



The Dominant Risk of Cost Overrun in Design and Build Building Construction Project at PT XYZ

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ABSTRACT: Design and build is intended as a strategy to integrate design and construction functions in order to reduce costs and streamline the coordination process. The responsibilities for design and construction are combined into a single entity, namely the general contractor. Field data indicate that this system is not entirely free from the threat of cost overruns. This study was conducted at PT XYZ, a state-owned contractor specializing in building construction services. The objectives of this study are to identify risks, determine the most dominant risks, and design risk response measures for building construction projects under design-and-build contracts. Based on data from PT XYZ's reports, it was found that 20 out of 45, or 44.44%, of design-and-build building projects experienced cost overruns. Data collection was conducted through literature reviews, interviews, and Likert-scale questionnaires distributed to respondents. Risk variables were categorized into several groups: design, construction, finance, legal, organizational management, and the external environment. Risk level analysis utilized the Probability-Impact Matrix (PIM) based on the ISO 31000:2018 standard. The risk identification results from the literature review identified 50 risk variables that contribute to cost overruns in building construction projects. The research results show that the dominant risks causing cost overruns include cost estimation errors, increases in indirect costs due to contract duration extensions, design errors, and unforeseen site conditions. The recommended risk response strategies include avoid, mitigate, transfer, and accept, depending on the characteristics of each risk.

KEYWORDS: Risk Management, Cost Overrun, Design and Build, ISO 31000:2018, Probability-Impact Matrix

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I. INTRODUCTION

The construction sector plays a crucial role in driving economic growth across various parts of the world, including Indonesia. However, this sector is widely recognized as having a very high level of risk, with the primary indicators being cost overruns and project delays. Various international studies confirm that in construction projects, cost overruns are an almost inevitable phenomenon [1]. This phenomenon indicates inefficiencies in the planning, control, and decision-making processes, particularly in projects that use the design-and-build contract system.

Design and build building project does not merely focus on physical work on-site; rather, it requires in-depth planning, precise engineering calculations, state of the art control management, and a complex multi-party coordination network. To bridge the complexities of conventional procurement schemes, the modern construction industry has adopted the integrated design-and-build contract mechanism. This system is proposed as a solution to streamline the relationship between the architect/planner team and the construction contractor. Within the design and build framework, full responsibility for both the design visualization process and physical execution is consolidated under the control of a single legal entity: the general contractor. This integrated governance model is projected to accelerate decision-making, eliminate overlapping contractual clauses, and reduce unexpected expenses resulting from miscommunication.

However, empirical evidence from the field reveals a contradictory reality. Various global analyses indicate that average cost overruns in design-build schemes range from 10% to 45% of the total base contract value [1]. A comprehensive study reveals that approximately 78% of public facility projects using the design-build scheme in several developing countries suffer from cost overruns exceeding 20% [2]. This is driven by a tendency to prepare overly optimistic initial cost estimates without thorough risk management calculations. In

Southeast Asia, similar issues plague ASEAN countries such as Malaysia, Thailand, and the Philippines, where fluctuations in material commodity prices, tender calculation errors, and weak on-site supervision are the dominant triggers for the collapse of a project’s financial stability [2].

In Indonesia, these cost management challenges are acutely felt by large corporations, one of which is PT XYZ, a subsidiary of a leading state-owned enterprise that has specialized in vertical construction since 2008. The track record shows that out of a total of 49 design-and-build contract-based projects handled, 45 have been completed and 4 are still in progress. Through an in-depth evaluation of the completed projects, it was found that 20 projects experienced significant cost overruns, equivalent to 44.44% of the total population of completed design-and-build projects.

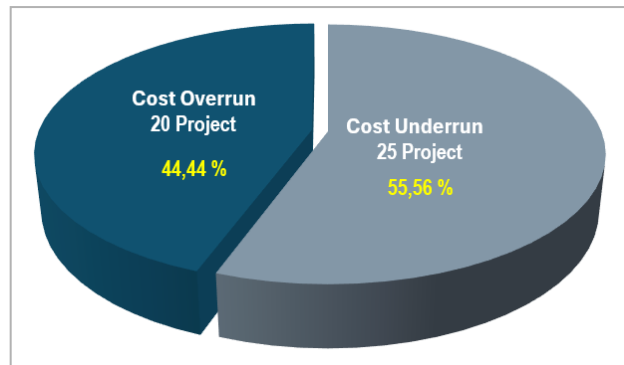


Figure 1: Cost performance design and build project PT XYZ
Source: PT XYZ, 2025

These cost overruns vary widely: 8 projects had deviations of less than 2%, 3 projects fell within the 2%–5% range, 2 projects were in the 5%–7% range, 2 projects were in the 7%–10% range, and 5 projects suffered extreme cost overruns exceeding 10%.

