	0.466	0.75	0.6
6	0.684	0.966	0.7	0.6
7	0.726	0.8	0.9	0.6
8	0.736	0.766	0.85	1
9	0.726	0.933	0.7	1
10	0.726	0.733	0.8	0.8
11	0.757	0.733	0.75	0.8
12	0.726	0.8	0.9	0.8
13	0.81	0.833	0.65	0.8
14	0.652	0.7	0.9	0.6
15	0.726	0.766	0.75	0.8
16	0.726	0.7	0.75	0.8
17	0.631	0.633	0.55	0.8
18	0.6	0.633	0.75	0.6
19	0.642	0.466	0.65	0.6
20	0.631	0.533	0.7	0.8

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21	0.705	0.866	0.85	0.8
22	0.694	0.8	0.75	0.6
23	0.621	0.6	0.65	0.8
24	0.631	0.7	0.6	0.6
25	0.642	0.666	0.55	0.6
26	0.663	0.633	0.65	0.8
27	0.578	0.7	0.55	0.8
28	0.663	0.633	0.6	0.6
29	0.642	0.733	0.55	0.8
30	0.557	0.6	0.6	0.6
31	0.621	0.6	0.5	0.6
32	0.631	0.433	0.5	0.6
33	0.631	0.566	0.55	0.8
34	0.442	0.333	0.3	0.4
35	0.747	0.666	0.75	0.4

Table 4.2 Consolidation of Relative Importance Index between All Respondents with Experience

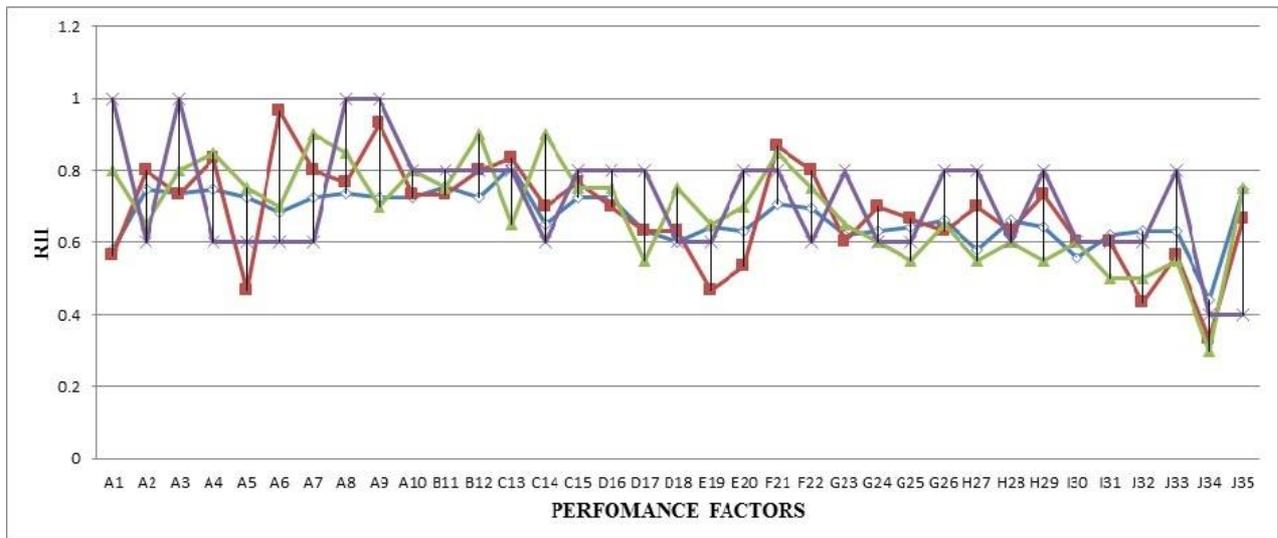


Fig 4.1 Variations on Relative Importance Index with Experience

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V. CONCLUSIONS

The Relative Important Index and Rank of top significant factors affecting the schedule performance by major group perspective.

Sl. No.	FACTORS	RII	RANK
1	Support on projects (Monitoring , feedback and coordination)	0.751	1
2	Support by project manager	0.748	2
3	Owner’s competence	0.739	3
4	Support by favourable working condition	0.734	4
5	owner and top management support	0.725	5
6	Commitment of all project participants	0.719	6
7	Harsh climatic conditions at site	0.698	7
8	Conflicts among project participants	0.659	8
9	Doubts of project participants	0.654	9
10	Project manager’s ignorance	0.652	10

Table 5.1 Rank Validation and Relative Importance Index (RII) on Major Groups

When considering the major groups of schedule performance, support on projects (monitoring, feedback and coordination) is ranked (RII= 0.751) to be in first position. Support by PM (RII= 0.748), Owners competence (RII= 0.739), followed by support by favourable working conditions (RII= 0.734), owner and top management support (RII= 0.725), commitment of all participants (RII= 0.719), harsh climatic conditions at site (RII= 0.698), conflicts among project participants (RII= 0.659), doubts of project participants (RII= 0.654), PM’s ignorance (RII= 0.652) respectively.

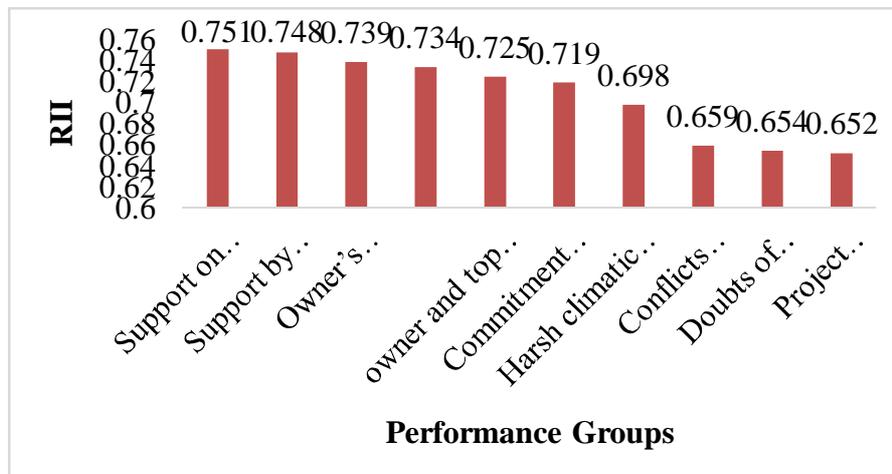


Fig 5.1 Performance Groups Vs. Relative Importance Index

The results can be implemented in any construction projects to minimize the construction delays that affect the schedule performance. This study provides a good guidance for managerial intervention and also some guidelines and

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actionable information that Project Managers and other top management officials can utilize to manage their projects for the improvisation of schedule performance.

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