iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VII **Month of publication:** July 2022

DOI: https://doi.org/10.22214/ijraset.2022.45477

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Indexing of Factors Affecting Time and Cost Overrun in Construction Projects

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Abstract: ***In a construction project, time overrun occurs when the work specified in the contract is not executed within the specified time frame and when the entire project cost exceeds for whatever causes, this is referred to as cost overrun. This study aim to analyze these factors that cause above delays in construction projects. A total 47 such factors were identified and classified into 8 segments, which are then indexing by using the method Relative Importance Index (RII).***
Keywords: Construction industries, Causes of overrun, Questionnaire, Relative Importance Index (RII), Indexing

I. INTRODUCTION

The construction industry is a veritable importance part of the moderation development for any developing country. In India, the construction industry plays a veritably important part for the moderation. It provide the physical structure, which is primary for the country's development. The time required to finish construction for both public and private projects is typically longer that the time stipulated in the contracts [1]. If the project costs and schedules exceed their planned targets, client satisfaction would be compromised [2]. This study makes an attempt to find the critical factors impacting resource-related detention in construction systems.

A. Cause Of Cost Overruns

Cost overrun may be a quite common development and the majority of comes in industry face this drawback. Cost happens once the last word price or expenditure of the projects exceeds the initial estimation price [3]. Author in [4] discovered that cost is one in all the most issue in industry. The matter is also found in each developing and developed countries. This drawback is kind of serious and additional study in this issue is required to cut back the issue. There square measure some factors that contributes to cost in industry that square measure found from the research study.

B. Factors Affecting Cost And Time Overrun

There are total 47 such factors were identified and classified into 8 segments as shown in table no. 1

TABLE-1
DELAYS CAUSING FACTORS.

Sl.no	Category	Factors
1.	Cost Factors	• Market share of organization • Liquidity of organization • Cash flow of project • Project design cost • Material and equipment cost • Project labor cost • Project overtime cost • Cost of rework • Cost of variation orders • Regular project budget update • Cost control

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2.	Time Factors	• site preparation time • Planned time for project construction • Time needed to implement variation orders • Time needed to rectify defects • Average delay in claim approval • Average delay in payment from owner to contractor • Availability of resource as planned through project duration • Average delay because of closures and materials shortage
3.	Quality factors	• Conformance to specification • Availability of personals with high experience and qualification • Quality of equipment's and raw materials in project • Participation of managerial levels with decision making • Quality assessment system in organization • Quality training/meeting
4.	Productivity factors	• Project complexity • Number of new projects / year • Management-labor relationship • Absenteeism rate through project • Sequencing of work according to schedule
5.	Client Satisfaction Factors	• Information coordination between owner and project parties • Leadership skills for project manager • Speed and reliability of service to owner • Number of disputes between owner and project parties • Number of reworks
6.	Regulatory and Community Satisfaction Factors	• Cost of compliance to regulators requirements • Number of non-compliance to regulation • Quality and availability of regulator documentation • Neighbours and site conditions problems
7.	Health and Safety Factors	• Application of Health and safety factors in organization • Easiness to reach to the site (location of project) • Reportable accidents rate in project • Assurance rate of project • Learning from own experience and past history
8.	Environment factors	• Air quality • Noise level • Waste around the site

II. OBJECTIVE

To evaluate the time delay and cost increase in the construction projects.

III. LITERATURE REVIEW

Raut S. P.1 , Gohatre V. S. 2 , Nistane H.P (2014) -. This study focus on the delay may be defined as exceeding the completion date specified in the contract or exceeding the date on which the parties agreed to the delivery of the project. The purpose of this paper is to examine ways to minimize the cause of build delays. Project delays include several factors such as missing funds, changes in the drawings, lack of effective communication and inadequate project management.

Madan Kumar Sha, et.al (2015)- The study of objective of the this research paper is 'To explore all the important factors contributing the cost overrun and identifying the critical factors of cause and effect of delay in construction project. Consultants and Contractors have been interviewed personally to get the practical problems through a survey questionnaire. The answers have been grouped and suitable methodologies for solving the problems have been formulated which are suitable for our Nepali Scenario.

