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Causes Of Cost Overrun In Building Construction Projects

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Abstract

Cost Overrun is a persistent problem in both developed and developing countries, causing financial losses, difficulties, project delays, and possibly even project failure. The project cost overrun on 4 buildings is quite large and encourages the search for the cause of the project cost overrun, which not only includes 4 buildings but also other equivalent building projects. Through interviews and distribution of questionnaires that have previously been validated by several experts so that the questionnaire is valid. Distribution was carried out and received a return of 37 respondents. The result is that there are 20 valid indicators and the causes of cost overrun are obtained from RII calculations by placing the 8 largest ranks on 11 indicators, with the biggest causes of Cost Overrun being Lack of control and control of material quality, shortage of labor, weak logistics supervision resulting in loss of materials, inflation and escalation of material prices, high rental or purchase prices for equipment due to not conducting a survey first, Lack of construction materials, poor productivity and quality of human resources, additional work due to changes in design and drawings, work instructions that are not understood properly, by paying attention to the highest to lowest variables, the main one is material, the second highest is equipment, the third highest is labor, and the lowest rank is other variables.

Keywords: *causes of cost overrun, building construction projects, RII, variables, indicators*

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INTRODUCTION

A construction project is the process of transforming plans or designs and specifications into physical structures and facilities. Successful construction project execution, namely timely, cost-effective, and high-quality projects, is the goal and expectation of project owners and contractors. The larger a project, the more complex its mechanisms, which means more problems must be addressed. If the project is not handled properly, various problems will arise, including cost overruns, one of the causes of which is inflation ([1] Vincent et al.[1]), and raw material shortages ([2]- [3]).

Despite advances in project planning and management, construction projects often struggle to maintain budget control. This cost overrun is a persistent problem in both developed and developing countries, leading to financial losses, difficulties, project delays, and possibly even project failure. Cost overrun can be defined as the extent to which actual costs exceed the estimated planned costs, measured in terms of currency and price stability. The frequency, magnitude, and distribution of cost overruns must be taken into account as part of the cost overrun assessment for a particular type of investment. (Flyvbjerg, et al. [4]).

LITERATURE REVIEW

Based on research by Widiaputra and Arumsari [5], the issue addressed in their journal is cost overrun, which is attributed to a combination of internal factors—such as management-related issues—and external project factors, including inflation and price fluctuations.

Research by Abdelalim et al. [6] highlights the lack of a comprehensive approach to understanding the interrelationships among the various factors that cause cost overruns. Meanwhile, research by Putra and Waty [7] identifies errors in estimating material costs and labor wages as the primary drivers of cost overruns.

Cost overruns in construction projects can stem from both internal and external factors [8, 9]. Such overruns are a common occurrence in construction projects and can lead to financial losses. In other words, cost overruns represent a significant challenge to the successful delivery of construction projects (Ghazal and Hammad [10, 11, 12]).

While previous studies on cost overruns have often examined construction projects in a general sense—as seen in the work of Vincent et al. [1, 2, 3]—this study focuses on four large-scale building construction projects (detailed in Table 1). Consequently, this research aims to investigate the specific causes of cost overruns in these cases, which may differ from those identified in previous studies.

This research is also aligned with the Sustainable Development Goals (SDGs), specifically SDG 9: Industry, Innovation, and Infrastructure. The term "resilient infrastructure" is used here because controlling cost overruns is an essential part of enhancing the resilience of infrastructure implementation.

Resilient infrastructure pertains not only to the physical functionality of a structure but also to a project's capacity to manage cost risks, scope changes, and implementation uncertainties.
The objective of this study is to identify the causes of cost overruns in building construction projects, including the relevant variables and indicators.

METHOD

The methodology begins by examining cost overruns across four building construction projects. To identify the causes of cost overruns in building construction projects—drawing not only from four specific case studies but also from existing literature—a questionnaire was developed and subsequently validated by several experts. The questionnaire was then distributed, either via Google Forms or in a manual format, to competent stakeholders, including project owners, contractors, and consultants.

