



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: V Month of publication: May 2019

DOI: <https://doi.org/10.22214/ijraset.2019.5273>

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Assessment of Factors Responsible for Delay in Road Construction for Amravati City

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Abstract: Research presents the result of the questionnaires survey conducted to identify and evaluate the relative importance and Importance index of the significant factors contributing to delay in road construction project. Road construction projects are heavily affected by causes of delay, if anybody doesn't know the factors that causes delay then they cannot be succeeded. In this research the project team members i.e. owner, contractor, consultant, Engineers etc. are taken for questionnaire survey to obtain the delay factors and research to identify the main causes and effects of delay In road construction projects.

Keywords: Delay, Survey, Importance Index technique (IMPI), Relative Importance Index (RII)

I. INTRODUCTION

For the road construction projects have the attributes of construction equipment in addition to the common characteristics of general commodities, control of cost and management present complexity and different levels to project governors. The construction equipment's will act as backbone for huge construction projects. Proper use of appropriate equipment's will contribute economy, quality, safety, speed and timely completion of project. Equipment's used in road works are from small to heavy construction equipment's. Almost 15- 30% of total project cost has been accounted towards equipment and machinery. The use of equipment & methods has made possible changes in construction technology in recent decades.

Road construction projects are the yardstick to measure the development of country. Now the Road construction projects are changing their face. Proper planning, selection, procurement, installation, operation, maintenance and equipment replacement policy plays an important role in equipment management for successful completion of project. With the growing use of machinery it has become necessary for construction engineers to be thoroughly familiar with the construction application and upkeep of the wide range of modern equipment.

Before starting any project its planning is done with great care, as the efficiency of the whole project largely depends upon its planning. While planning each and every detail should be worked out in anticipation and should be considered carefully. Planning of a construction project involves deciding about the extent of mechanization, equipment planning, and execution planning etc. while planning a highway project equipment manager should be carefully decided the extent of mechanization so as to minimize the cost of project.

II. OBJECTIVES

- A. To identify the equipment used in road works.
- B. To study factor affecting delay of road construction work.
- C. To study the technologies used for road construction.
- D. To analyse the collected data.
- E. To summarise the result
- F. To identify preventive measures for obstacles and suggestion which affect productivity on construction site.

III. RESEARCH METHODOLOGY

The data collected to determine the most influential factors for delay of Road construction project was done through a survey by explorative questionnaire to the respondents involved in activities of construction firms in various sites in the Amravati region of Maharashtra of India.

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 as well as important index (IMPI).

IV. DATA COLLECTION

The target population included civil engineering and Road construction firms of Amravati of Maharashtra India. The site super visors, Contractors and etc. of various targeted for survey in Amravati. These details were considered as size of population to decide sample size of study.

We distributed over a 100 Questionnaires, out of which we received 50 questionnaires. The analysis of these questionnaires helped us 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.

A. Relative Importance Index Technique

It is used to determine the relative importance of the various causes and effects of delays. The same method is going to be 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:

$$RII = \frac{\sum W}{(A * N)}$$

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.

B. Importance Index Technique

In this technique, for each cause/factor two questions were asked: What is the frequency of occurrence for this cause? And what is the degree of severity of this cause on project delay? Both frequency of occurrence and severity were categorized on a four-point scale. Frequency of occurrence is categorized as follows: always, often, sometimes and rarely (on 4 to 1 point scale). Similarly, degree of severity was categorized as follows: extreme, great, moderate and little (on 4 to 1 point scale).

C. Frequency Index

A formula is used to rank causes of delay based on frequency of occurrence as identified by the participants.

$$\text{Frequency Index (F.I.) (\%)} = \frac{\sum a (n/N) * 100}{4}$$

Where, a is the constant expressing weighting given to each response (ranges From 1 for rarely up to 4 for always), n is the frequency of the responses, and N is total number of responses.

D. Severity Index

A formula is used to rank causes of delay based on severity as indicated by the participants.

$$\text{Severity Index (S.I.) (\%)} = \frac{\sum a (n/N) * 100}{4}$$

Where, a is the constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe), n is the frequency of the responses, and N is total number of responses.

E. Importance Index

The importance index of each cause is calculated as a function of both frequency and severity indices, as follows:

$$\text{Importance Index (IMPI) (\%)} = \frac{[F.I. * S.I.]}{100}$$

V. RESULTS

A. Part A: 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 Factors of delay for Road Construction.

Sr. No.	Factors	Weightage					Total (N)	ΣW	R.I.I.	Rank
		1	2	3	4	5				
1	Lack of equipment efficiency	8	15	14	11	2	50	67	0.268	15
2	Shortage of equipment	0	10	24	14	2	50	158	0.632	8
3	Improper maintenance of equipment	1	7	18	21	19	50	163	0.652	7
4	Due to heavy traffic on road	1	5	7	18	6	50	188	0.752	4
5	Low level of equipment operators skill	0	4	16	24	16	50	182	0.728	5
6	Limited construction area	12	2	8	22	6	50	198	0.792	2
7	Changes in material type and specification during construction	3	25	11	8	16	50	133	0.532	11
8	Low productivity of labors	1	7	16	20	3	50	173	0.692	6
9	Shortage in construction material	6	20	9	9	6	50	139	0.556	10
10	Personal conflicts between labor & management team	0	2	2	25	6	50	215	0.86	1
11	Personal conflicts between labors	0	8	8	19	21	50	191	0.764	3
12	Weather condition	2	19	16	10	15	50	143	0.572	9
13	Poor qualification of contractors technical staff	11	22	9	6	2	50	116	0.464	14
14	Ineffective scheduling of projects by contractor	11	19	8	8	4	50	125	0.5	12
15	Improper construction method	13	18	8	7	4	50	121	0.484	13

