

# Questionnaire Survey: For Identifying Most Cost Influencing Parameter In Case Of Road Projects

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**Abstract-** Money is the prime importance in case of road projects as huge amount of funds (in trillions) is involved in such projects. The construction industry in India suffers from cost overruns. Various parameters affecting the road project cost. These parameters affect the cost in vast manner so they are responsible for deviation of cost of road projects. Regression analysis is simple technique for determining the influence of these factors on cost of road projects. Identifying and evaluating the factors that influence cost are critical issues faced by construction managers. It is therefore important that factors affecting cost of the road projects are well identified so that efforts can be made to improve the situation. So purpose of this work is, to study the parameters that affect the cost of the road project and to suggest regression analysis technique for evaluating these parameters from the point of view of judging their influence on cost.

**Index Terms-** Influencing factors, Questionnaire Survey, Questionnaire Survey and regression, Parameters.

## I. INTRODUCTION

India has a road network of over 4,236,000 kilometers (2,632,000 mi) in 2011, the third largest road network in the world. At 0.66 km of roads per square kilometer of land, the quantitative density of India's road network is similar to that of the United States (0.65) and far higher than that of China (0.16) or Brazil (0.20). However, qualitatively India's roads are a mix of modern highways and narrow, unpaved roads, and are undergoing drastic improvement. As of 2008, 49 percent – about 2.1 million kilometers – of Indian roads were paved. Adjusted for its large population, India has less than 4 kilometers of roads per 1000 people, including all its paved and unpaved roads. In terms of quality, all season, 4 or more lane highways, India has less than 0.07 kilometers of highways per 1000 people, as of 2010. These are some of the lowest road and highway densities in the world. For context, United States has 21 kilometers of roads per 1000 people, while France about 15 kilometers per 1000 people – predominantly paved and high quality in both cases. In terms of all season, 4 or more lane highways, developed countries such as United States and France have a highway density per 1000 people that is over 15 times as India.

India in its past did not allocate enough resources to build or maintain its road network. This has changed since 1995,

with major efforts currently underway to modernize the country's road infrastructure. India plans to spend approximately US\$70 Billion by 2013 to modernize its highway network. As of October 2013, India had completed and placed in use over 21,300 kilometers of recently built 4 or 6-lane highways connecting many of its major manufacturing centers, commercial and cultural centers. The rate of new highway construction across India has accelerated in recent years. As of October 2011, the country was adding 11 kilometers of new highways, on average, every day. The expected pace of project initiations and completion suggests that India would add about 600 kilometers of modern highway per month, on average, through 2014. Some of the major projects that are being implemented include the National Highways Development Project, Yamuna Expressway and the KMP Expressway. According to 2009 estimates by Goldman Sachs, India will need to invest US\$1.7 trillion on infrastructure projects before 2020 to meet its economic needs, a part of which would be in upgrading India's road network. The government of India is attempting to promote foreign investment in road projects by offering financial incentives. This has led the government to create ambitious targets of building an average of 20kms a day, which according to figures from the NHAI, only 12kms a day has been completed since April 2007. But meeting these targets is imperative in accompanying the growing pace of the country. So the Indian government has moved to financing projects through PPPs – as their overseeing of projects using the government budget was inadequate to assist the required growth. Poor cost performance of construction projects seems to be the norm rather than the exception particularly in most developing countries where the problem is more acute. Road construction is generally undertaken by private companies on B.O.T. basis. Cost estimation is necessary for application of tenders to get a project. Generally, the estimated cost of the project and the actual cost of the project vary to a large extent. This is because; road construction costs depend on a large number of parameters related to construction, climatic conditions, financial status and many other. Questionnaire survey analysis is simple technique for determining the influence of these factors on cost of road projects. As we know the most cost affecting parameter of road projects, we can make feasible improvement in road alignment, design features as well as in selection of site. As a result we can reduce the cost of road projects. In India cost of road and infrastructure projects is most overgrowing issue, due to our economic status as a developing country significant cost

overruns. Road construction is one of the major activities in the construction industry.