Shabbab Al Hammadi1, M. Sadique Nawab (2016) –This study focus on unexpected problems encountered during Conception, designing & construction phase often led to unwanted delay in project completion. A survey was conducted in Saudi Arabia to determine exact factors responsible for project delay. This was achieved by carrying a critical analysis of the literature and carrying out a questionnaires survey among consultants, project managers and engineers involved in construction projects and collecting their responses. The importance of Project owner's role, contractor related, Financing related, Materials related, Design documents have been cited as main delay factors.

Shruthi Sivaprakasam, S.Dinesh, J. Jayashree (2017) - Construction Delays are the time

Over run either beyond date specified in a contract. Delays exceed initial time and cost estimates. Delays can be minimized only when their causes are identified and analyzed. The causes of delay in construction projects are taken from the past literature review. The literature reviews are summarized and various causes related to the delays based on literature review summary.

Mohammad Al-Mohammad, Omar Bin Jamaludin (2018)- This study review also discussed the groups causing delay based on the source of delay. The top five delay factors related to contractor, owner and consultant have been discussed within each category. This paper revealed that previous researches are regarded as the main source for causes of delay identification. Moreover, questionnaire and the relative importance index are the most frequent methods for collecting data and ranking delay factors, respectively.

Mohd Danish, Dr. Syed Khursheed Ahmad (2019) - This paper study has carried out based on literature review and a questionnaire survey. The eighty-three questionnaire has been made on the basis of pilot study, which has been distributed on various construction sites. Interview has been taken on each construction sites, also take photos of any ongoing activity on that site. Then ranked on their importance index by the data collection in India.

Ludwig Rivera , Hilario Baguec, Jr. and Chunho Yeom(2020)- This study aims to determine the ten principal causes of delay in road construction projects in twenty five developing countries across the globe. The study involves two steps. First, the authors compiled information regarding the most frequent delays in a road construction project. Second, they analyzed the intensity of each cause of delay in these projects. Being more accurate in the methodology, given the nature of the information, the researchers used a quasi-meta-analysis for processing the data. Half (50%) of the countries have similar causes of delay, and likewise, 50% of the countries identified the top ten primary causes of delay in road construction projects based on the intensity results.

Mr. Aishwarya Avinashe.1, Prof. S.Sabihuddin (2021) - This study focus is to fill in a critical information gap. By identifying various factors that cause construction problems and using them as a starting point, we consider the construction of objects, housing construction. Provided are the results of a survey that was conducted on the relative importance of entrepreneurs and consultants that were determined using the Relative Importance Index. (RII)

IV. METHODOLOGY

A questionnaire survey was conducted by construction professionals representing various stakeholders involved in construction projects in India. Data collection is the most critical part since the accuracy of the data obtained will determine the success or failure of this research. The data of this research are collect through the literature review, survey questionnaires and Google from or through mail from public and private bodies. The information gotten in the survey was broke down by Relative Importance Index Method and indexing them to find the factor effecting time and cost overrun.

A. Questionnaire Survey

The questionnaire was designed based on critical factors were identified that contributed to the construction projects as. A questionnaire survey was developed to assess the perceptions of various construction professionals of the relative importance of causes and the effects of construction projects. The questionnaire was designed into two sections: Section A; section B. Section A is to obtain the requested background information about the respondents. Section B is to obtain information on the factors that contribute to the causes of factors in construction projects from the perspective of construction professionals. Total forty seven resources related factors were identified under eight broad categories. A five point Likert scale (1 very low, 2 low, 3 medium , 4 high , 5 very high) was adopted where respondents were asked to rank the importance and impact of a particular factor on risks in one of their selected projects.(Appendix 1).

B. Analysis Data

The data obtained was analyses to determine the relative importance of the various factors that contribute to cause of construction project.

C. Relative Importance Index

The contribution of each factor to overall delays was examined and the ranking of the attributes in term of their critically as perceived by the respondent was done by use of Relative importance index (RII) which was computed using equation (1) and the result of the analysis are presented in table 2, indexing and ranking is shown in Table 3. [25]

$$\boldsymbol{RII} = \frac{n_5^5+n_4^4+n_3^3+n_2^2+n_1^1}{A\times N} \times \mathbf{100} \qquad (1)$$

Where, n5 = No of respondents for very high importance,
n_4 = No of respondents for high importance,

n_3 = No of respondents for medium importance,
n_2 = No of respondents for low importance,
n_1 = No of respondents for very low importance,
A = 5 (Highest value i.e. very high importance),
N = Total no of respondents (i.e. 71 in this case).

