# Causes of Cost Overrun in Construction Projects in Balochistan

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**Abstract.** Cost overrun in construction projects is a common phenomenon which may result due to various factors including management issues, site and terrain problems, and unavailability of basic construction requirements. Cost overrun is common in developing countries; however, it occurs more in hard areas such as Balochistan province of Pakistan. This study is carried out to examine the effect of causes of cost overrun in construction projects in Balochistan. Owing to the geographical importance of this province and potential increase in infrastructure in upcoming years, a study was aimed to identify the causes and evaluate their overall impact on cost overrun of projects in Balochistan province. Study based on a questionnaire was carried out and analysis done on SPSS. Results were evaluated and relationships of factors causing cost overrun were analyzed in detail. This study can help the government and private sector to consider these factors beforehand in the planning phase, so as to avoid or minimize cost overrun in construction projects. This study covers cost management & risk management related to construction projects.

**Keywords:** Cost management; Cost Overrun; Balochistan; Project management; Civil Engineering; Construction Industry.

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## 1. Introduction

Cost overrun in construction projects is common in developing countries, still very threatening as it may even lead to project failure. Ahiaga & Smith (2017) presented a database with over 250 projects from a number of countries and different time periods; depicting 86% of projects suffered cost overrun with average overrun of 28%. Projects related to transport infrastructure (e.g., roads, rails and highways) are mostly ended up with an over cost with 86% probability.

The most increase is observed in rail projects as 45%, 34% for bridges and as maximum as 20% for road projects. Moreover, (Olaniran & Edwards, 2015) discovered that cost increase may be over 70% in normal project conditions and 183% in extreme and special conditions.

Keeping in view the type of projects, various factors contribute to over budgeting of projects. It mainly depends upon the type and nature of the construction project (Akram & Ali, 2017). Inadequate planning during the estimation phase has resulted in numerous project failure stories in the construction industry in Pakistan. During the budgeting stage, failure to consider all the relevant factors which may lead to cost escalation in a specific region leads to such hazards.

Sites which are located in remote areas are facing higher risks than construction sites in well located areas. Absence of smoothness in construction, abruptly

changing scenarios, and changing dynamics has an intense impact on cost of projects.

Considering the province of Balochistan, dynamics of construction execution are far different in comparison to other parts of the country due to a large number of factors contributing towards cost overrun.

Being an underdeveloped province and non-existence of infrastructure, construction in this area poses countless challenges. Geographical features of this province dictating rugged mountainous terrain and startling low water table is another contest for project managers. About 80% of the area of this province can be classified as inter-mountainous (PDMA GOB, 2017).

Resultantly, project managers in Balochistan not only deal with traditional challenges, but also tackle issues emerging due to remote site locations in Balochistan. Moreover, due to the prevailing law and order situation in the region, construction companies and contractors are reluctant to be employed in Balochistan.

This study revolves around to examine the causes of cost overrun in the area of construction projects by using water scarcity (Muhammad et al., 2015), unavailability of construction material (Remon Fayek, 2015) & skilled labor (Akram et al., 2017) and location of construction sites in remote area (Muhammad et al., 2015) that lead towards cost overrun in construction projects in Balochistan (Azhar et al., 2012).

The key research objectives derived through causes of cost overrun in the area of construction projects in Balochistan are listed below:

- To examine the impact of water scarcity on cost overrun of construction projects in Balochistan.
- To examine the impact of and unavailability of construction material on cost overrun of construction projects in Balochistan.
- To analyze the effect of non-availability of skilled labor on cost overrun of construction projects in Balochistan.
- To examine the impact of remote location of construction site on cost overrun of construction projects in Balochistan.

## 2. Methodology

Raosoft software was used to calculate a sample size of 200. 49 x companies working in the construction industry in Balochistan province were considered and 4 x individuals from each company were engaged (to include contractors, project managers, site representatives and government officials or clients). The sample size is also confirmed using formula i.e.; company x project team (49 x 4 = 196 ~ 200).

### 2.1 Theoretical Framework

Theoretical framework of the study is illustrated in Fig. 3 depicting Independent and Dependent variables.

### 2.2 Hypotheses

Proposed Hypotheses for the research are appended below:

H1- Water scarcity is positively associated with cost overrun in construction projects in Balochistan.

H2 – Non-availability of construction materials positively associated with cost overrun in construction projects in Balochistan.