Cost Overrun Data for Four Building Construction Projects
Data regarding cost overruns were collected from building construction projects completed up to 2026, as presented in Table 1.

Respondent Characteristics

The study involved 37 respondents, all of whom hold bachelor's degrees in Civil Engineering, with professional experience ranging from 1 to 15 years. The majority of respondents hold a bachelor's degree (S1) and possess more than 5 years of experience. Respondents were categorized into three groups based on their years of experience: 1–5 years, 5–10 years, and over 10 years. The largest group of respondents who completed and returned the questionnaire fell into the 5–

10 years of experience category,that you can seen on Figure 1

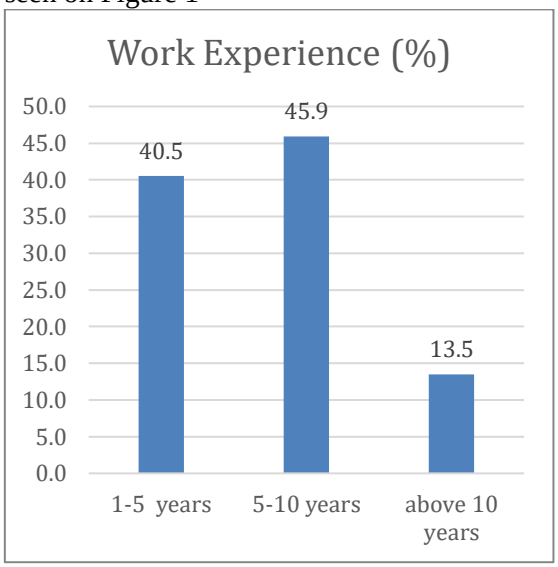


Figure 1. Work Experience Respondents

Sampling Procedure

The sampling procedure involved distributing the questionnaire to stakeholders associated with construction work, including contractors, planners, and supervisors. A total of 37 individuals responded; all 37 responses were deemed valid, as the questionnaires were completed accurately and appropriately.

Questionnaire Validation Process

The questionnaire was reviewed by several experts. Initially, 19 indicators were approved; however, following suggestions and additions provided by the experts, the number of indicators for cost overruns was expanded from the original 19 to 25.

Table 1. Cost Overrun Data for 4 Building Construction Projects

Num	Project Name	Number of items	Total Budget Plan	Total Execution Budget Plan	*Cost overrun (%)*
1	Apartment complex project in Kalimantan	42	Rp 249.668.731.804	Rp 278.751.974.970	11,65%
2	Bank office building in Ragunan	92	Rp 68.904.321.384	Rp 76.562.998.220	11,11%
3	Campus project in Bandung	85	Rp 32.722.481.009	Rp 37.568.267.482	14,81%
4	IKN office project in East Kalimantan	140	Rp 123.736.809.061	Rp 136.953.457.025	10,68%

Source : Dewanto dan Waty. [13]

1. Cost Overrun Variables

The cost overrun variables were derived from a literature review concerning cost overruns, drawing on several reliable sources, as presented in Table 2.

Table 2. Cost Overrun Variables

Variable	Indicator	X1	X2	X3
Cost Estimation	Failure to account for unforeseen costs.	✓	✓	✓
	Incomplete data and information regarding activities and materials, resulting in numerous additional works outside the contract scope.	✓	✓	✓
	Errors in cost estimation.	✓		✓
	High labor costs or wages.			✓