TABLE-2
RESPONDENT SHEET

Sl.no	Questionnaire	Total	Mean	SD	COV
1	Market share of organization	44.2	0.62	0.23	0.37
2	Liquidity of organization	46.8	0.66	0.23	0.34
3	Cash flow of project	50.8	0.72	0.21	0.29
4	Project design cost	55.2	0.78	0.18	0.23
5	Material and equipment cost	56	0.79	0.15	0.19
6	Project labor cost	54.4	0.77	0.19	0.24
7	Project overtime cost	55.2	0.78	0.15	0.2
8	Cost of rework	53.4	0.75	0.17	0.23
9	Cost of variation orders	53	0.75	0.16	0.22
10	Regular project budget update	54	0.76	0.21	0.28
11	Cost control system	59.2	0.83	0.17	0.21
12	Site preparation time	53.6	0.75	0.18	0.24
13	Planned time for project construction	54.6	0.77	0.19	0.25
14	Time needed to implement variation orders	51.2	0.72	0.18	0.25
15	Time needed to rectify defects	56.2	0.79	0.18	0.22
16	Average delay in claim approval	50.8	0.72	0.19	0.26
17	Average delay in payment from owner to contractor	52.4	0.74	0.18	0.24
18	Availability of resources as planned through project duration	53.8	0.76	0.19	0.25
19	Average delay because of closures and materials shortage	57.2	0.81	0.17	0.21
20	Conformance to specification	52.8	0.74	0.2	0.27
21	Availability of personals with high experience and qualification	52.8	0.74	0.21	0.28
22	Quality of equipment's and raw materials in project	58.8	0.83	0.17	0.2
23	Participation of managerial levels with decision making	57.6	0.81	0.18	0.22
24	Quality assessment system in organization	57	0.8	0.16	0.19
25	Quality training/meeting	51.8	0.73	0.22	0.3
26	Project complexity	53.6	0.75	0.18	0.24
27	Number of new projects / year	52.8	0.74	0.19	0.26
28	Management-labor relationship	53.2	0.75	0.18	0.24
29	Absenteeism rate through project	53.6	0.75	0.17	0.23
30	Sequencing of work according to schedule	56.6	0.8	0.18	0.23
31	Information coordination between owner and project parties	57.8	0.81	0.17	0.21
32	Leadership skills for project manager	59.2	0.83	0.17	0.2
33	Speed and reliability of service to owner	54	0.76	0.19	0.26
34	Number of disputes between owner and project parties	54.8	0.77	0.18	0.23
35	Number of reworks	53	0.75	0.18	0.25
36	Cost of compliance to regulators requirements	51	0.72	0.2	0.27
37	Number of non-compliance to regulation	51	0.72	0.18	0.25
38	Quality and availability of regulator documentation	54	0.76	0.17	0.22
39	Neighbours and site conditions problems	52.4	0.74	0.19	0.25
40	Application of Health and safety factors in organization	56	0.79	0.17	0.22
41	Easiness to reach to the site (location of project)	58.6	0.83	0.17	0.21
42	Reportable accidents rate in project	55	0.77	0.18	0.24
43	Assurance rate of project	53.4	0.75	0.18	0.24
44	Learning from own experience and past history	55.8	0.79	0.19	0.24
45	Air quality	50.8	0.72	0.23	0.32
46	Noise level	49.2	0.69	0.23	0.34
47	Wastes around the site	54.6	0.77	0.2	0.26

