Factors Influencing Cost Overrun and Delay with Their Risks in Construction Management.

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Abstract: Cost overrun and delay are the most important factors which affect the rate of progress in construction industries. There are numerous Risks are involved in cost and schedule overrun which leads to unprofitable situation or dropping the project. Previous literature studies are mainly focused only on cost overrun and delay but they do not deal with their risks which is important to study. This study is to assess the factors influencing time and cost overruns on construction projects and their risks also. The objectives of the study were achieved through valid questionnaire. The questionnaires are collected over 40 construction companies. From this survey, identify and ranking the various elements which are responsible for the inflation of cost and schedule overrun using analytical software like SPSS. And discuss about the significant values obtained from the collecting data and recommendation and mitigation ideas from the ranking of overrun factors. The significant value should be more than 0.05 and from our analysis most of the factors are above that value. The study clarified that incorrect estimates and low productivity level of labors highly contributes to overrun in construction management. It will leads to unprofitable situation, so proper scheduling and better management will rectify these problems.

Key words: Elements, Cost overrun, Schedule overrun, Construction projects.

I. INTRODUCTION

The construction industries are the important factor for the development of the country. They play a vital role in economic development also, construction materials, modified equipment import and export and most of the peoples are worked in construction field. Because of cost overrun and delay construction sector gets a big drawback. They reduce the rate of progress and increase the estimation cost leads to many problems. So, we will mainly know about what is cost overrun and delay.

Cost overrun

Cost overrun is defined as the increase of cost in the construction building above the estimated value. They are mainly occurred because of underestimation of the actual value of materials and machines, etc. In India most the construction projects are meets the cost overrun problem over 70% of construction deals this problem. There are numerous factors which are responsible for cost overrun depends on the nature and type of project buildings.

Schedule overrun

Schedule overrun is defined as the delay of the project or increase of time to finish the construction project.

They mainly occur because of many natural and other cause, like weather condition, unavailability of labours and equipments, etc. Time delay also interact with cost overrun because time, cost and scope are three dimensions of the construction projects. So, Time delay impacts the project progress which also reduces the project activities.

Risks

There are large number of risks in construction industries depends on cost and schedule overrun. Because they are main factors in decreasing the rate of progress and they will decide whether the project should be profitable or not. So, it is important to analysis about the various risks involved in construction projects on cost and delay.

II. LITERATURE REVIEW

- **Adriana Gomez and Jose Luiz poniz tienda** (2017), INTI journal concluded that the identify the results include a synthesis of internal and external factors, a critical evaluation of different investigation and recommendations for future purposes.

- **Emmanuel Bentil and Edward Nana and Alfred Fokuo**, 2016, Existence and Impact of Overruns in construction projects in GHANA, concluded that the study has not only fill the gap in existing subject in GHANA but made recommendations, will improve and minimize the occurrence of overruns.

- **Adam Abderisak , per-Erik Josephson and Goran Lindal**, Implication of Overruns in Major Public construction projects, concluded that the purpose of which is to extended understanding of the relationship between client's action and effects of cost ,time and sustainability parameters.

- **Paul Terna Gbahabo and Oluseye Samuel Ajuwon**, Effects of cost overrun and schedule delay in Sub Saharan Africa, efficient and effective monitoring and evaluation performance has been recommended amongst other measures such as adoption of modern computer aided estimating tools and public private partnership.

- **Alirezarezaei and saeedjalal**, Investigation on Causes of Delay and Cost overrun in Construction Industry, that are 3 major factors causing delay are security measures, high number of sub-contractors by same contractor and poor labour productivity.

- **Changizahbab and tahirçelik,** 2012, An Investigation on Time and Cost Overrun in Construction Projects, there is a high necessity for further investigation on delay and cost overrun factors as well as quality and health & safety and suggesting right actions to minimize these kinds of defects.
- **Faith o u okafor,** Factors Influencing delays and cost overruns on construction Projects in Nigeria, the article proposes some of the factors that lead to Project delays include, high level of Corruption within the Government and Construction Industry, Communication Barrier, Poor Contract Management, Changes in site condition, Shortage of material and improper planning.