## II. LITERATURE REVIEW

The various papers that were referred for finding out the factors are as follows-

- 1) Abdullah Alhomidan (2013), had presented a paper on “Factors Affecting Cost Overrun in Road Construction Projects in Saudi Arabia” He took 41 factors causing cost overrun in road construction projects which were defined through a detailed literature review. These causes were classified into 6 groups according to the sources of delay: project, managerial, consultant, external, construction items, and financial. Frequency and severity of each factor is determined by the zone in which they fell i.e yellow, green, red. The survey indicated that the most severe factors affecting cost overrun in road construction projects are: internal administrative problems, payments delay, poor communication between construction parties, and delays in decision making. The results show that most of the critical factors are managerial factors that could be controlled and minimized by improving the managerial skills of the construction teams by conducting proper trainings and workshops
- 2) Bent Flyvbjerg, et all (2004)// they had presented a paper on “What Causes Cost Overrun in Transport Infrastructure Project “. The study is based on a sample of 258 rail, bridge, tunnel, and road project worth US\$90 billion. The focus is on the dependence of cost escalation on (1) length of project implementation phase, (2) size of project and (3) type of project ownership. First it is found with very high statistical significance that cost escalation is strongly dependant on length of implementation phase because they translate into risks of substantial cost escalation. Second, it is found that project have grown larger over time and that for bridges and tunnel larger project have larger percentage cost escalation . finally, by comparing cost escalation for three types of project ownership—private, state owned enterprises and other public ownership—it is shown that the often seen claim that public ownership is problematic and private ownership effective in curbing cost escalation is an oversimplification. Types of accountability appears to matter to the cost escalation than type of ownership.
- 3) Ibrahim Mahamid (2013), he had presented a paper “Common risks affecting time overrun in road construction projects in Palestine: Contractors’ perspective” . His study aims at identifying the common risks affecting time overrun in road construction projects in the West Bank in Palestine from contractors’ viewpoint. 45 factors that might cause delays of road construction projects were defined through a detailed

literature review. A questionnaire survey was performed to rank the considered factors in terms of severity and frequency. The analysis of the survey indicated that the top risks affecting time overrun in road construction projects in Palestine are: financial status of the contractors, payment delays by the owner, the political situation and segmentation of the West Bank, poor communication between construction parties, lack of equipment efficiency and high competition in bids.

- 4) Shri. B.S. Patil ,et all.(2011)// they had presented a paper in international journal as “Factors Affecting The Cost And Quality Of Construction” they highlighted some of the points which are very essential in reducing the cost and delay of project and also remedies. Main causes of time-delays in order are the number of change orders, financial constraints and owners lack of experience in construction. The three main causes of cost overruns on the other hand in order are contractor related problems, material-related problems and, again, owners financial constraints. to minimize, time-delays and cost-overruns and thereby ensuring quality? They should:: (a) ensure adequate and available source of finance; (b) perform a pre-construction planning of project tasks and resource needs; (c) allocate sufficient time and money on the design phase;(d) if cost-effective (depending on the size of the project), hire an independent supervising engineer to monitor the progress and quality of the work and ensure timely delivery of materials; and finally, the most important factor of all, (e) select a competent consultant and a reliable contractor to carry out the work.

## III. METHODOLOGY

In this research work Questionnaire survey is used as a tool to find out the various factors and most influencing parameter, also this survey hands a systematic approach and an easy format through which all the parameter are covered and can be easily assessed.

- A) The procedure followed is as follows
  1. As a first step, cost influencing parameters are well identified thorough literature review, data collected from various govt. authorities, contractors, site engineers, supervisors and labour supervisors
  2. A structured questionnaire was prepared considering all the above factors and they were arranged in a descending order according to their repetition by majority of people.
  3. Each factor was given a scale of 0 to 10, so that the person could express the severity of impact by an individual factor on cost i.e. 0 being the lowest and 10 being the highest.
  4. The whole scale was divided into two parts
    - 1) 0 to 4 - least influencing.

2) 5 to 10 – most influencing.

5. A total of 85 questionnaires were distributed and collected from various govt. authorities, contractors, site engineers, supervisors and labour supervisors.
6. The scale value obtained by the individual factors from 85 questionnaires was noted down in table I and II.
7. These values obtained from the questionnaires were analyzed on the basis of mean and coefficient of variance.

#### IV. FACTORS

The Factors were collected from literature review Apart from that, collected from various govt. Authorities like PWD, Zilla Parishad, PMGSY etc, local govt. and private contractor, site engineers, site supervisors etc. list of 29 factors that were included in the questionnaire is given below.