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TABLE-3
Raking Of Factors

Sl no	Factors	RII	Racking order
1	Cost control	83.4	1
2	Leadership skills for project manager	83.4	1
3	Quality of equipment's and raw materials in project	82.8	2
4	Easiness to reach to the site (location of project)	82.5	3
5	Information coordination between owner and project parties	81.4	4
6	Participation of managerial levels with decision making	81.1	5
7	Average delay because of closures and materials shortage	80.6	6
8	Quality assessment system in organization	80.3	8
9	Sequencing of work according to schedule	79.7	9
10	Time needed to rectify defects	79.2	10
11	Material and equipment cost	78.9	11
12	Application of Health and safety factors in organization	78.9	11
13	Learning from own experience and past history	78.6	12
14	Project design cost	77.7	13
15	Project overtime cost	77.7	13
16	Reportable accidents rate in project	77.5	14
17	Number of disputes between owner and project parties	77.2	15
18	Planned time for project construction	76.9	16
19	Wastes around the site	76.9	16
20	Project labor cost	76.6	17
21	Regular project budget update	76.1	18
22	Speed and reliability of service to owner	76.1	18
23	Quality and availability of regulator documentation	76.1	18
24	Availability of resource as planned through project duration	75.8	19
25	site preparation time	75.5	20
26	Project complexity	75.5	20
27	Absenteeism rate through project	75.5	20
28	Cost of rework	75.2	21
29	Assurance rate of project	75.2	21
30	Management-labor relationship	74.9	22
31	Cost of variation orders	74.6	23
32	Number of reworks	74.6	23
33	Conformance to specification	74.4	24
34	Availability of personals with high experience and qualification	74.4	24
35	Number of new projects / year	74.4	24
36	Average delay in payment from owner to contractor	73.8	25
37	Neighbours and site conditions problems	73.8	25
38	Quality training/meeting	73	26
39	Time needed to implement variation orders	72.1	27
40	Cost of compliance to regulators requirements	71.8	28
41	Number of non-compliance to regulation	71.8	28
42	Cash flow of project	71.5	29
43	Average delay in claim approval	71.5	29
44	Air quality	71.5	29
45	Noise level	69.3	30
46	Liquidity of organization	65.9	31
47	Market share of organization	62.3	31

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V. SUMMARY

From the above indexing and ranking of forty seven factors it concluded that most significant factors causing delays in time and cost overrun in construction projects, are cost and leadership skill for project management with RII 0.834 and on 1st rank. Before awarding the project owner and client should focus on cost control because it helps to complete the project within scheduled and within in the budget while leadership skill is proper planning and monitoring and, helps to run projects very effectively. Factors whose RII is 80 and above is considered as a most critical that impacting delays in construction projects. These factors are Cost control, leadership skill for project manager, Quality of equipment's and raw material, easiness to reach to the site (location of project), information coordination between owner and project parties, participation of managerial levels with decision making, Average delays because of closure and material shortage and quality assessment system in organization.

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ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

APPENDIX 1
QUESTIONNAIRE FORMAT

APPENDIX A

Sample Questionnaire Form

Optimization of Factor That Critically Impact Time and Cost Overrun in Construction Projects in India