Variable	Indicator	X1	X2	X3
Material	Limited contractor capital, causing disruptions to project execution.			✓
	Late payments from the project owner.			✓
	Additional work resulting from design and drawing changes.	✓		
	Shortages of construction materials.	✓	✓	
	Failure to account for national economic inflation and material price escalation.	✓	✓	✓
	Inadequate material quality control and monitoring.	✓	✓	✓
Tenaga Kerja	Delays in material supply that hinder project progress.		✓	✓
	Weak logistics supervision resulting in material losses.	✓	✓	✓
	Fluctuations in labor wages.	✓		
	Labor shortages.	✓	✓	✓
	Poor human resource productivity and quality.	✓		✓
	Poor coordination between site managers and project workers.			✓
	Poor worker performance resulting in work errors or mistakes.		✓	✓
	Improper personnel assignment.	✓		
	High equipment rental or purchase costs due to the lack of prior surveys.	✓	✓	
	High equipment mobilization and demobilization costs.	✓	✓	✓
Lain - lain	Equipment damage or loss.	✓		
	Errors in equipment selection.	✓		
	Lack of practical implementation of the Earned Value Management (EVM) system.	✓		
	Insufficient attention to occupational health and safety (OHS) on the project.	✓	✓	
	Poor coordination among Work Breakdown Structure (WBS) functions, resulting in rework.	✓	✓	✓
	Workers' inadequate understanding of drawings and instructions.	✓		✓
	Design changes during construction.			✓
	Incomplete contract documents.			✓
	Unrealistic project scheduling.			✓
	Additional work requests from the project owner.		✓	✓
	Poor coordination between site managers and project workers.		✓	✓
	Work instructions that are not properly understood.		✓	✓
	Adverse weather conditions causing delays.			✓

Note:
X1 : Putra, dan Waty,[7].
X2 : Andian, dan Waty,[[8].
X3 : Bataric, dan Waty, [14]

2. Questionnaire Draft

This final questionnaire draft has been approved by experts—individuals holding a degree in civil engineering with at least 10 years of professional experience in the building construction sector. The approved questionnaire is presented in Table 3, comprising a total of 25 indicators representing causes of cost overruns.

Table 3. Final Draft of the Questionnaire

Num	Describe
1	Failure to account for unforeseen costs can lead to cost overruns in construction projects
2	Incomplete data and information regarding activities and materials can result in additional work that falls outside the scope of the contract.
3	Errors in estimating project costs can lead to an inflation of project execution costs.
4	Shortages of construction materials during project execution can cause an increase in project costs.
5	Failure to account for national economic inflation and the escalation of material prices can contribute to cost overruns.
6	Insufficient control and quality management of materials can lead to an increase in project costs..
7	Delays in the supply of materials can hinder project execution, resulting in cost overruns.
8	Weak logistics oversight, leading to the loss of materials, can increase project costs.
9	Shortages of labor can impede project execution and lead to cost overruns.
10	Low productivity and poor quality of human resources can result in an inflation of project costs.
11	Poor worker performance, leading to errors or mistakes, can increase project costs.
12	High costs for renting or purchasing equipment—often due to a lack of prior market research—can lead to an increase in project costs.
13	High costs associated with the mobilization and demobilization of equipment can cause cost overruns.
14	Insufficient attention to occupational health and safety (OHS) can lead to an increase in project costs.
15	Poor coordination between functions within the Work Breakdown Structure (WBS) can necessitate rework, thereby increasing project costs.
16	A lack of understanding among workers regarding construction drawings and provided instructions can lead to an inflation of project costs.
17	Requests for additional work by the project owner can result in cost overruns.
18	Poor coordination between field managers and project workers can lead to an increase in project costs.
19	Work instructions that are not correctly understood by workers can lead to errors, resulting in cost overruns.
20	Limited funding sources available to the contractor can hinder project execution, potentially leading to cost overruns.
21	Limited funding sources available to the contractor can hinder project execution, potentially leading to cost overruns.
22	Assigning personnel to roles that do not align with their expertise can disrupt project execution and result in higher costs.
23	Design changes that occur during the project execution phase can contribute to cost overruns.
24	Developing an unrealistic project schedule can lead to delays, which in turn contribute to cost overruns.

Num	Describe
25	Unfavorable weather conditions during project execution can cause delays and an increase in project costs.