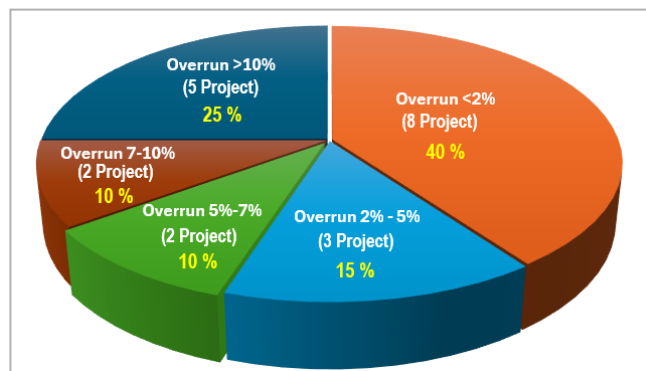


Figure 2: Prosentase cost overrun percentage for PT XYZ design and build project
Source: PT XYZ, 2025

These cost deviation conditions confirm that actual on-site operational expenditures exceeded the limits of the Implementation Cost Budget Plan (RABP) established at the start of the project, thereby eroding the corporation’s profit margins. Given that design-and-build contracts are often combined with a lumpsum scheme, all financial consequences resulting from design and on-site uncertainties automatically become the contractor’s full responsibility. Therefore, it is important to conduct an in depth analysis of the factors causing cost overruns in building construction projects using the design and build contract system implemented by PT XYZ. This study aims to identify the dominant risk factors causing cost overruns and to formulate more effective control strategies for the project. The results of this study are expected to improve the effectiveness of project cost control.

II. LITERATURE REVIEW

2.1. DESIGN AND BUILD

Design and build construction work encompasses the entire process of constructing a building or other physical structure, in which the design phase is integrated with the construction phase [3]. This approach bypasses the bureaucratic process of conventional procurement (design-bid-build), which requires the project owner to first appoint a design consultant and wait for the design to be completed before opening a tender for a construction contractor. This integration significantly reduces the total project duration (fast-tracking) and facilitates technical communication from the earliest stages.

Although it offers coordination advantages, this system imposes massive technical risks on service providers. In accordance with PUPR Ministerial Regulation No. 1 of 2020, the selection of integrated design and build construction projects must consider criteria that include: complex projects or specific projects [3]. The criteria for “complex” design-build projects, as defined in Article 5, paragraph (2) of Ministry of Public Works and Public Housing Regulation No. 1 of 2020, include: projects with high risk, requiring advanced technology, utilizing specially designed equipment, and presenting technical difficulties in defining how to meet procurement needs and objectives; and/or involves a high degree of uncertainty (unforeseen conditions) [3].

Concentrating full responsibility on a single contractor increases exposure to the risk of budget estimation failure if the project owner’s functional vision is not fully developed at the start of the bidding process. In other words, the design-and-build contract system is not merely a technical choice but also a collaborative strategy that demands synergy between speed, quality, and cost control. Its success depends heavily on the organization’s readiness to manage risks and its ability to adapt to the project’s complexity.

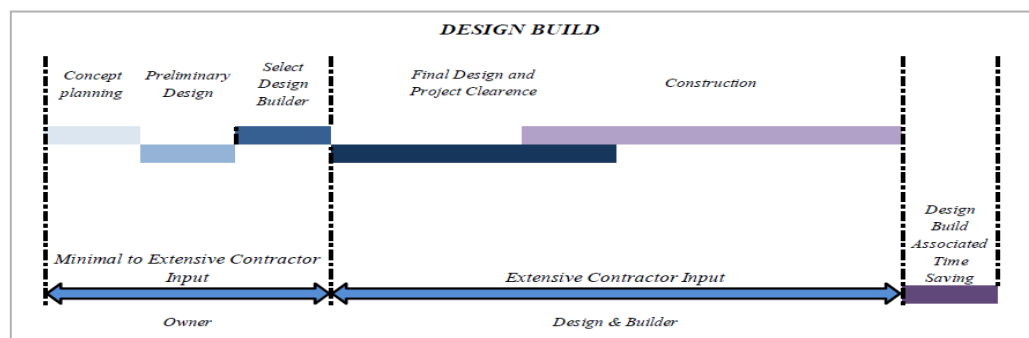


Figure 3: Design and Build Process

Source: Alam (2011)

2.2. RISK MANAGEMENT

Referring to the ISO 31000:2018 standard, risk is defined as the actual effect of uncertainty on the achievement of institutional or project objectives. In building construction, risk represents the probability of events occurring that have a negative impact on the project’s budget, schedule, and quality [4]. The anatomy of risk consists of three essential components: the triggering event, the probability or likelihood of that event occurring, and the magnitude of the resulting financial or operational loss (impact or consequence) [5]. ISO 31000:2018 outlines eight key principles of risk management: Integrated, Structured and Comprehensive, Customized, Inclusive, Dynamic, Best Available Information, Human and Cultural Factors, and Continual Improvement [6].

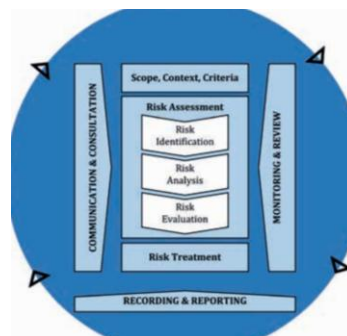


Figure 4: Manajemen Risiko ISO 31000:2018

Source: ISO 31000:2018

Risk management in construction projects involves a systematic process to identify, analyze, and respond to risks throughout the project lifecycle (Smith et al., 2020). According to ISO 31000:2018, the risk management process consists of a series of activities, including: (1) Communication and Consultation, (2) Scope, Context, and Criteria, (3) Risk Assessment (Risk Identification, Risk Analysis, Risk Evaluation), (4) Risk Treatment (Transfer, Mitigation, Avoidance, Acceptance), (5) Monitoring and Review, (6) Documentation and Reporting [6].