The 29 factors are as follows;-

- 1) Terrain Condition
- 2) Land Acquisition
- 3) Road Length
- 4) Soil & Rock Suitability / Drillability
- 5) Traffic Intensity
- 6) Material Related Problem (Transportation, Cost, Handling Etc.)
- 7) Project Size / Phases
- 8) Payment Related Problem From Owner Side
- 9) Poor Communication Between Construction Parties
- 10) Lack Of Equipment Efficiency (Efficiency Of Operator, Suitability Of Particular Equipment To Site Condition)
- 11) Climatic Condition
- 12) Drainage Problem
- 13) Road Width
- 14) Financial Status Of Contractor
- 15) Lack Of Experience & Knowledge Of Construction Parties
- 16) Local Issues
- 17) Labour Availability
- 18) Involvement Of More No. Of Parties ( Contractor) In Single Project
- 19) Lack Of Efficiency Of Contractor To Achieve Time Goal Of Project
- 20) Availability Of Modern Equipment & Methods
- 21) Alignment Of Road
- 22) Technicality Involved ( Method of Construction )
- 23) Time ( Delay In Project Completion Affect Overall Procurement Cost, Labour Cost, Equipment Cost Etc.)
- 24) Thickness Of Various Layers In Case Of Flexible Pavement ( WBM, BBM, BM)
- 25) No. Of Cross Drainage Works
- 26) Application Of Geotextile Membrane In Road Construction
- 27) Poor Site Management
- 28) Conflict Among Project Participants
- 29) Re Work Due To Poor Material Quality Used Before

#### IV. STRUCTURED QUESTIONNAIRE

The structured questionnaire was prepared by taking into consideration all the above 29 factors, along with few more blank points for any other factors which would be included by the technical persons. The questionnaire is prepared with each and every factors having a scale of 0 to 10 ( 0 meaning the lowest & 10 meaning the highest). The purpose of scaling the factor is to understand the intensity of impact that the factor would produce on the cost of the project according to the respective person. Below is the prepared structured questionnaire.

[ Q.S.:- ]

#### QUESTIONNAIRE SURVEY

PROJECT TITLE: Questionnaire Survey: For Identifying Most Cost Influencing Parameters in case of road Projects.

DATE : / / 2014

( To be filled by concerned Authority)

Following are the Cost influencing Factor in case of Road Projects. Give the Rating in between 0 to 10 as per your opinion.

##### 1. TERRAIN CONDITION

0 1 2 3 4 5 6 7 8 9 10

##### 2. LAND ACQUISITION

0 1 2 3 4 5 6 7 8 9 10

##### 3. ROAD LENGTH

0 1 2 3 4 5 6 7 8 9 10

##### 4. SOIL & ROCK SUITABILITY / DRILLABILITY

0 1 2 3 4 5 6 7 8 9 10

##### 5. TRAFFIC INTENSITY

0 1 2 3 4 5 6 7 8 9 10

##### 6. MATERIAL RELATED PROBLEM ( Transportation, Cost, Handling etc.)

0 1 2 3 4 5 6 7 8 9 10

##### 7. PROJECT SIZE / PHASES

0 1 2 3 4 5 6 7 8 9 10

##### 8. PAYMENT RELATED PROBLEM FROM OWNER SIDE

- 0 1 2 3 4 5 6 7 8 9 10
9. POOR COMMUNICATION BETWEEN CONSTRUCTION PARTIES.
- 0 1 2 3 4 5 6 7 8 9 10
10. LACK OF EQUIPMENT EFFICIENCY (Efficiency of Operator, suitability of particular equipment to site condition)
- 0 1 2 3 4 5 6 7 8 9 10
11. CLIMATIC CONDITION
- 0 1 2 3 4 5 6 7 8 9 10
12. DRAINAGE PROBLEM
- 0 1 2 3 4 5 6 7 8 9 10
13. ROAD WIDTH
- 0 1 2 3 4 5 6 7 8 9 10
14. FINANCIAL STATUS OF CONTRACTOR
- 0 1 2 3 4 5 6 7 8 9 10
15. LACK OF EXPERIENCE & KNOWLEDGE OF CONSTRUCTION PARTIES
- 0 1 2 3 4 5 6 7 8 9 10
16. LOCAL ISSUES
- 0 1 2 3 4 5 6 7 8 9 10
17. LABOUR AVAILABILITY
- 0 1 2 3 4 5 6 7 8 9 10
18. INVOLVEMENT OF MORE NO. OF PARTIES ( CONTRACTOR ) IN SINGLE PROJECT
- 0 1 2 3 4 5 6 7 8 9 10
19. LACK OF EFFICIENCY OF CONTRACTOR TO ACHIEVE TIME GOAL OF PROJECT
- 0 1 2 3 4 5 6 7 8 9 10
20. AVAILABILITY OF MODERN EQUIPMENT & METHODS
- 0 1 2 3 4 5 6 7 8 9 10