H3- Unavailability of skilled labor positively associated with cost overrun in construction projects in Balochistan.

H4- Location of construction sites in remote area positively associated with cost overrun in construction projects in Balochistan.

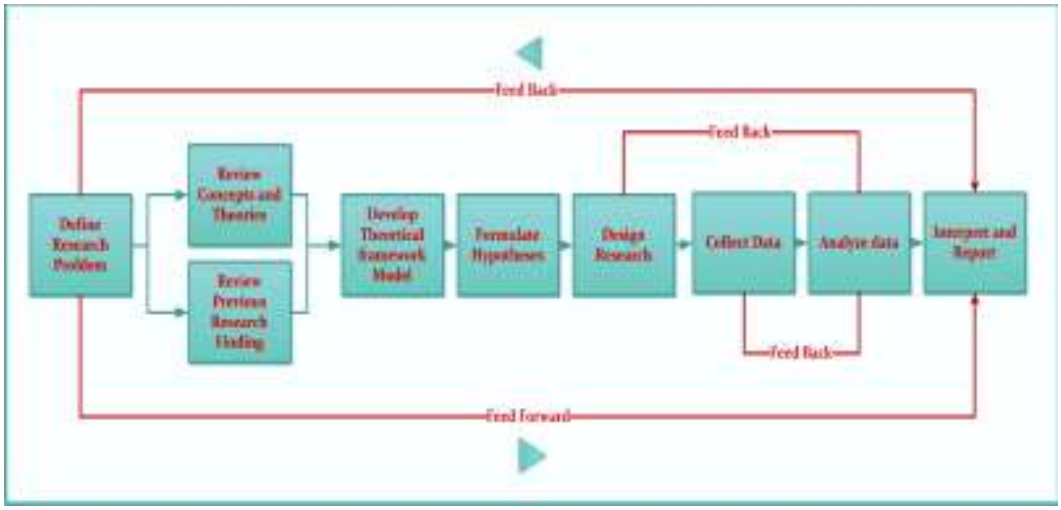


**Figure 1 Research Methodology**


**Figure 2 Rao soft Calculator**

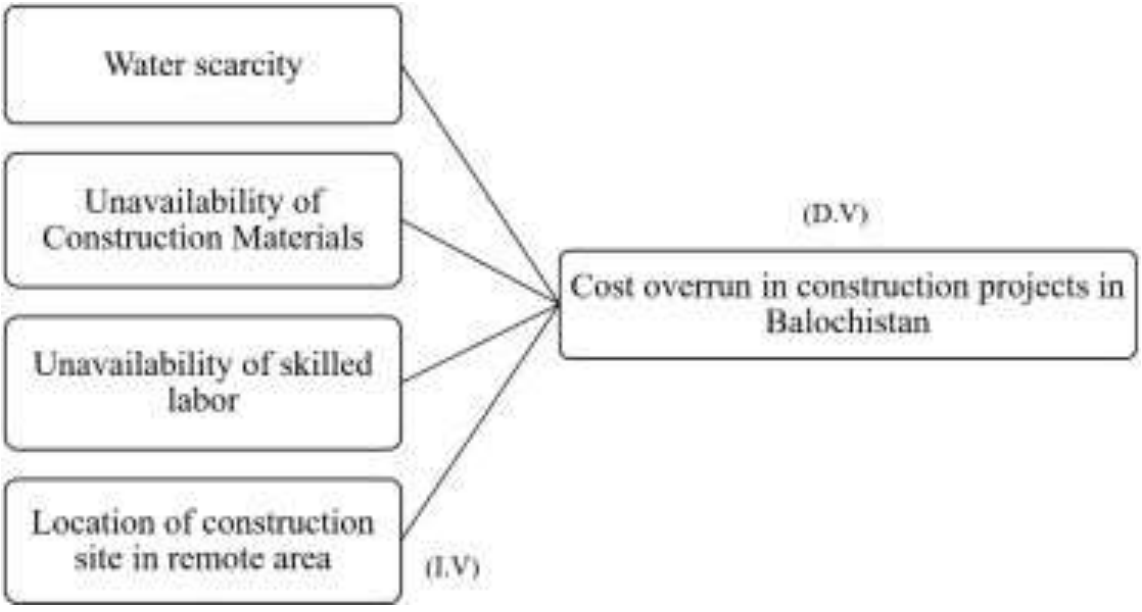


**Figure 3 Theoretical Framework**

## 3. Analysis & Results

Correlation analysis and regression model was carried out based on data collected using SPSS software. Correlation analysis is a statistical test normally used for testing of proposed hypotheses whereas a regression analysis model is an imperative test for analysis which displays the impact of independent variables on dependent variables. Both tests displayed significant results as appended in Table 1.