RESULTS AND DISCUSSION

1. Validity Test

The initial stage involved conducting a validity test on the questionnaire, based on responses received from 37 participants.
The validity test results indicate that item V1.1/Q1 has an *r-calculated* value of 0.258, which is lower than the *r-table* value of 0.325; therefore, this item is considered invalid. Item V1.1/Q1 addresses the indicator regarding the failure to account for unexpected costs within the cost estimation variable. The remaining 24 items have *r-calculated* values greater than the *r-table* value, rendering them valid and suitable for subsequent analysis, as shown in Table 4. Consequently, the initial total of 25 indicators was reduced to 24 for further data processing.Uji Validitas

Tabel 4. Bivariate Validity Test Results Output

Num	Code Item	Question Code	Variable	Indicator	r Calculate	r Table	Information
1	V1.2	Q2	Estimated costs	Data and information regarding activities/materials are incomplete.	0,444	0,325	Valid
2	V1.3	Q3	Estimated costs	Errors in cost estimation	0,429	0,325	Valid
3	V1.4	Q20	Estimated costs	Limited contractor capital	0,530	0,325	Valid
4	V1.5	Q21	Estimated costs	Additional work resulting from design and drawing changes	0,431	0,325	Valid
5	V2.1	Q4	Material	Shortage of construction materials	0,655	0,325	Valid
6	V2.2	Q5	Material	Inflation and the escalation of material prices	0,612	0,325	Valid
7	V2.3	Q6	Material	Lack of control and quality assurance for materials	0,735	0,325	Valid
8	V2.4	Q7	Material	Delay in material supply	0,714	0,325	Valid
9	V2.5	Q8	Material	logistics oversight has resulted in the loss of materials.	0,727	0,325	Valid
10	V3.1	Q9	Man power	Labor shortage	0,798	0,325	Valid
11	V3.2	Q10	Man power	The productivity and quality of human resources are poor.	0,741	0,325	Valid

Num	Code Item	Question Code	Variable	Indicator	r Calculate	r Table	Information
12	V3.3	Q11	Man power	Poor employee performance that leads to work errors	0,666	0,325	Valid
13	V3.4	Q22	Man power	Inappropriate placement of personnel	0,732	0,325	Valid
14	V4.1	Q12	Equipment	Rental or purchase costs for equipment are high because no prior survey was conducted.	0,873	0,325	Valid
15	V4.2	Q13	Equipment	The costs for equipment mobilization or demobilization are high.	0,856	0,325	Valid
16	V5.1	Q14	Others	Lack of attention to occupational health and safety (OHS)	0,705	0,325	Valid
17	V5.2	Q15	Others	Coordination between functions within the WBS is poor.	0,779	0,325	Valid
18	V5.3	Q16	Others	lack of understanding regarding drawings and instructions	0,820	0,325	Valid
19	V5.4	Q17	Others	Request for additional work by the project owner	0,769	0,325	Valid
20	V5.5	Q18	Others	Poor coordination between field managers and project workers	0,619	0,325	Valid
21	V5.6	Q19	Others	Instructions are not properly understood	0,770	0,325	Valid
22	V5.7	Q23	Others	Design changes during execution	0,592	0,325	Valid
23	V5.8	Q24	Others	Unrealistic project scheduling	0,716	0,325	Valid
24	V5.9	Q25	Others	Adverse weather conditions lead to cost overruns	0,675	0,325	Valid

2. Reliability Test

A reliability test is conducted to determine the level of consistency in respondents' answers to questionnaire items. The testing is performed using Cronbach's Alpha. An instrument or variable is considered reliable if its Cronbach's Alpha value is greater than 0.700, as shown in Table 5.

In the analysis by variable, the categories of Material, Labor, Equipment, and Others each yielded a Cronbach's Alpha value greater than 0.700, indicating they are reliable. The variable "Cost Estimation" resulted in a Cronbach's Alpha value of 0.522; as it failed to meet the reliability criteria, it was excluded from further analysis, leaving only 4 variables to be used in the subsequent stages of the study.
Consequently, the initial 24 indicators—derived from 5 variables—were reduced to 20 indicators, stemming from the 4 variables identified as causes of cost overruns.