III. SCOPE AND OBJECTIVE

3.1 Scope

❖ The study has been conducted over 40 various construction industries all over Tamilnadu and Pondicherry regions.

❖ This study mainly centered on evaluating the factors which influences the cost and schedule overrun on construction site.

❖ The critical factors are picked out by using ANOVA and SPSS analysis methods.

❖ The analysis can be carried out based on the responses of engineers and construction management.

3.2 Objective

By collecting the real data from construction industries about cost and schedule overrun and analysis the data by SPSS (statistical package for the social sciences) software. We have to conclude and analyse the cost and schedule overrun and their risk in construction field. To find the strategies to mitigate the problem and remedies to solve the problem.

The main objectives of this study are as follows:

- Study the problem of cost and schedule overrun in construction projects.
- Identify the various elements which are responsible for the inflation of cost overrun and schedule overrun and their risks which affect the rate of progress.
- Ranking the factors which are responsible for the inflation of overrun using analytical software like SPSS.
- Discuss the significant value obtained from collecting data and way to mitigate the problems which causes overrun.
- Recommending suitable remedies to overcome the problem.

IV. RESEARCH DESIGN AND METHODOLOGY

4.1 Research Design

The first step in research was to identify the problem where and which it should developed. Mainly there are identified through literature review in some case it also identified through internet. Then data collection is to be conducted through questionnaire survey. At last the data are analyzed through analytical software. On basis of results the factors are ranked and their recommendations are given to rectify it.

4.2 Methodology

- Select the projects undergone time & cost overrun
- Collected all data about overrun of the project
- Identify the reason by questionnaire from consultants

- Analyse the obtained data
- Understand the causes of overruns
- Examine the reasons of overrun
- Recommendation of measure that minimize and mitigate the problem.

V. DATA COLLECTION AND ANALYSIS

5.1 Details of Questionnaire survey

This section presents about the questionnaire survey which was conducted to get the opinion of engineers and top management in the construction industries. The questionnaire contains 50 numbers of questions 25 about cost and 25 about delay. They are developed on the basis of degree of severity and overall importance. The results are analysed on the analytical software to rank and determine the top factors.

5.2 Data collection

Data collection is the process of collecting proper data about the factors which are influence the major role in cost and schedule overrun in construction projects. Those data are collected from engineers and top-level management like General manager and project manager. Data are collected from all over tamilnadu and pondycherry region. We distributed over a 60 number of questionnaires set in the Engineer side all over Tamilnadu. But received only 41 number of questionnaires set and most of the questionnaire survey was conducted in Chennai regions. Some other data are collected from internet.

5.3 Data Measurement Scale

In order to select the method of analysis, the level of measurement must be known. For each type of measurement, there is an appropriate method can be applied. In my research the five-point scale should be used. Based on the five-point scale, we have the following table 5.1

Table 5.1 Five-point scale used for data measurement

Item	VERY LESS	LESS	MODERATE	HIGH	EXTREME
Scale	1	2	3	4	5

5.4 Sample size

Data collection questionnaires was developed in engineer side as well as top management. 24 numbers of questionnaires asked related to cost overrun and 25 numbers of questionnaires asked related to schedule overrun. The questionnaire was asked in the positive and negative side in both groups.

5.5 DATA ANALYSIS

Data analysis is the process of inspecting and modeling data with the goal of discovering useful information, informing conclusions and supporting decision making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names.

5.6. SPSS

SPSS is short for Statistical Package for the Social Sciences, and it's used by various kinds of researchers for complex statistical data analysis. Most top research agencies use **SPSS** to analyze survey data and mine text data so that they can get the most out of their research projects.

A. T-test

The t-test is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. A t-test is most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were known,

B. Analysis of Variance

Analysis of variance (ANOVA) is an analysis tool used in statistics that splits an observed aggregate variability found inside a data set into two parts: systematic factors and random factors. The systematic factors have a statistical influence on the given data set, while the random factors do not. Analysts use the ANOVA test to determine the influence that independent variables have on the dependent variable in a regression study.