The outcome demonstrated that the correlational value of water scarcity and cost overrun in construction projects in Balochistan is .403**, correlation value of unavailability of construction material and cost overrun in construction projects in Balochistan is .383**, correlational value of unavailability of skilled labor and cost overrun in construction projects in Balochistan is .500**, and the correlational value of location of construction sites in remote area and cost overrun in construction projects in Balochistan is .464**, all depicting positive relationships among variables.

Regression is denoted by R (Correlation coefficient) i.e.; 60.7%, which shows a strong correlation between all independent variables (I.V) water scarcity, unavailability of construction material & skilled labor and location of site and dependent variable (D.V) cost overrun in construction projects. The R square is .369 which reveals that 36.9% variation in cost overrun is explained by independent variables mentioned above. Adjusted R square is 0.364 and standard error of estimation is 0.785. These values are favorable for continuing research. Results of ANOVA analysis is mentioned in table 3.

The ANOVA analysis is evaluated using the results of the regression model. ANOVA analysis relates to Frequency as denoted by F i.e.; 78.249%, shows variance in the model at level of significance is .000. results of regression model and remnant calculated in terms of squares sum and df are (193.110, 523.807 and 4,536) the worth of mean square is (48.277 and 0.617). The outcome of Coefficient analysis is calculated in table 4.

This coefficient analysis is also calculated by considering results of regression model analysis. This analysis is carried out using two components; standardized and unstandardized coefficient. As regards to regression constant, value of 0.432 is the average cost overrun in construction projects in Balochistan, when water scarcity, unavailability of material & skilled labors and construction site location is taken as zero.

Results in above table show following:

- Scarcity of water is revealed as a highly influential variable in the research to affect the cost overrun in the construction projects of Balochistan with B=0.166 and significance level 0.001, which signifies that 1 unit of this independent variable may produce 16.6% change in the dependent variable.
- Unavailability of construction material is also a leading variable to affect the cost overrun in the construction projects of Balochistan with B=0.158 and significance level 0.000, which signifies that 1 unit of this independent variable may produce 15.8 % change in the dependent variable.
- Un-availability of skilled labor is also a significant variable with B=0.311 and significant level 0.000, which signifies that 1 unit of this independent variable may produce 31.1% change in the dependent variable.
- Location of site in remote area also remains a significant variable with B=0.230 and significant level 0.000, which signifies that 1 unit of this independent variable may produce 23% change in the dependent variable.

## Table 1. Correlational Analysis Table

**Correlations**

| | | Water Scarcity | Unavailability Of Construction Material | Unavailability Of Skilled Labor | Location of Construct ion sites In Remote Area | Cost Overrun in Construction Project in Balochistan |
|---|---|---|---|---|---|---|
| Water Scarcity | Pearson Correlation | 1 | .374** | .393** | .395** | .403** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | 200 | 200 | 200 | 200 | 200 |
| Unavailability Of Construction Material | Pearson Correlation | .374** | 1 | .282** | .421** | .383** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 |
| | N | 200 | 200 | 200 | 200 | 200 |
| Unavailability Of Skilled Labor | Pearson Correlation | . 393** | .282** | 1 | .430** | .500** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 |
| | N | 200 | 200 | 200 | 200 | 200 |
| Location of Construction Sites in Remote Area | Pearson Correlation | . 395** | .421** | .430** | 1 | .464** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 |
| | N | 200 | 200 | 200 | 200 | 200 |
| Cost Overrun in Construction Project in Balochistan | Pearson Correlation | . 403** | .383** | .500** | .464** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | |
| | N | 200 | 200 | 200 | 200 | 200 |

**. Correlation is significant at the 0.01 level (2-tailed).

## Table 2. Regression Model Summary Table

**Regression Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .607a | .369 | .364 | 0.78548 |

a. Predictors: (Constant), Location of Construction Sites in Remote Area, Water Scarcity, Unavailability of Construction Material, Unavailability of Skilled Labor