2.3. COST OVERRUN

A cost overrun is defined as a situation in which the actual cost at the end of a project exceeds the agreed-upon and approved Project Cost Budget (RABP). The factors triggering this cost overrun can be classified into internal factors, such as: managerial errors, low labor productivity, errors in work methods, and design amendments. In addition, external factors include material price escalations due to economic conditions, changes in legal regulations, owner intervention, and natural disasters [7].

III. RESEARCH METHODOLOGY

The methodology was structured systematically, beginning with a comprehensive literature review to identify risk variables, which were then validated by experts. Respondent data were collected in a structured manner using a formal questionnaire based on a 5 point Likert scale to measure perceptions of the probability and significance of the impact of each risk variable [8].

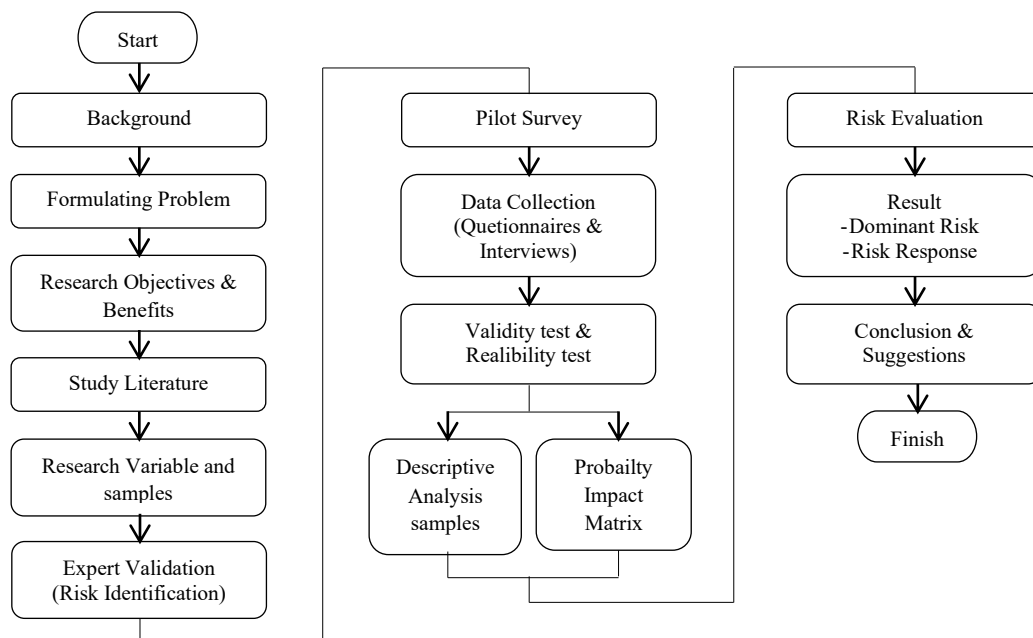


Figure 5: Research Design
Source: Processed Results, 2026

3.1. POPULATION AND SAMPLE

The population in this study consists of all building construction projects under design-and-build contracts that have been completed by PT XYZ and experienced cost overruns, totaling 20 projects.

The sample taken in this study were actors representing several building construction projects with design and build contracts that had been completed by PT XYZ and experienced cost overruns, with a sample size of 20 projects.

3.2. DATA COLLECTION TECHNIQUES

Primary data is data obtained from original sources without going through intermediaries or being processed by third parties. Primary data was collected through questionnaires and interviews with respondents or experts. Secondary data consists of data or information obtained from literature reviews, such as books, journals, papers, and previous studies, and can also be referred to as processed data. Data collection was conducted in several stages, including:

1. Stage 1: Conducting a literature review to identify risks related to cost overruns in building construction and design-build projects. This is followed by validation with experts to determine whether the variables are relevant.
2. Stage 2: A pilot survey was conducted to evaluate respondents' level of understanding of the questions; the survey was distributed to 5 respondents.
3. Stage 3: Distributing a 1–5 Likert-scale questionnaire to determine the probability and impact levels of cost overruns in design-and-build building construction projects.

Table 1. Cost Overrun Probability Scale

Scale	Probability	Keterangan
1	Very Low	The possibility of this happening is very small or almost never happens
2	Low	The possibility of something happening is small or occurring within a certain here
3	Medium	It may occur periodically or occasionally
4	High	The possibility of it happening is large or frequent
5	Very High	The possibility of this happening is very high or almost always happens

Source: Processed Results, 2026

Table 2. Cost Overrun Impact Scale

Skala	Impact	Keterangan
1	Very Low	The impact is not significant or has no effect on costs
2	Low	Minor impact on project costs (<5%)
3	Medium	Quite an impact on project costs (5%-7%)
4	High	Has a major impact on project costs (7%-10%)
5	Very High	Has a significant impact on project costs (>10%)

Source: Processed Results, 2026

3.3. DATA ANALYSIS TECHNIQUES

1. Risk Identification

Obtained through data collection from various literature studies and previous research related to risk factors that cause cost overruns. In addition, interviews were also conducted to obtain in-depth information and confirm the validity of the data obtained. The variables obtained were then validated by experts to ensure the data was relevant

2. Validity and Realibility Tests

The validity test used was the Pearson Product-Moment Correlation method, which involves comparing the calculated correlation coefficient (r) with the table value of r . If the calculated r is greater than the table value of r , the data is considered valid; conversely, if the calculated r is less than the table value of r , the data is considered invalid. Furthermore, if the sig. (2-tailed) value is less than 0.05, the results are considered valid; conversely, if the sig. (2-tailed) value is greater than 0.05, the results are considered invalid.

