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Development Of Alliance Strategy in The Implementation Of Risk-Based EPC Projects To Enhance Cost Performance Capacity Of PT XYZ

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ABSTRACT: In Indonesia's construction industry, EPC (Engineering, Procurement, Construction) contracts have become a widely recognized option, especially for projects with high levels of complexity. PT XYZ, as a state-owned construction company (BUMN), is actively involved in EPC projects in sectors such as power plants, factories, and oil processing. Given the high complexity of these projects, PT XYZ needs to form a consortium with partners to complement its limited capabilities. However, the formation of a consortium introduces risks that could potentially harm PT XYZ during project execution. This research aims to develop a risk management strategy to assist PT XYZ in making the right decisions in managing consortium risks, thereby enhancing the company's capacity to complete EPC projects. The research findings reveal that the highest risks occur during the construction phase, categorized as "Medium to High" level. These risks include "The Vendor Chosen by the Partner Lacks Competence", "Redesign Work, Design Errors or Defects, and Poor Design Variation Process Management", and "Poor Coordination Process Between Design, Procurement, and Construction"

Keywords: EPC project strategic alliance, construction, construction consortium, risk management, risk management for EPC Project, partnering

INTRODUCTION

In general, most construction companies in Indonesia are familiar with the EPC contract type, also known as Engineering-Procurement-Construction. This type of contract is often applied to complex projects supporting industrial development, which in turn contributes to the country's economic growth. EPC projects involve a complex process that includes a series of products (materials, equipment), services, and construction tasks, where each element is specifically designed to deliver a particular output for the client within a predetermined timeframe. Examples of such outputs include a building, a power plant, a ready-to-operate factory, or similar structures (Jiang & Tang, 2023).

In EPC projects, all stages of construction—from planning and design to procurement and execution—are the responsibility of the EPC contractor, who secures the job through a service provider selection process. The contractor assumes full responsibility from the beginning, covering engineering services, material procurement, and construction services. With the rapid growth of the global economy, reflected in the development of various industrial sectors, the popularity of EPC project procurement has significantly increased. The demand for EPC projects is driven by factors such as population growth, national economic growth, and a focus on sustainable development (Hansen, 2015).

Through the EPC (Engineering, Procurement, and Construction) approach, clients can rely on the contractor as a single entity responsible for design, procurement, and construction. This approach aims to deliver superior performance in areas such as early builder involvement, innovation, cost savings, schedule reductions, and improved quality (Du et al., 2016).

During the securing of EPC Projects, PT XYZ does not always have the ability to comply with the requirements laid out by the Client. This is due to the fact that PT XYZ is not a company that possesses the end-to-end technology or the requisite capabilities that are necessary in the execution of EPC projects on its own. For this reason, PT XYZ looks for assistance from other people to cover these weaknesses by entering into a non-legal partnership known as a joint operation or KSO, or forming consortiums (Kim et al., 2024).

As a matter of fact, the objective of establishing a joint operation (KSO) focus on enabling two or more parties to work together in relation to business activities with the goal of achieving certain purposes for the benefit of both the parties involved in the collaboration. However, this does not mean that the parties who are engaged in the collaboration are required to equally possess equal strengths or capabilities, or that the two parties will necessarily share the benefits equally. Instead, participants contribute or play a role in the business based on their respective strength or potential. Thus, the profits or losses which the parties sustain are proportional, that is, they correspond with the powers and capabilities of the party in question (Indarto et al., 2021).

However, it is shows in the table 1 below that despite forming a KSO, PT XYZ still experienced significant losses due to the designs prepared by its KSO partners. As shown in Table 1, there are four projects undertaken by PT XYZ suffered losses, mostly caused by the scope of work managed by its partners.

The underperformance of KSO partners has forced PT XYZ to bear losses caused by significant design errors, which have affected the company's revenue. For example:

- **Project A** suffered losses entirely due to the partner's technology not being functional within the system, leading to ongoing disputes.
- **Project B** experienced an overall loss of 39%, with 16% attributed to design errors.
- **Project C** incurred an overall loss of 13%, with 52% of that loss caused by design issues.
- **Project D** faced a loss of 7% of the contract value, of which 67% was due to design problems.