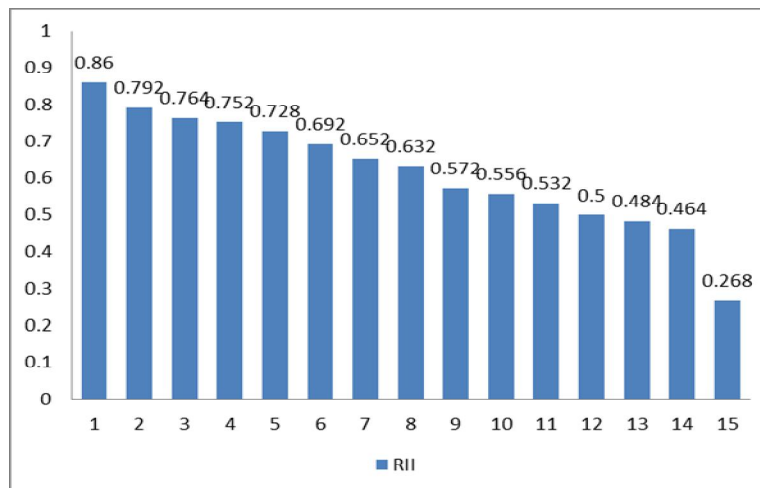


Fig. 5.1: R.I.I. against Factor Number

B. Part B: Results of Questionnaire Survey for IMPI

In importance index method also survey is carried out on severity and frequency occur and the IMPI is find out in form of percentage as shown in Table 5.2 and graph in fig 5.2

Table 5.2: IMPI of Identified Factors of delay for Road Construction.

Sr. No.	Factors	FI (%)	SI (%)	IMPI (%)
1	Lack of equipment efficiency	50.0	55.5	27.77
2	Shortage of equipment	58.5	66.5	38.9
3	Improper maintenance of equipment	66.5	68	45.22
4	Due to heavy traffic on road	77	78.5	60.44
5	Low level of equipment operators skill	65.5	72.5	47.48
6	Limited construction area	81.5	83	67.64
7	Changes in material type and specification during construction	45.5	52	23.66
8	Low productivity of labors	71	74	52.54
9	Shortage in construction material	55	61	33.55
10	Personal conflicts between labor & management team	81	84.5	68.44
11	Personal conflicts between labors	80	77.5	62
12	Weather condition	55.5	58	32.19
13	Poor qualification of contractors technical staff	41.5	50.5	20.97
14	Ineffective scheduling of projects by contractor	47	52	24.4
15	Improper construction method	50	48	24

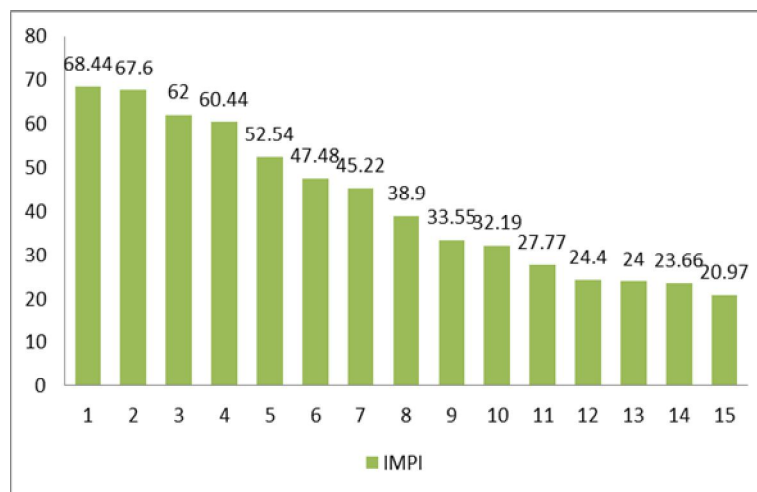


Fig. 5.2: IMPI against Factor Number



In this method questionnaire survey is carried out as per survey percentage is find out. The importance index technique is in percentages which are shown in graph in fig. 5.2 IMPI against factor number. The graph is plot such that highest percentage towards lowest percentage. Delay factor have highest percentage is most important than other factors. As per percentage awarded to the factor as per calculation they can arrange in descending order means highest percentage first and after date lowest percentage factor. This type Importance Index Technique is to be done.

VI. CONCLUSION

Delays can be avoided or minimized when their causes are clearly identified. The aim of this report was to identify the delay factors in Road construction projects, since delays are considered to be a serious problem in the construction industry. According to the findings above, following points can be recommended in order to minimize and control delays in road construction projects:

- A. During study it was found that Personal conflicts between labors and management team or among labors should be minimized by proper communication, facilities provided to labor should be improve and reason of conflicts should be minimized.
- B. Limited construction areas have rank second by RII method. Because in limited construction area fixed form paver is suitable than slip form paver.
- C. RII and IMPI technique give fourth rank to the factor, due to heavy traffic on road. Due to heavy traffic it is impossible for pavers and equipment to do work efficiently and properly.
- D. In study this factor have last rank by using RII method and IMPI technique but efficiency of equipment is depending upon maintenance of equipment, drivers skill, and site condition.
- E. Proper scheduling is required for any construction work, without scheduling work is not completed properly and productivity of labors also reduce.

VII. ACKNOWLEDGEMENT

The Authors thankfully acknowledge to Prof. Ram Meghe College Of engineering and Management, for their motivations and infrastructural support to carry out this research.

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