3. Risk Analysis

This analysis is conducted after obtaining the probability and impact values from respondents and using the Probability Impact Matrix. The probability and impact values for each risk variable—derived from the results of the respondent questionnaire—are then analyzed by calculating the Severity Index, which represents the responses of multiple respondents. The Severity Index can be calculated using the following equation:

$$SI = \frac{\sum_{i=1}^5 a_i x_i}{5 \sum_{i=1}^5 x_i} \quad (1)$$

Keterangan:

SI = Severity Index

a_i = Assesment Constant

x_i = Respondent Frequency

I = 0,1,2,3,4.....n

x_1, x_2, x_3 are the reponse frequency

The Severity Index calculation results are displayed as percentages, which are then converted into a probability and impact rating scale as shown in the following table:

Table 3. Severy Index Scale

Description	Code	Scale	Severity Index (%)
Very Low	SK	1	≤ 20%
Low	K	2	21% - 40%
Medium	SK	3	41% - 60%
High	B	4	61% - 80%
Very High	SB	5	81% - 100%

Source: Setyaning et al (2023)

The Severity Index calculation results are used to determine the probability and impact scale values for each risk, which are then multiplied using the following equation [9]. Dari penilaian risiko, lalu diurutkan berdasarkan peringkat nilainya untuk mengetahui faktor dominan dari risiko tersebut.

$$R = P \times I \tag{2}$$

Notes:

R = Risk Level

R = Probabilitas





I = Dampak

The results of the risk level calculations are then entered into the Probability-Impact Matrix to determine the risk category for each variable.

PROBABILITY	Very High	5	5	10	15	20	25
	High	4	4	8	12	16	20
	Medium	3	3	6	9	12	15
	Low	2	2	4	6	8	10
	Very Low	1	1	2	3	4	5
			1	2	3	4	5
			Very Low	Low	Medium	High	Very High
IMPACT							

Figure 6: Risk Matrix
Source: PT XYZ (2025)

Table 4. Risk Category

Risk Value (R = P x I)	Risk Level	Symbol
≤ 2	Low	
3 - 7	Moderate	
8 - 14	High	
15 - 25	Very High	

Source: PT XYZ (2025)

4. Risk Response

Risk response aims to reduce the likelihood of a risk occurring, reduce its impact, or alter the risk's characteristics so that it falls within a level acceptable to the project. Risk response can be divided into several strategies, namely risk avoidance (avoiding the risk), risk mitigation (reducing the probability or impact of the risk), risk transfer (transferring the risk to another party, for example through insurance or a contract), and risk acceptance (accepting the risk with certain controls in place).

IV. RESULT AND DISCUSSION

4.1. IDENTIFIKASI RISIKO

Risk identification began with a literature review. The literature review identified 47 risk variables that influence cost overruns in building projects under design-and-build contracts. Subsequently, expert validation was conducted via a questionnaire regarding the identified risk variables. Based on the results of the expert validation, all variables were deemed relevant, and three additional variables were identified, bringing the total number of risk variables to 50.

Table 5. Risk Identification

Variable	Types of Risk
Design	
X1	The design team's understanding of applicable regulatory standards
X2	Miss cost estimates
X3	Miss design
X4	Misinterpretation of actual site data for tender
X5	Clarity in defining the project scope in the TOR
X6	Owner's willingness to provide input on the design
X7	Frequent design and specification changes
X8	Delays in design approval
X9	Lack of BIM technology implementation
Construction	
X10	Accidents due to errors in construction methods
X11	Changes in the scope of work
X12	Incorrect methods applied to the project, both new and established methods
X13	Rework due to failure to meet quality standards
X14	Poor accuracy of the project program
X15	Negligence and delays by subcontractors
X16	Owner rejection of work
X17	Construction delays
X18	Lack of skilled workers
X19	Project management planning
X20	Increased indirect costs due to extended contract duration
X21	Site challenges and soil conditions
X22	Many works with unforeseen condition
X23	Contract addendum due to numerous changes made by the Owner during the implementation process
X24	Lack of competency in implementing value engineering in construction
Finance	
X25	Late payments by the Owner
X26	Long delays in payments
X27	Owner fails to pay due to financial constraints
X28	Owner's limited budget
X29	Unstable currency value
Contractual dan Legal	
X30	Unclear contract definitions
X31	The right to claim additional costs for all articles is removed
X32	Hirarki dokumen yang keliru dan tidak jelas