21. ALIGNMENT OF ROAD
- 0 1 2 3 4 5 6 7 8 9 10
22. TECHNICALITY INVOLVED ( Method of Construction )
- 0 1 2 3 4 5 6 7 8 9 10
23. TIME ( Delay in project Completion Affect Overall Procurement Cost, Labour Cost, Equipment cost etc.)
- 0 1 2 3 4 5 6 7 8 9 10
24. THICKNESS OF VARIOUS LAYERS IN CASE OF FLEXIBLE PAVEMENT ( WBM, BBM, BM)
- 0 1 2 3 4 5 6 7 8 9 10
25. NO. OF CROSS DRAINAGE WORKS
- 0 1 2 3 4 5 6 7 8 9 10
26. APPLICATION OF GEOTEXTILE MEMBRANE IN ROAD CONSTRUCTION
- 0 1 2 3 4 5 6 7 8 9 10
27. POOR SITE MANAGEMENT
- 0 1 2 3 4 5 6 7 8 9 10
28. CONFLICT AMONG PROJECT PARTICIPANTS
- 0 1 2 3 4 5 6 7 8 9 10
29. RE WORK DUE TO POOR MATERIAL QUALITY USED BEFORE
- 0 1 2 3 4 5 6 7 8 9 10
- 
- ANY OTHER.....
30. -----
- 0 1 2 3 4 5 6 7 8 9 10
31. -----
- 0 1 2 3 4 5 6 7 8 9 10
32. -----
- 0 1 2 3 4 5 6 7 8 9 10

NAME OF INDUSTRY / ORGANIZATION : -----

NAME OF SIGNATORY : -----

DESIGNATION : -----

DATE :

PLACE :

SEAL :

**SIGNATURE :**

$$\sigma = \sqrt{\left(\frac{X^2}{N} - \left(\frac{X}{N}\right)^2\right)}$$

- 4) At last the coefficient of variance (C.V.) of individual factors was calculated by following formula.

$$C.V = \frac{\sigma}{X}$$

- 5) The C.V. for a single variable aims to describe the dispersion of the variable in a way that does not depend on the variable's measurement unit. The higher the CV, the greater the dispersion in the variable. The CV for a model aims to describe the model fit in terms of the relative sizes of the squared residuals and outcome values. The lower the C.V., the smaller the residuals relative to the predicted value. This is suggestive of a good model fit.

Based on the mean value obtained by the individual factors the factor getting the higher value was selected as the most cost influencing factor and these factors were arranged in ascending order.

**V. ANALYSIS**

The Analysis was carried out in two stages i.e.

- 1) Lower scale analysis
- 2) Higher scale analysis

The procedure for the analysis is as follows-

- 1) The total sum of the individual factor was calculated by multiplying the scale value to the no. of times the factor got the same scale value in 85 questionnaires.
- 2) This total was then divided with number of questionnaire and the mean (X) was obtained

$$X = \frac{TOTAL}{N}$$

- 3) After mean, standard deviation ( $\sigma$ ) was calculated from the following formula given below

Table I: lower scale analysis

FACTORS	Scaling coefficient					TOTAL	MEAN X	S.D $\sigma$	C.V
	0	1	2	3	4				
Terrain Condition	0	3	8	7	11	84	0.99	0.11	10.78
Land Acquisition	0	4	6	7	4	53	0.62	0.07	10.78
Road Length	4	5	8	12	5	77	0.91	0.10	10.78
Soil & Rock Suitability / Drillability	0	3	4	9	11	82	0.96	0.10	10.78
Traffic Intensity	1	3	2	7	4	44	0.52	0.06	10.78
Material Related Problem (Transportation, Cost, Handling Etc.)	0	3	3	7	9	66	0.78	0.08	10.78
Project Size / Phases	1	3	1	16	15	113	1.33	0.14	10.78
Payment Related Problems From Owner Side	0	1	12	13	8	96	1.13	0.12	10.78
Poor Communication Between Construction Parties	5	6	9	13	13	115	1.35	0.15	10.78
Lack Of Equipment Efficiency(Efficiency Of Operator, Suitability Of Particular Equipment To Site Condition)	0	1	7	11	5	68	0.80	0.09	10.78
Climatic Condition	1	1	5	10	11	85	1.00	0.11	10.78