Table 5. Reliability Test Output Results

Code Variable	Variable	Number of Item	Cronbach's Alpha	Note	Criteria
V2	Material	5	0,871	Reliabel	> 0,700
V3	Man Power	4	0,827	Reliabel	> 0,700
V4	Equipment	2	0,938	Reliabel	> 0,700
V5	Others	9	0,913	Reliabel	> 0,700

3. Calculation of the Relative Importance Index (RII)

The RII calculation was performed for 20 indicators of cost overrun. The Relative Importance Index (RII) is used to determine the relative level of importance for each indicator contributing to cost overruns, based on respondents' answers. The formula used is as follows:

$$RII = \Sigma W / (A \times N) \quad \text{.....(4.1)}$$

Where: ΣW is the sum of the respondents' scores, A is the highest weight on the Likert scale, and N is the total number of responden

Table 6 RII's Level of Importance (Faustine dan Waty, [15]**)**

RII Value	Level of Importance
0,0 - 0,2	Very Low
0,2 - 0,4	Low
0,4 - 0,6	Medium
0,6 - 0,8	High
0,8 - 1,0	Very High

The RII calculations have been performed, and the items have been ranked based on these results; the outcomes are presented in Table 7, ranging from the highest-ranked items—V2.3 and V3.1—to the lowest-ranked item, V3.3.

Tabel 7. RII Calculation Ranking Order

Ranking	Variable	Question Code	Factor	Total Value	RII	Level of Importance
1	V2.3	Q6	Lack of control and quality assurance for materials	202	0,910	Very High
1	V3.1	Q9	Labor Shortage	202	0,910	Very High

Ranking	Variable	Question Code	Factor	Total Value	RII	Level of Importance
2	V2.5	Q8	logistics oversight has resulted in the loss of materials.	201	0,905	Very High
3	V2.2	Q5	Inflation and the escalation of material prices	198	0,892	Very High
4	V4.1	Q12	Rental or purchase costs for equipment are high because no prior survey was conducted.	197	0,887	Very High
5	V2.1	Q4	Shortage of construction materials	196	0,883	Very High
6	V3.2	Q10	The productivity and quality of human resources are poor.	195	0,878	Very High
7	V5.6	Q19	Instructions are not properly understood	192	0,865	Very High
7	V5.7	Q23	Design changes during execution	192	0,865	Very High
8	V5.3	Q16	Workers' lack of understanding regarding drawings and instructions	191	0,860	Very High
8	V5.8	Q24	Unrealistic project scheduling	191	0,860	Very High
9	V4.2	Q13	The costs for equipment mobilization or demobilization are high.	190	0,856	Very High
10	V3.4	Q22	Inappropriate placement of personnel	188	0,847	Very High
11	V5.9	Q25	Adverse weather conditions lead to cost overruns	186	0,838	Very High
12	V5.5	Q18	Coordination between field managers and project workers	185	0,833	Very High
13	V2.4	Q7	Delay in material supply	183	0,824	Very High

Ranking	Variable	Question Code	Factor	Total Value	RII	Level of Importance
13	V5.4	Q17	Request for additional work by the project owner	183	0,824	Very High
14	V5.1	Q14	Lack of attention to occupational health and safety (OHS)	180	0,811	Very High
14	V5.2	Q15	Coordination between functions within the WBS is poor.	180	0,811	Very High
15	V3.3	Q11	Poor employee performance that leads to work errors	172	0,775	High

3.1 Overall Top 7 Highest RII Values

Summary of the top 7: The eleven indicators with the highest RII values demonstrate that the seven dominant factors do not originate from a single variable group; rather, they encompass variables related to materials, labor, equipment, and project management, as shown in Table 8.