Variable	Types of Risk
X33	Incomplete documents
X34	Contractor's misinterpretation of the contract
X35	Unlimited late fees to the contractor
X36	Contractual disputes
X37	Unfamiliarity with the contract
Organizational Management	
X38	Coordination and communication between departments within the contractor's work
X39	Communication between expert teams in design and build work, both during the planning and implementation processes
X40	Inexperienced staff
X41	Project Manager competency in implementing Design and Build projects
External dan Environmental	
X42	The Owner's understanding of calculating the Design and Build budget according to the
X43	Conditions and environment do not match initial expectations
X44	Local regulations
X45	Changes in the government's political and economic situation or policies
X46	Owner intervention
X47	Fluctuations in labor costs and material prices
X48	Temporary suspension of work by the Owner
X49	Uncontrollable events: Pandemics, natural disasters, and political instability
X50	Difficulties in obtaining permits and approvals from the Owner during various construction processes

Source: Processed Results, 2026

4.2. VALIDITY AND RELIABILITY TESTS

The validity test was conducted using the Pearson correlation method (Pearson Product Moment Correlation) and SPSS version 30 software. By determining the r-table value based on a total of 20 respondents and the specified significance level, the r-table value ($df = N - 2$) at a 5% significance level was calculated to be 0.4438. Based on the validity test results using SPSS, it was determined that 14 variables were invalid and must be removed from the list of variables, namely: X1, X4, X5, X6, X8, X9, X13, X25, X26, X28, X35, X38, X39, and X41.

The reliability test in this study used the Cronbach's Alpha technique, conducted using SPSS version 30. A measurement instrument is considered reliable if the Cronbach's Alpha value is greater than 0.70, and vice versa. The results of the SPSS reliability test showed that Cronbach's Alpha had a value higher than 0.70, so it can be deemed reliable.

4.3. DESCRIPTIVE ANALYSIS

An initial overview of each cost overrun risk in a building project with a design and build contract can be carried out using descriptive analysis at each probability level and impact level.

Table 6. Analisis Deskriptif Probabilitas Risiko

No	Code	Type of Risk	Scale					Mean	Min	Max	Median	Modus	Probability Level
			1	2	3	4	5						
Design													
1	X2	Miss cost estimates	0	3	3	11	3	3,70	2	5	4,00	4	Besar
2	X3	Miss design	0	7	5	7	1	3,10	2	5	3,00	2	Sedang
3	X7	Frequent design and specification changes	1	2	4	10	3	3,60	1	5	4,00	4	Besar
Construction													
4	X10	Accidents due to errors in construction methods	5	8	3	4	0	2,30	1	4	2,00	2	Kecil
5	X11	Changes in the scope of work	4	1	7	7	1	3,00	1	5	3,00	3	Sedang

No	Code	Type of Risk	Scale					Mean	Min	Max	Median	Modus	Probability Level
			1	2	3	4	5						
6	X12	Incorrect methods applied to the project, both new and established methods	4	5	7	4	0	2,55	1	4	3,00	3	Sedang
7	X14	Poor accuracy of the project program	1	7	9	3	0	2,70	1	4	3,00	3	Sedang
8	X15	Negligence and delays by subcontractors	1	5	8	5	1	3,00	1	5	3,00	3	Sedang
9	X16	Owner rejection of work	2	9	5	4	0	2,55	1	4	2,00	2	Sedang
10	X17	Construction delays	0	6	8	6	0	3,00	2	4	3,00	3	Sedang
11	X18	Lack of skilled workers	4	9	4	2	1	2,35	1	5	2,00	2	Kecil
12	X19	Project management planning	1	7	5	6	1	2,95	1	5	3,00	2	Sedang
13	X20	Increased indirect costs due to extended contract duration	1	2	2	7	8	3,95	1	5	4,00	5	Besar
14	X21	Site challenges and soil conditions	0	9	5	4	2	2,95	2	5	3,00	2	Sedang
15	X22	Many works with unforeseen condition	0	3	4	8	5	3,75	2	5	4,00	4	Besar
16	X23	Contract addendum due to numerous changes made by the Owner during the implementation process	3	0	8	8	1	3,20	1	5	3,00	3	Sedang
17	X24	Lack of competency in implementing value engineering in construction	3	7	7	3	0	2,50	1	4	2,50	2	Besar
Finance													
18	X27	Owner fails to pay due to financial	10	8	0	0	2	1,80	1	5	1,50	1	Kecil
19	X29	Unstable currency value	6	8	2	2	2	2,30	1	5	2,00	2	Kecil
Contractual dan Legal													
20	X30	Unclear contract definitions	1	6	9	3	1	2,85	1	5	3,00	3	Sedang
21	X31	The right to claim additional costs for all articles is removed	6	5	5	4	0	2,35	1	4	2,00	1	Kecil
22	X32	Incorrect and unclear document hierarchy	5	6	7	2	0	2,30	1	4	2,00	3	Kecil
23	X33	Incomplete documents	3	9	5	2	1	2,45	1	5	2,00	2	Kecil
24	X34	Contractor's misinterpretation of the contract	2	8	7	3	0	2,55	1	4	2,50	2	Sedang
25	X36	Contractual disputes	3	5	8	2	2	2,75	1	5	3,00	3	Sedang
26	X37	Unfamiliarity with the contract	6	9	4	1	0	2,00	1	4	2,00	2	Kecil
Organizational Management													
27	X40	Inexperienced staff	4	8	8	0	0	2,20	1	3	2,00	2	Kecil
External dan Environmental													
28	X42	The Owner's understanding of calculating the Design and Build budget according to the TOR	2	5	7	3	3	3,00	1	5	3,00	3	Sedang
29	X43	Conditions and environment do not match initial expectations	0	8	7	3	2	2,95	2	5	3,00	2	Sedang
30	X44	Local regulations	4	6	6	2	2	2,60	1	5	2,50	2	Sedang
31	X45	Changes in the government's political and economic situation or policies	3	7	5	4	1	2,65	1	5	2,50	2	Sedang
32	X46	Owner intervention	0	7	8	3	2	3,00	2	5	3,00	3	Sedang
33	X47	Fluctuations in labor costs and material prices	2	7	4	4	3	2,95	1	5	3,00	2	Sedang
34	X48	Temporary suspension of work by the Owner	5	7	4	2	2	2,45	1	5	2,00	2	Kecil
35	X49	Uncontrollable events: Pandemics, natural disasters, and political instability	6	8	2	3	1	2,25	1	5	2,00	2	Kecil
36	X50	Difficulties in obtaining permits and approvals from the Owner during various construction processes	5	5	6	4	0	2,45	1	4	2,50	3	Kecil