## Table 3. ANOVA Analysis Table

**ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 193.110 | 4 | 48.277 | 78.249 | .000 A |
| | Residual | 330.697 | 536 | 0.617 | | |
| | Total | 523.807 | 540 | | | |

a. Predictors: (Constant), Location of Construction Sites in Remote Area, Water Scarcity, Unavailability of Construction Material, Unavailability of Skilled Labor b. Dependent Variable: Cost Overrun in Construction Project in Balochistan

**Table 4. Coefficient Analysis Table**

| Coefficient Analysis | | | | | |
|---|---|---|---|---|---|
| **Model** | **Unstandardized Coefficients** | | **Standardized Coefficients** | **t** | **Sig.** |
| | **B** | **Std. Error** | **Beta** | | |
| (Constant) | 0.432 | 0.180 | | 2.404** | 0.017 |
| Water Scarcity | 0.166 | 0.047 | 0.139 | 3.500** | 0.001 |
| Unavailability Of Construction Material | 0.158 | 0.040 | 0.154 | 3.940** | 0.000 |
| Unavailability Of Skilled Labor | 0.311 | 0.039 | 0.312 | 7.883** | 0.000 |
| Location of Construction Sites in Remote Area | 0.230 | 0.045 | 0.210 | 5.096** | 0.000 |
| R-Sq = 0.369; F (4, 536) = 78.249*; *p<0.01; **p<0.05 | | | | | |

**Table 5. Hypotheses Valuation Summary Table**

| **Hypotheses** | **Remarks (Admit or Reject)** |
|---|---|
| Water scarcity is positively associated with cost overrun in construction projects in Balochistan | Admit |
| Unavailability of construction materials positively associated with cost overrun in the form of construction projects in Balochistan | Admit |
| Unavailability of skilled labor positively associated with cost overrun in the form of construction projects in Balochistan. | Admit |
| Location of construction sites in remote area positively associated with cost overrun in the form of construction projects in Balochistan | Admit |

## 4. Conclusion

In cost management, unconventional conditions for construction results in cost overrun. All four factors for cost overrun mentioned in the study were analyzed in detail statistically and their effect on cost overrun on projects was studied. Following major conclusions have been derived:

- Water scarcity has a direct and strong influence on cost overrun in construction projects in Balochistan province. The same is depicted by results in statistical study of this research (r=0.403, p<0.01). In order to overcome water scarcity, contractors tend to resort to alternate means of water such as water tankers, which adds up to the cost. Less rains and low dependency on natural ways to overcome water shortage is also a major reason. This research verifies the study and findings of Muhammad et al., 2015, where water scarcity is identified as one of the major costs of cost overrun in hard areas as compared to urban areas.
- Un-availability of construction material has a substantial correlation with cost overrun and the same being verified by statistical results (r=0.383, p<0.01). The findings of Raymen Fayek, 2015 are hence confirmed. Due to this setback, procurement of material is resorted from major cities (Karachi being nearest), which results in increased overall project cost due to additional transportation cost. Moreover, local sand (a basic construction material) in Balochistan is termed as unfit for construction. Washing of sand results in high costs of this basic material.
- Non availability of skilled labor in Balochistan is directly and strongly co related with cost overrun. It is logically proven with statistical outcome (r=0.500,

p<0.01). This research confirms the cause of cost overrun highlighted by Akram et al., 2017. Local labor available in Balochistan is not skilled in nature and is only available for non-skilled tasks. Alternative arrangement of labor from Sindh and southern Punjab adds to the overall project cost. Location of site plays a pivotal role in estimation and cost budget. Site being in remote and hard areas has a direct relation with cost overrun in construction projects in Balochistan. Statistical results also confirm the findings (r=0.464, p<0.01). The same as identified by Muhammad et al. 2015 stands confirmed. When the location of a site is in a remote area, long distances, an increase in transportation cost, camp establishment, alternative arrangement of electricity and enhanced measures for security are the reasons for cost over shooting from estimated budget.

### 4.1 Limitations / Future Direction

This research identifies the causes of Cost Overrun in Construction Projects in Balochistan. It is highlighted that due to limited time span and lack of budget, the research was not able to be carried on an extensive platform and was done on four factors only. In future, similar studies should be carried out considering more factors that may lead to cost overrun in construction projects in Balochistan.

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