C. Mean

The mean value of a certain data set is equal to sum of all values of the data set divided by the total number of data. The main factors of SPSS are mean difference within the groups and mean difference between the groups. The expected value is denoted by the lowercase Greek letter mu (μ).

D. STANDARD DEVIATION

The standard deviation is a measure of amount of variation of set of values. On other words it also known as the amount of depression of the data set values. It is important factor to know the variance of the values in SPSS. It is denoted by (σ).

D. VARIANCE

Variance (σ^2) in statistics is a measurement of the spread between numbers in a data set. That is, it measures how far each number in the set is from the mean and therefore from every other number in the set.

VI. RESULTS AND DISCUSSION

6.1 SPSS Analysis Results
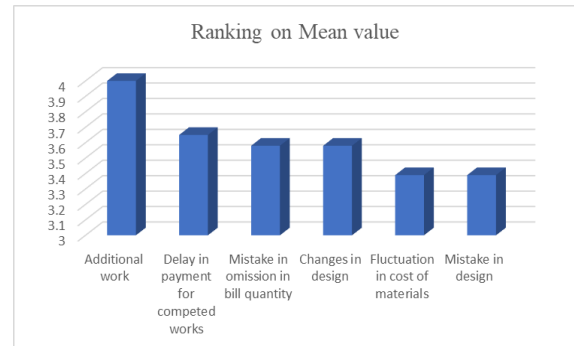
Mean, std deviation and variance of variables

A. Cost Overrun:

Descriptive statistics

Table 6.1 Ranking order of Cost Overrun factors.

	N	MEAN	STD.DEVIATION	VARIANCE
Additional work	41	4	1	1
Delay in payment for competed works	41	3.65	1.17	1.37
Mistake in omission in bill quantity	41	3.65	1.17	1.37
Changes in design	41	3.58	1.148	1.318
Fluctuation in cost of materials	41	3.39	1.256	1.578
Mistake in design	41	3.39	1.334	1.778

Fig 6.1 Mean value Ranking CO factors.

B. Schedule overrun:

Descriptive statistics

Table 6.2 Ranking order of Schedule Overrun factors.

	N	MEAN	STD.DEVIATION	VARIANCE
Poor site management	41	3.87	1.088	1.183
Modification in material specification	41	3.58	1.089	1.185
Shortage of materials	41	3.58	1.089	1.185
Rework due to error	41	3.52	1.411	1.991
Insufficient equipment	41	3.48	1.338	1.791
Unavailability of utilities in site	41	3.42	1.025	1.052

Fig 6.2 Mean value Ranking SO factors.

6.2 Discussion

In this chapter we discuss about the significant values that are obtained from the collection of data, from the ANNOVA results obtained from top factors of cost and schedule are to be classified according to the significance between the groups or Non significance between the groups based on the nature of the project and type of the building. And the top factors are

R1- Additional work **R2-**changes in design
R3-poor site management **R4-** shortage of materials
R5- modification in specification

One-way ANNOVA results, based on nature of project;

According to nature of project from the table 6.3, the factors R1, R3, R5 had the significance value as 0.594, 0.526, and 0.62. It was higher than the significant value 0.05(constant) so the null hypothesis is accepted and it is concluded that there is no significant different between the nature of the project, which are private sector, public sector and private partnership sectors. Then the significant value of factor R2 and R4 are 0.042 and 0.031, it was less than the significant value 0.05 so the null hypothesis is rejected and it is concluded that there is a significant different between the nature of the projects.