Source: Processed Results, 2026

Table 7. Analisis Deskriptif Dampak Risiko

No	Code	Type of Risk	Scale					Mean	Min	Max	Median	Modus	Probability Level
			1	2	3	4	5						
Design													
1	X2	Miss cost estimates	0	1	2	5	12	4,40	2	5	5,00	5	Besar
2	X3	Miss design	0	2	2	10	6	4,00	2	5	4,00	4	Besar
3	X7	Frequent design and specification changes	2	5	6	5	2	3,00	1	5	3,00	3	Sedang
Construction													
4	X10	Accidents due to errors in construction methods	3	3	3	7	4	3,30	1	5	4,00	4	Sedang
5	X11	Changes in the scope of work	1	4	7	5	3	3,25	1	5	3,00	3	Sedang
6	X12	Incorrect methods applied to the project, both new and established methods	2	3	9	5	1	3,00	1	5	3,00	3	Sedang
7	X14	Poor accuracy of the project program	3	3	6	6	2	3,05	1	5	3,00	3	Sedang
8	X15	Negligence and delays by subcontractors	0	3	8	4	5	3,55	2	5	3,00	3	Besar
9	X16	Owner rejection of work	1	6	3	6	4	3,30	1	5	3,50	2	Sedang
10	X17	Construction delays	1	2	4	7	6	3,75	1	5	4,00	4	Besar
11	X18	Lack of skilled workers	4	6	5	3	2	2,65	1	5	2,50	2	Sedang
12	X19	Project management planning	1	5	6	5	3	3,20	1	5	3,00	3	Sedang
13	X20	Increased indirect costs due to extended contract duration	1	1	2	8	8	4,05	1	5	4,00	4	Besar
14	X21	Site challenges and soil conditions	0	4	7	6	3	3,40	2	5	3,00	3	Sedang
15	X22	Many works with unforeseen condition	0	1	6	8	5	3,85	2	5	4,00	4	Besar
16	X23	Contract addendum due to numerous changes made by the Owner during the implementation process	3	2	10	2	3	3,00	1	5	3,00	3	Sedang
17	X24	Lack of competency in implementing value engineering in construction	2	5	9	3	1	2,80	1	5	3,00	3	Sedang
Finance													
18	X27	Owner fails to pay due to financial	3	5	3	7	2	3,00	1	5	3,00	4	Sedang
19	X29	Unstable currency value	4	6	3	5	2	2,75	1	5	2,50	2	Sedang
Contractual dan Legal													
20	X30	Unclear contract definitions	2	4	7	6	1	3,00	1	5	3,00	3	Sedang
21	X31	The right to claim additional costs for all articles is removed	2	3	5	7	3	3,30	1	5	3,50	4	Sedang
22	X32	Incorrect and unclear document hierarchy	2	6	6	4	2	2,90	1	5	3,00	2	Sedang
23	X33	Incomplete documents	2	5	3	9	1	3,10	1	5	3,50	4	Sedang
24	X34	Contractor's misinterpretation of the contract	2	3	6	6	3	3,25	1	5	3,00	4	Sedang
25	X36	Contractual disputes	2	3	8	4	3	3,15	1	5	3,00	3	Besar
26	X37	Unfamiliarity with the contract	4	4	6	4	2	2,80	1	5	3,00	3	Sedang
Organizational Management													
27	X40	Inexperienced staff	4	5	7	3	1	2,60	1	5	3,00	3	Sedang
External dan Environmental													
28	X42	The Owner's understanding of calculating the Design and Build budget according to the TOR	1	3	4	5	7	3,70	1	5	4,00	5	Besar
29	X43	Conditions and environment do not match initial expectations	0	2	9	5	4	3,55	2	5	3,00	3	Besar
30	X44	Local regulations	2	6	5	7	0	2,85	1	4	3,00	4	Sedang
31	X45	Changes in the government's political and economic situation or policies	3	3	8	3	3	3,00	1	5	3,00	3	Sedang
32	X46	Owner intervention	0	4	6	5	5	3,55	2	5	3,50	3	Besar
33	X47	Fluctuations in labor costs and material prices	0	4	6	7	3	3,45	2	5	3,50	4	Sedang