Drainage Problems	1	7	6	8	13	95	1.12	0.12	10.78
Road Width	4	6	8	17	5	93	1.09	0.12	10.78
Financial Status Of Contractor	4	5	7	9	11	90	1.06	0.11	10.78
Lack Of Experience & Knowledge Of Construction Parties	1	3	5	7	15	94	1.11	0.12	10.78
Local Issues	1	3	7	13	7	84	0.99	0.11	10.78
Labour Availability	2	3	6	3	7	52	0.61	0.07	10.78
Involvement Of More No. Of Parties (Contractor) In Single Project	1	8	8	12	11	104	1.22	0.13	10.78
Lack Of Efficiency Of Contractor To Achieve Time Goal Of Project	0	3	5	12	10	89	1.05	0.11	10.78
Availability Of Modern Equipment & Methods	0	2	5	9	7	67	0.79	0.08	10.78
Alignment Of Road	1	4	1	4	11	62	0.73	0.08	10.78
Technicality Involved( Method Of Construction)	0	2	10	3	12	79	0.93	0.10	10.78
Time (Delay In Project Completion Affect Overall Procurement Cost Labour Cost, Equipment Cost Etc.)	0	2	0	2	16	72	0.85	0.09	10.78
Thickness Of Various Layers In Case Of Flexible Pavement(Wbm,Bbm,Bm)	2	5	0	9	8	64	0.75	0.08	10.78
No. Of Cross Drainage Work	3	1	7	4	9	63	0.74	0.08	10.78
Application Of Geotxtile Membrane In Road Construction	4	4	6	5	6	55	0.65	0.07	10.78
Poor Site Management	0	2	6	3	11	67	0.79	0.08	10.78
Conflict Among Project Participants	2	3	2	20	13	119	1.40	0.15	10.78
Re Work Due To Poor Material Quality Used Before	4	1	6	9	13	92	1.08	0.12	10.78

Table II: Higher Scale Analysis

Factors	Scaling Coefficient						Total	Mean X	S.D $\sigma$	C.V
	5	6	7	8	9	10				
Terrrain Condition	11	7	9	10	8	7	382	4.49	0.48	10.8
Land Acquisition	15	11	8	7	11	7	422	4.96	0.54	10.8
Road Length	11	5	5	10	7	6	323	3.8	0.41	10.8
Soil & Rock Suitability / Drillability	13	6	9	8	11	5	377	4.44	0.48	10.8
Traffic Intensity	14	10	11	9	10	13	499	5.87	0.63	10.8
Material Related Problem (Transportation, Cost, Handling Etc.)	12	18	6	12	4	5	392	4.61	0.5	10.8
Project Size / Phases	11	14	8	7	3	2	298	3.51	0.38	10.8
Payment Related Problems From Owner Side	11	9	8	11	4	4	329	3.87	0.42	10.8
Poor Communication Between Construction Parties	7	6	8	4	3	5	236	2.78	0.3	10.8