Table 6.3 one-way ANNOVA results, top factors

Nature of the project		Top Five Ranked Factors				
		R1	R2	R3	R4	R5
Private	Mean	4.62	3.92	4.42	3.62	4.15
	N	28	28	28	28	28
	Std. Deviation	1.625	0.744	1.302	1.359	1.572
Public	Mean	3.9	3.85	3.55	4.36	3.18
	N	11	11	11	11	11
	Std. Deviation	1.514	1.368	1.615	1.027	1.088
Private partnership	Mean	3.4	3.18	3.25	4.13	5.2
	N	3	3	3	3	3
	Std. Deviation	1.926	1.408	1.632	0.808	1.414
F- value		0.637	3.586	0.255	3.227	0.507
P-value		0.594	0.042	0.526	0.031	0.42

One-way ANNOVA results, based on type of the project building,

According to the type of project from table 6.4, the factors R1, R2, R4, R5 had the significance value as 0.994, 0.742, 0.93 and 0.72. It was higher than the significant value 0.05 so the null hypothesis is accepted and it is concluded that there is no significant different between the type of the project building, which are residential, commercial and industrial buildings. Then the significant value of factor R3 0.026, it was less than the significant value 0.05 so the null hypothesis is rejected and it is concluded that there is a significant different between the type of the buildings.

Table 6.4 one-way ANNOVA results, top factors

Nature of the project		Top Five Ranked Factors				
		R1	R2	R3	R4	R5
Residential	Mean	4.12	3.92	4.42	3.62	4.45
	N	23	23	23	23	23
	Std. Deviation	1.225	1.104	1.402	1.059	1.072
Commercial	Mean	3.3	3.65	3.25	4.16	3.98
	N	12	12	12	12	12
	Std. Deviation	1.514	1.368	1.615	1.027	1.088
Industrial	Mean	3.93	3.88	2.95	3.93	4.2
	N	8	8	8	8	8
	Std. Deviation	1.926	1.408	1.632	0.808	1.414
F- value		1.637	0.886	4.255	1.217	1.507
P-value		0.994	0.742	0.026	0.931	0.72

From the ANNOVA results 7 out of 10 factors results are significant between the groups and 3 out of 10 factors are Non-significant between the groups, from the mean value of the factors we can identify the Top 6 factors which are mainly influenced the cost and schedule overrun in projects.

VII. CONCLUSION AND RECOMMENDATION

Time and cost overrun have been a major recurring problem in construction industry. Brief reasons for cost and time overruns as reported by various project implementing agencies are Additional work, Poor site management, Mistake in omission in bill quantity, Modification in material specification, Changes in design, Shortage of materials. These factors are ranked according to the mean value of cost and schedule overrun factors. According to the SPSS analysis 10 factors are noted as important factors which influences the cost and schedule overrun in all the sectors. From the results, most of the factors results are more than 5% or 0.05(constant value from ANNOVA table) so they are significant between the groups and 3 of the factors are Non-significant between the groups because their values are lesser than 0.05, from the analysis factors like additional work, delay in payment, fluctuation in material cost, poor management, rework, modifying specification, insufficient equipment's are significant between nature of project and type of building. So, these factors are mainly occurring in all sectors and levels of construction building. It will leads to unprofitable situation, so proper scheduling and better management will rectify these problems.

Recommendations for mitigating this problem are Better scheduling and management, More effective supply chain, Improved information and monitoring, Harsher penalties.

i. Better scheduling and management

Schedule management is the best way to eliminate the cost and schedule overrun in the construction projects. There are many to rectify the overrun problems but better scheduling and managing will enhances the rate of progress and maintain whole project under control. Some of the best ways for better schedule management,

1. Make a note on milestones
2. Determine and manage your dependencies
3. Chart your critical path
4. Identify scheduling assumptions and constrains.

ii. More effective supply chain

More effective chain supply means proper communication between top level and lower level management. It will enhance the understanding between workers and management. In case of unavailability of material, equipment and labour it reduce the rate of progress but in effective chain supply those problems are totally negligees. At last the future needs are determined and tally all aspects.

iii. Improved information and monitoring

The other way is to improve communication between top management and lower management. And also increase the supervision over the entire project. so, enhancement of the communication and monitoring will increase the productivity and decrease the cost and schedule overrun.

iv. Harsher penalties

Giving harsher penalties to the workers responsible for the overruns minimize the probability of errors and increase the efficiency of the work. This will lead to increase in rate of work and mitigate the problems.

ACKNOWLEDGEMENT

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