No	Code	Type of Risk	Scale					Mean	Min	Max	Median	Modus	Probability Level
			1	2	3	4	5						
34	X48	Temporary suspension of work by the Owner	4	4	3	5	4	3,05	1	5	3,00	4	Sedang
35	X49	Uncontrollable events: Pandemics, natural disasters, and political instability	1	4	8	5	2	3,15	1	5	3,00	3	Sedang
36	X50	Difficulties in obtaining permits and approvals from the Owner during various construction processes	2	4	6	8	0	3,00	1	4	3,00	4	Sedang

Source: Processed Results, 2026

4.4. ANALISIS RISIKO

Metode Probabilty Impact Matrix digunakan untuk melakukan analisis risiko yang dilakukan dalam penelitian ini. Nilai Severity Index dihitung dari data yang diperoleh dari hasil penilaian kuisisioner skala likert yang telah diisi oleh seluruh responden, yang bertujuan untuk mengetahui nilai tingkat risiko

Table 8. Analisis Risiko

No	Code	Type of Risk	Probability		Impact		Risk Value (R=PxI)	Risk Level
			SI	Scale	SI	Scale		
Design								
1	X2	Miss cost estimates	74%	4	88%	5	20	Very High
2	X3	Miss design	62%	4	80%	4	16	Very High
3	X7	Frequent design and specification changes	72%	4	60%	3	12	High
Construction								
4	X10	Accidents due to errors in construction methods	46%	3	66%	4	12	High
5	X11	Changes in the scope of work	60%	3	65%	4	12	High
6	X12	Incorrect methods applied to the project, both new and established methods	51%	3	60%	3	9	High
7	X14	Poor accuracy of the project program	54%	3	61%	4	12	High
8	X15	Negligence and delays by subcontractors	60%	3	71%	4	12	High
9	X16	Owner rejection of work	51%	3	66%	4	12	High
10	X17	Construction delays	60%	3	75%	4	12	High
11	X18	Lack of skilled workers	47%	3	53%	3	9	High
12	X19	Project management planning	59%	3	64%	4	12	High
13	X20	Increased indirect costs due to extended contract duration	79%	4	81%	5	20	Very High
14	X21	Site challenges and soil conditions	59%	3	68%	4	12	High
15	X22	Many works with unforeseen condition	75%	4	77%	4	16	Very High
16	X23	Contract addendum due to numerous changes made by the Owner during the implementation process	64%	4	60%	3	12	High
17	X24	Lack of competency in implementing value engineering in construction	50%	3	56%	3	9	High
Finance								
18	X27	Owner fails to pay due to financial constraints	36%	2	60%	3	6	Moderat
19	X29	Unstable currency value	46%	3	55%	3	9	High
Contractual dan Legal								
20	X30	Unclear contract definitions	57%	3	60%	3	9	High
21	X31	The right to claim additional costs for all articles is removed	47%	3	66%	4	12	High
22	X32	Incorrect and unclear document hierarchy	46%	3	58%	3	9	High
23	X33	Incomplete documents	49%	3	62%	4	12	High
24	X34	Contractor's misinterpretation of the contract	51%	3	65%	4	12	High

No	Code	Type of Risk	Probability		Impact		Risk Value (R=P×I)	Risk Level
			SI	Scale	SI	Scale		
25	X36	Contractual disputes	55%	3	63%	4	12	High
26	X37	Unfamiliarity with the contract	40%	2	56%	3	6	Moderat
Organizational Management								
27	X40	Inexperienced staff	44%	3	52%	3	9	High
External dan Environmental								
28	X42	The Owner's understanding of calculating the Design and Build budget according to the	60%	3	74%	4	12	High
29	X43	Conditions and environment do not match initial expectations	59%	3	71%	4	12	High
30	X44	Local regulations	52%	3	57%	3	9	High
31	X45	Changes in the government's political and economic situation or policies	53%	3	60%	3	9	High
32	X46	Owner intervention	60%	3	71%	4	12	High
33	X47	Fluctuations in labor costs and material prices	59%	3	69%	4	12	High
34	X48	Temporary suspension of work by the Owner	49%	3	61%	4	12	High
35	X49	Uncontrollable events: Pandemics, natural disasters, and political instability	45%	3	63%	4	12	High
36	X50	Difficulties in obtaining permits and approvals from the Owner during various construction processes	49%	3	60%	3	9	High

Source: Processed Results, 2026

Untuk dapat mengetahui risiko mana saja yang masuk dalam kategori rendah, moderat, tinggi dan sangat tinggi, maka setiap variabel risiko dimasukkan ke dalam matriks risiko sesuai dengan kategorinya. Berdasarkan Tabel 8, kemudian dilakukan pemetaan kategori risiko kedalam Probability Impact Matrix sesuai tingkat risiko yang telah dihitung.