Lack Of Equipment Efficiency(Efficiency Of Operator, Suitability Of Particular Equipment To Site Condition)	10	17	8	13	2	5	380	4.47	0.48	10.8
Climatic Condition	6	11	10	10	4	11	392	4.61	0.5	10.8
Drainage Problems	9	9	11	8	0	10	340	4	0.43	10.8
Road Width	8	8	8	12	3	3	297	3.49	0.38	10.8
Financial Status Of Contractor	9	7	14	7	3	3	298	3.51	0.38	10.8
Lack Of Experience & Knowledge Of Construction Parties	9	8	8	16	3	3	334	3.93	0.42	10.8
Local Issues	11	13	11	6	3	5	335	3.94	0.42	10.8
Labour Availability	13	14	7	11	8	7	428	5.04	0.54	10.8
Involvement Of More No. Of Parties (Contractor) In Single Project	7	9	16	5	1	1	260	3.06	0.33	10.8
Lack Of Efficiency Of Contractor To Achieve Time Goal Of Project	16	9	7	9	3	6	342	4.02	0.43	10.8
Availability Of Modern Equipment & Methods	4	17	13	17	5	5	444	5.22	0.56	10.8
Alignment Of Road	11	11	11	13	5	10	447	5.26	0.57	10.8
Technicality Involved( Method Of Construction)	11	12	6	13	10	4	403	4.74	0.51	10.8
Time (Delay In Project Completion Affect Overall Procurement Cost Labour Cost, Equipment Cost Etc.)	10	12	10	7	12	9	446	5.25	0.57	10.8
Thickness Of Various Layers In Case Of Flexible Pavement(Wbm,Bbm,Bm)	5	6	19	9	12	7	444	5.22	0.56	10.8
No. Of Cross Drainage Work	8	13	8	15	4	6	390	4.59	0.49	10.8
Application Of Geotxtile Membrane In Road Construction	10	12	16	6	4	6	378	4.45	0.48	10.8
Poor Site Management	19	8	13	5	8	6	406	4.78	0.52	10.8
Conflict Among Project Participants	8	14	7	2	1	4	238	2.8	0.3	10.8
Re Work Due To Poor Material Quality Used Before	8	10	7	9	7	7	354	4.16	0.45	10.8

VI. RESULT

Table III: lower scale analysis

FACTORS	Scaling coefficient					TOTAL	MEAN X	S.D σ	C.V
	0	1	2	3	4				
Conflict Among Project Participants	2	3	2	20	13	119	1.40	0.15	10.78
Poor Communication Between Construction Parties	5	6	9	13	13	115	1.35	0.15	10.78
Project Size / Phases	1	3	1	16	15	113	1.33	0.14	10.78
Involvement Of More No. Of Parties (Contractor) In Single Project	1	8	8	12	11	104	1.22	0.13	10.78
Payment Related Problems From Owner Side	0	1	12	13	8	96	1.13	0.12	10.78
Drainage Problems	1	7	6	8	13	95	1.12	0.12	10.78

Lack Of Experience & Knowledge Of Construction Parties	1	3	5	7	15	94	1.11	0.12	10.78
Road Width	4	6	8	17	5	93	1.09	0.12	10.78
Re Work Due To Poor Material Quality Used Before	4	1	6	9	13	92	1.08	0.12	10.78
Financial Status Of Contractor	4	5	7	9	11	90	1.06	0.11	10.78
Lack Of Efficiency Of Contractor To Achieve Time Goal Of Project	0	3	5	12	10	89	1.05	0.11	10.78
Climatic Condition	1	1	5	10	11	85	1.00	0.11	10.78
Terrrain Condition	0	3	8	7	11	84	0.99	0.11	10.78
Local Issues	1	3	7	13	7	84	0.99	0.11	10.78
Soil & Rock Suitability / Drillability	0	3	4	9	11	82	0.96	0.10	10.78
Technicality Involved ( Method Of Construction)	0	2	10	3	12	79	0.93	0.10	10.78
Road Length	4	5	8	12	5	77	0.91	0.10	10.78
TIME (Delay In Project Completion Affect Overall Procurement Cost Labour Cost, Equipment Cost Etc.)	0	2	0	2	16	72	0.85	0.09	10.78
Lack of equipment efficiency (Efficiency Of Operator, Suitability Of Particular Equipment To Site Condition)	0	1	7	11	5	68	0.80	0.09	10.78
Availability Of Modern Equipment & Methods	0	2	5	9	7	67	0.79	0.08	10.78
Poor Site Management	0	2	6	3	11	67	0.79	0.08	10.78
Material related problem (Transportation, Cost, Handling Etc.)	0	3	3	7	9	66	0.78	0.08	10.78
Thickness Of Various Layers In Case Of Flexible Pavement (WBM,BBM,BM)	2	5	0	9	8	64	0.75	0.08	10.78
No. Of Cross Drainage Work	3	1	7	4	9	63	0.74	0.08	10.78
Alignment Of Road	1	4	1	4	11	62	0.73	0.08	10.78
Application Of Geotxtile Membrane In Road Construction	4	4	6	5	6	55	0.65	0.07	10.78
Land Acquisition	0	4	6	7	4	53	0.62	0.07	10.78
Labour Availability	2	3	6	3	7	52	0.61	0.07	10.78
Traffic Intensity	1	3	2	7	4	44	0.52	0.06	10.78