Table 8. Top 7 Indicators with the Highest RII Values

Ranking	Variable	Question Code	Factor	Total Value	RII	Level of importance
1	V2.3	Q6	Lack of control and quality assurance for materials.	202	0,910	Very High
1	V3.1	Q9	Shortage man power	202	0,910	Very High
2	V2.5	Q8	logistics oversight has resulted in the loss of materials.	201	0,905	Very High
3	V2.2	Q5	Inflation and the escalation of material prices	198	0,892	Very High
4	V4.1	Q12	Rental or purchase costs for equipment are high because no prior survey was conducted.	197	0,887	Very High
5	V2.1	Q4	Shortage of construction materials	196	0,883	Very High
6	V3.2	Q10	The productivity and quality of human resources are poor.	195	0,878	Very High

Ranking	Variable	Question Code	Factor	Total Value	RII	Level of importance
6	V5.6	Q19	Instructions are not properly understood	192	0,865	Very High
6	V5.7	Q23	Design changes during execution	192	0,865	Very High
7	V5.3	Q16	Workers' lack of understanding regarding drawings and instructions	191	0,860	Very High
7	V5.8	Q24	Unrealistic project scheduling	191	0,860	Very High

3.2 RII Recapitulation by Variable

A recapitulation of the RII by variable was also conducted, revealing a high level of importance, as shown in Table 9.

Table 9. RII recapitulation based on variables

Ranking	Code Variable	Variable	Number of Item	Total Value	Nilai Maksimum	RII Variabel	Persentage	Category
1	V2	Material	5	980	1110	0,883	88.29%	Very high
2	V4	Equipment	2	387	444	0,872	87.16%	Very high
4	V3	Man Power	4	757	888	0,852	85.25%	Very high
5	V5	Others	9	1680	1998	0,841	84.08%	Very high

Summary by variable: The variable with the highest RII value is "Materials," with an RII of 0.883 (or 88.29%). This indicates that issues related to materials—such as quality control, price escalation, material availability, and logistics oversight—constitute a group of factors that must be prioritized in project cost control.

3.3 Ranking of Highest RII Values for Each Variable

Summary by variable: Within the "Materials" variable, the most significant indicator is a lack of control and quality management for materials. For the "Labor" variable, the primary indicator is a shortage of labor. Regarding the "Equipment" variable, the top indicator is high rental or purchase costs resulting from a failure to conduct proper market surveys. For the "Miscellaneous" category, the most prominent indicators are work instructions that are not correctly understood, as well as design changes during the execution phase; these findings are presented in Table 10

Table 10. Order of the largest RII indicators for each variable

Num	Variable	Ranking Variable	Code Item/Question	Indicator	Total Value	RII
1	V2 - Material	1	V2.3 / Q6	Lack of control and quality assurance for materials.	202	0,910
2	V2 - Material	2	V2.5 / Q8	logistics oversight has resulted in the loss of materials	201	0,905

Num	Variable	Ranking Variable	Code Item/Question	Indicator	Total Value	RII
3	V2 - Material	3	V2.2 / Q5	Inflation and the escalation of material prices	198	0,892
4	V2 - Material	4	V2.1 / Q4	Shortage of construction materials	196	0,883
5	V2 - Material	5	V2.4 / Q7	Delay in material supply	183	0,824
6	V3 – Man Power	1	V3.1 / Q9	Shortage man power	202	0,910
7	V3 – Man Power	2	V3.2 / Q10	The productivity and quality of human resources are poor.	195	0,878
8	V3 – Man Power	3	V3.4 / Q22	Inappropriate placement of personnel	188	0,847
9	V3 – Man Power	4	V3.3 / Q11	Poor employee performance that leads to work errors	172	0,775
10	V4 – equipment	1	V4.1 / Q12	Rental or purchase costs for equipment are high because no prior survey was conducted.	197	0,887
11	V4 – equipment	2	V4.2 / Q13	The costs for equipment mobilization or demobilization are high.	190	0,856
12	V5 - others	1	V5.6 / Q19	Instructions are not properly understood	192	0,865
13	V5 - others	2	V5.7 / Q23	Design changes during execution	192	0,865
14	V5 - others	3	V5.3 / Q16	Workers' lack of understanding regarding drawings and instructions	191	0,860
15	V5 - othersV	4	V5.8 / Q24	Unrealistic project scheduling	191	0,860
16	V5 – others	5	V5.9 / Q25	Adverse weather conditions lead to cost overruns	186	0,838
17	V5 - others	6	V5.5 / Q18	Coordination between field managers and project workers	185	0,833
18	V5 - others	7	V5.4 / Q17	Request for additional work by the project owner	183	0,824
19	V5 - others	8	V5.1 / Q14	Lack of attention to occupational health and safety (OHS)	180	0,811
20	V5 - others	9	V5.2 / Q15	Coordination between functions within the WBS is poor.	180	0,811