Part One: Demographic

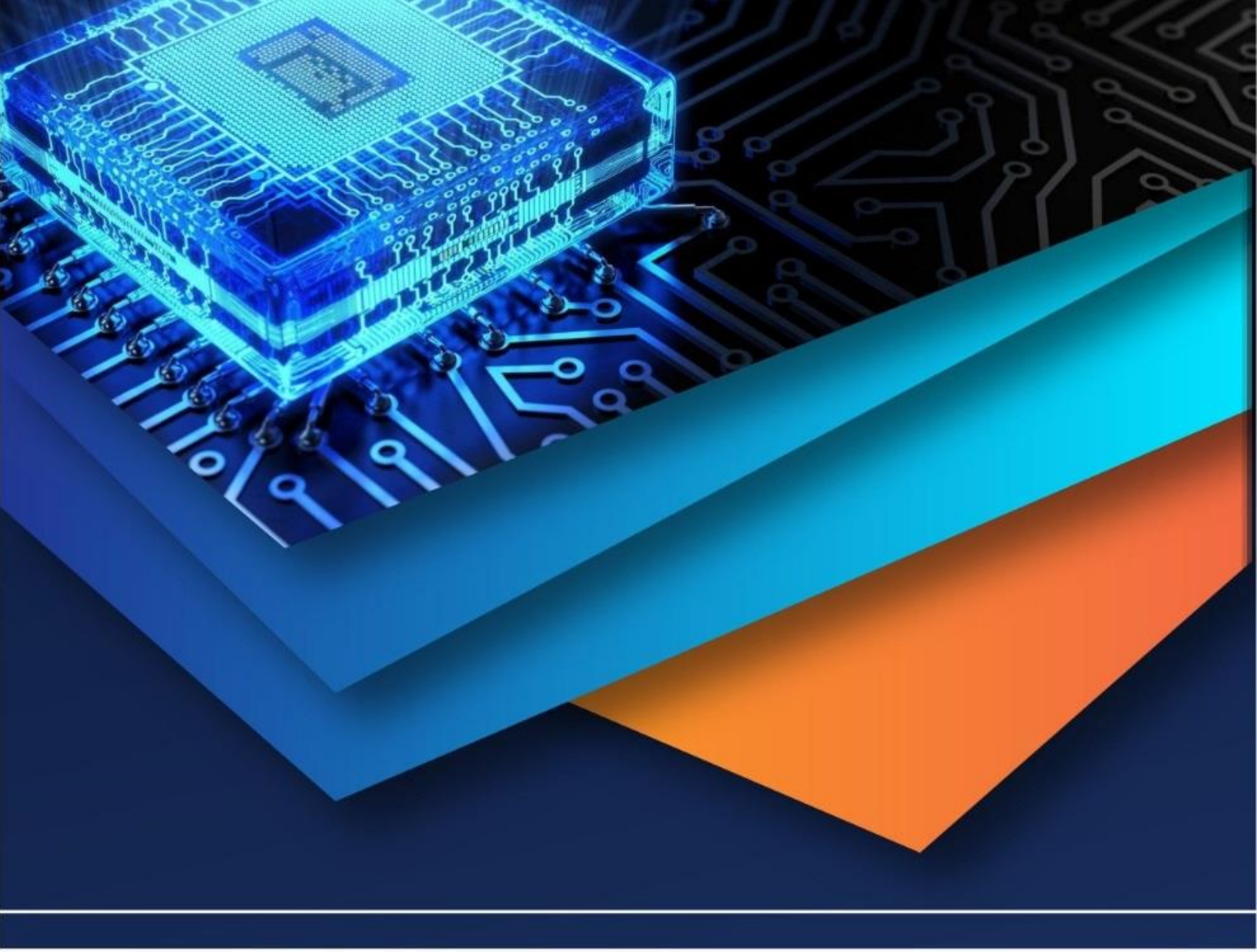
1 **Name :-**
2 **Age:-**
3 **Sex:-**
4 **Designation with Company Name :-**
5 **Experience (No. of Years):-**
6 **Mobile No. :-**

Part Two: Factors Affecting the Performance of Construction Project

Sample questionnaire form distributed to commission members (Experts).Tick mark the suitable response among 1, 2, 3,4and 5 in which 1 represents very low important and 5represent very high important

Groups/Factors	Very low important	Low important	Medium Important	High important	Very high important
(1) Cost factors	1	2	3	4	5
Market share of organization					
Liquidity of organization					
Cash flow of project					
Project design cost					
Material and equipment cost					
Project labor cost					
Project overtime cost					
Cost of rework					
Cost of variation orders					
Regular project budget update					
Cost control system					
(2) Time factors					
Site preparation time					
Planned time for project construction					
Time needed to implement variation orders					
Time needed to rectify defects					
Average delay in claim approval					
Average delay in payment from owner to contractor					
Availability of resources as planned through project duration					
Average delay because of closures and materials shortage					
(3) Quality factors					
Conformance to specification					
Availability of personals with high experience and qualification					
Quality of equipments and raw materials in project					
Participation of managerial levels with decision making					
Quality assessment system in organization					
Quality training/meeting					
(4) Productivity factors					
Project complexity					
Number of new projects / year					
Management labor relationship					
Absenteeism rate through project					
Sequencing of work according to schedule					
(5) Client Satisfaction factors					
Information coordination between owner and project parties					
Leadership skills for project manager					
Speed and reliability of service to owner					
Number of disputes between owner and project parties					
Number of reworks to regulation					
Quality and availability of regulator documentation					
Neighbors and site conditions problems					
(7) Health and Safety factors					
Application of Health and safety factors in organization					
Easiness to reach to the site (location of project)					
Reportable accidents rate in project					
Assurance rate of project					
Learning from own experience and past history					
(8) Environment factors					
Air quality					
Noise level					
Wastes around the site					

Signature & Seal with date



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