Table IV: higher scale analysis

Factors	Scaling Coefficient						Total	Mean X	S.D σ	C.V
	5	6	7	8	9	10				
Traffic Intensity	14	10	11	9	10	13	499	5.87	0.63	10.8
Alignment Of Road	11	11	11	13	5	10	447	5.26	0.57	10.8
TIME(Delay In Project Completion Affect Overall Procurement Cost Labour Cost, Equipment Cost Etc.)	10	12	10	7	12	9	446	5.25	0.57	10.8
Availability Of Modern Equipment & Methods	4	17	13	17	5	5	444	5.22	0.56	10.8
Thickness Of Various Layers In Case Of Flexible Pavement (WBM,BBM,BM)	5	6	19	9	12	7	444	5.22	0.56	10.8
Labour Availability	13	14	7	11	8	7	428	5.04	0.54	10.8
Land Acquisition	15	11	8	7	11	7	422	4.96	0.54	10.8
Poor Site Management	19	8	13	5	8	6	406	4.78	0.52	10.8
Technicality Involved ( Method Of Construction)	11	12	6	13	10	4	403	4.74	0.51	10.8



Material Related Problem (Transportation, Cost, Handling Etc.)	12	18	6	12	4	5	392	4.61	0.5	10.8
Climatic Condition	6	11	10	10	4	11	392	4.61	0.5	10.8
No. Of Cross Drainage Work	8	13	8	15	4	6	390	4.59	0.49	10.8
Terrrain Condition	11	7	9	10	8	7	382	4.49	0.48	10.8
Lack Of Equipment Efficiency(Efficiency Of Operator, Suitability Of Particular Equipment To Site Condition)	10	17	8	13	2	5	380	4.47	0.48	10.8
Application Of Geotxtile Membrane In Road Construction	10	12	16	6	4	6	378	4.45	0.48	10.8
Soil & Rock Suitability / Drillability	13	6	9	8	11	5	377	4.44	0.48	10.8
Re Work Due To Poor Material Quality Used Before	8	10	7	9	7	7	354	4.16	0.45	10.8
Lack Of Efficiency Of Contractor To Achieve Time Goal Of Project	16	9	7	9	3	6	342	4.02	0.43	10.8
Drainage Problems	9	9	11	8	0	10	340	4	0.43	10.8
Local Issues	11	13	11	6	3	5	335	3.94	0.42	10.8
Lack Of Experience & Knowledge Of Construction Parties	9	8	8	16	3	3	334	3.93	0.42	10.8
Payment Related Problems From Owner Side	11	9	8	11	4	4	329	3.87	0.42	10.8
Road Length	11	5	5	10	7	6	323	3.8	0.41	10.8
Project Size / Phases	11	14	8	7	3	2	298	3.51	0.38	10.8
Financial Status Of Contractor	9	7	14	7	3	3	298	3.51	0.38	10.8
Road Width	8	8	8	12	3	3	297	3.49	0.38	10.8
Involvement Of More No. Of Parties (Contractor) In Single Project	7	9	16	5	1	1	260	3.06	0.33	10.8
Conflict Among Project Participants	8	14	7	2	1	4	238	2.8	0.3	10.8
Poor Communication Between Construction Parties	7	6	8	4	3	5	236	2.78	0.3	10.8

## VII. CONCLUSION

As per the lower scale analysis in table no. III “conflict among project participants” has highest mean of 1.4. So this is the most cost influencing parameter as per lower scale analysis. But lower scale analysis represents the factors which has least influence on cost.

As per the higher scale analysis table no. IV “Traffic Intensity”, “Alignment Of Road”, “Time” have the highest mean of 5.87, 5.26, 5.25. So these are the most cost influencing parameters as per higher scale analysis. Also these factors have a greater influence on cost.

As values of C.V. and S.D. obtained in both the analysis are nearly equal hence above results are based on the mean of data calculated in the table I and II.

Also the accuracy of the questionnaire survey depends on the number of questionnaire i.e. more the number of questionnaires more is the accuracy of the results.

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