4. Cost Overrun Mitigation

Based on the eight indicators with the highest Relative Importance Index (RII) values, mitigation measures are required to directly address the causes of cost overruns. The following mitigation strategies are designed for implementation across the project planning, procurement, execution, and control phases, as outlined in Table 11.

Summary of mitigation measures: controlling cost overruns requires improving the accuracy of estimates, tightening the management of materials and logistics, ensuring an adequate and competent workforce, conducting surveys on equipment costs, and managing design changes through documented approval procedures

Table 11. Mitigating the Causes of Cost Overrun Based on the 10 Highest RII Values

Ranking	Causes of Cost Overrun	RII	Mitigation

1	Lack of control and quality control of materials	0,910	Establish material inspection and testing plans, use approved suppliers, inspect materials upon delivery, document test results, and reject materials that do not meet specifications.
1	Labor shortage	0,910	Plan workforce requirements based on the schedule and workload, prepare backup personnel or alternative subcontractors, recruit workers in advance, and monitor workforce adequacy weekly.
2	Weak logistics supervision leading to material losses.	0,905	Implement stock cards and digital record-keeping, restrict warehouse access, appoint responsible logistics personnel, conduct regular stocktaking, and reconcile material withdrawals with work requirements.
3	Inflation and escalation of material prices	0,892	Conduct regular market surveys and price updates, procure major materials in advance, establish fixed-price contracts or clear price escalation clauses, use alternative suppliers, and allocate contingency funds for price fluctuations.
4	High equipment rental or purchase costs due to the lack of prior surveys	0,887	Compare quotations from multiple providers, evaluate rental and purchase options based on usage duration, develop equipment utilization schedules, and minimize idle time through work coordination.
5	Shortages of construction materials	0,883	Develop procurement schedules aligned with construction schedules, establish safety stock levels for critical materials, monitor supplier lead times, and prepare more than one qualified supplier.
6	Poor human resource productivity and quality	0,878	Select workers based on their competencies, provide training and briefings before work begins, establish measurable productivity targets, strengthen supervision, and conduct performance evaluations and corrective actions.
7	Poor human resource productivity and quality	0,869	Coordinate and finalize designs before work begins, implement written change order procedures, assess cost and schedule impacts, and obtain project owner approval before carrying out additional work.
8	Work instructions not properly understood	0,865	Communicate work methods and the latest drawings through pre-work meetings or toolbox meetings, provide clear written instructions, confirm workers' understanding, and ensure that revised documents are distributed to all relevant parties.

CONCLUSION

Based on the questionnaire results and the Relative Importance Index (RII) method:
1. The primary causes of cost overruns are:
a. Lack of material quality control and oversight
b. Shortage of labor
c. Weak logistics supervision, leading to material loss
d. Inflation and escalation of material prices

e. High equipment rental or purchase costs due to a lack of prior market research
f. Shortage of construction materials
g. Poor productivity and quality of human resources
h. Additional work resulting from design and drawing changes
i. Work instructions that are not properly understood

2. The causes of cost overruns, ranked by variable from highest to lowest impact, are: materials (highest), followed by equipment**,** then labor, with "other variables" ranking the lowest.

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