PROBABILITY	Very High	5					
	High	4			X7, X23	X3, X22	X2, X20
	Medium	3			X12, X18, X24, X29, X30, X32, X40, X44, X45, X50	X10, X11, X14, X15, X16, X17, X19, X21, X31, X33, X34, X36, X42, X43, X46, X47, X48, X49	
	Low	2			X27, X37	X27	
	Very Low	1					
			1	2	3	4	5
			Very Low	Low	Medium	High	Very High
			Impact				

Figure 7: Pemetaan Risiko
Source: Processed Results, 2026

Berdasarkan Figure 5 dapat diketahui bahwa terdapat 4 risiko dengan kategori Sangat Tinggi, 30 risiko dengan kategori Tinggi, dan 2 risiko dengan kategori Moderat. Risiko dominan adalah risiko dengan nilai tertinggi atau yang memiliki kategori risiko Sangat Tinggi. Sehingga dapat disimpulkan bahwa risiko dominan cost overrun pada proyek gedung dengan kontrak design and build adalah pada variable X2, X3, X20 dan X22.

Table 9. Risiko Dominan

Rank	Code	Type of Risk	Risk Value	Risk Level
1	X2	Miss cost estimates	20	Very High
2	X20	Increased indirect costs due to extended contract duration	20	Very High
3	X3	Miss design	16	Very High
4	X22	Many works with unforeseen condition	16	Very High

Source: Processed Results, 2026

4.5. RESPON RISIKO

Untuk menentukan risiko mana yang perlu dilakukan pengelolaan risiko terlebih dahulu, maka dapat dilihat berdasarkan level risikonya. Respon risiko dalam penelitian ini hanya dilakukan pada risiko dominan, yaitu risiko yang berada pada kategori level risiko Sangat Tinggi. Respon risiko diperoleh melalui kuisioner atau wawancara kepada responden yang memberikan nilai skala 5 (lima) pada tingkat probabilitas dan tingkat dampak, yang kemudian dilakukan validasi kepada pakar. Respon risiko terhadap risiko dominan cost overrun proyek gedung dengan kontrak design and build dapat dilihat pada Table 8.

Table 10. Respon Risiko Dominan

No	Risk	Cause	Impact	Risk Response			
				Avoid	Mitigate	Transfer	Accept
1	Miss cost estimates	a. Unclear scope of work from the owner b. Not thoroughly studying the tender	a. Margin not achieved b. Project incurs losses	a. Study all tender documents. b. Clarify details with the owner during the tender regarding the scope of work and specifications.	a. Checking document hierarchy during b. Monthly cost control evaluations	a. Using a QS consultant to cost estimation calculations.	a. Looking for opportunities through Value Engineering b. Implementing lean construction
2	Increased indirect costs due to extended contract duration	a. Delayed design and material approval from the owner b. Long design process due to repeated c. Changes in the scope of work from the owner	a. Margin not achieved b. Project incurs losses	a. Rejecting requests for changes to the scope of work that impact the implementation time. b. Identifying the critical path of the work.	a. Limiting design requests or suggestions from the owner b. Periodic evaluation of the implementation schedule	a. Implementing a late penalty clause against subcontractors, and eliminating overhead claims for time extensions. b. Reporting any obstacles or constraints impacting the implementation schedule in each daily report.	a. Optimizing personnel needs and operational costs b. Claiming overhead costs if caused by negligence or a request for a scope change by the owner
3	Miss design	a. Invalid field data b. Lack of understanding in design	a. The design is not synchronized between the structure, the architect, and the MEP. b. The actual cost does not match the plan.	a. Collaborate with consultants or experts in specific fields during the design process. b. Conduct checks between the ToR/ToR, specification outline, and Work Plan	a. Documentation and regular monitoring of field conditions	a. VA/VE accompanied by technical justification	

No	Risk	Cause	Impact	Risk Response			
				Avoid	Mitigate	Transfer	Accept
4	Many works with unforeseen condition	a. Unpredictable field conditions b. Incomplete existing data c. Difficult to reach or limited site access	a. The volume of work increases from the initial estimate or the work method changes. b. Unplanned additional costs	a. Avoid making technical assumptions based on limited supporting data. b. Survey existing conditions directly on-site to obtain accurate data.	a. Documenting and monitoring site conditions b. Reporting any unforeseen conditions to the owner	a. Using specialist subcontractors to transfer risk b. Using insurance to anticipate unforeseen conditions	a. Submitting a claim for unforeseen event costs b. Identify the risks for each work item in detail.

Source: Processed Results, 2026

V. CONCLUSION

PT XYZ is a subsidiary of a state owned enterprise engaged in the construction sector. There are 20 PT XYZ projects that experienced cost overrun in the implementation of design and build building projects. The results of risk identification based on literature studies and expert validation, obtained as many as 50 risk variables that influence cost overrun in building projects with design and build contracts. Based on the risk analysis, 4 variables were found with a Very High risk level, 30 variables with a High risk level, 2 variables with a Moderate risk level and for the low risk level was not found. The dominant risk is the risk that has a Very High risk level, in this study, the dominant risk of cost overrun at PT XYZ for building projects with design and build contracts includes: Miss cost estimates, Increased indirect costs due to extended contract duration, Miss design, and Many works with unforeseen conditions. These dominant risks can be carried out several strategies to anticipate risks, including risk avoidance, risk mitigation, risk transferring and risk accepting.

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