Table 1 Loses in PT XYZ due to Partner Performance in EPC Project

No	Project	Working with Consortiums	Total Contract	Contract Value (XYZ Portion)	Realized Loss (XYZ Portion)	Loss due to Partner Performances	Realized Loss (%) (XYZ Portion)	Loss due to Partner Performances (%)
			(a)	*(b)*	*(c)*	*(d)*	*(e) = (c)/(b)*	*(f) = (d)/(c)*
			(Rp)	(Rp)	(Rp)	(Rp)	(%)	(%)
1	Project A	Yes	Rp. 844,665,950,909	Rp. 128,114,391,000	Rp. 11,141,320,480	Rp 11,141,320,480	100%	100%
2	Project B	Yes	Rp 2,047,826,594,779	Rp. 2,043,226,727,990	Rp. 790,753,600,632	Rp. 129,558,203,988	39%	16%
3	Project A	Yes	Rp. 4,868,401,799,166	Rp. 664,159,197,000	Rp. 84,044,614,392	Rp. 44,119,044,733	13%	52%
4	Project B	Yes	Rp. 9,934,653,254,713	Rp. 4,372,010,006,000	Rp. 311,325,249,073	Rp 208,847,320,789	7%	67%

Due to this the Table 1 as shows, as a result, risk and risk management have become critical and pressing issues for companies and managers (Sadeghi et al., 2016).

Engineering, Procurement, and Construction (EPC) is a construction model that integrates the processes of engineering, procurement, and construction under a single contract. In an EPC project, the general contractor, appointed by the owner, is responsible for all tasks ranging from planning and material procurement to construction execution (Nurdiana & Susanti, 2020).

The engineering and design phase (E) has the greatest impact on the project, as many critical decisions are made during pre-project planning and the engineering phase. These decisions allocate a significant portion of the funds and other resources needed for successful project execution and completion. Engineering system design typically proceeds through several stages, including conceptual design, preliminary design, and detailed design (Yeo & Ning, 2002).

The engineering and design phase is immediately followed by the procurement phase (P). After receiving engineering drawings, specifications, and other relevant documents, contractors begin procuring project equipment and construction materials. Key activities in procurement/logistics include sourcing, purchasing, contracting, and on-site materials management (Aldhaheri et al., 2019).

During the construction phase (C), contractors start building the facilities as specified in the work packages prepared during the engineering phase, utilizing the equipment and materials procured in the procurement phase. The initial construction sequence is planned to reflect the most logical and cost-effective approach to meet the start and handover dates (Tarihoran & Latief, 2019).

Given these issues, it is essential for PT XYZ to identify inherent risk that may arise in approaching partnering scheme to be able to compete and manage an EPC project in order to stay relevant with One of the key stages of risk management is conducting risk analysis or assessment (Institute, 2017).

This research stands out by addressing the specific challenges of road infrastructure development in a rural village with abundant natural resources. Unlike prior studies that focus predominantly on urban areas or large-scale infrastructure projects, this study integrates community-driven insights, government collaboration, and sustainability principles. The tailored application of SWOT analysis for Tamansari Village provides a unique framework for leveraging local strengths and opportunities while mitigating weaknesses and threats in rural development.

The study aims to develop a comprehensive strategy for enhancing Tamansari Village's road infrastructure, focusing on sustainability and optimization of natural resources. The expected benefits include improved connectivity, better access to education and healthcare, and support for the local economy through agriculture, MSMEs, and tourism. This study not only addresses current infrastructure challenges but also lays a foundation for sustainable and inclusive growth, offering actionable recommendations for stakeholders to improve rural development outcomes.

RESEARCH METHODOLOGY

The data collection process conducted by the researcher for RQ 1 aims to gather various information, data, and conditions relevant to the study. The scope of this research employs the archival data collection method as an initial reference to understand how EPC projects are managed at PT XYZ. In this process, the researcher utilizes the existing SOPs at PT XYZ, which outline several activities included in these SOPs, as shown in Table 2.

Table 2 PT XYZ EPC Activites

No	XYZ Activities	Description
1	**Tendering Phase**	
a	Formation of the Tender Team	Formation of the Tender Team for PT XYZ and Potential KSO Partners
b	Preparation of Tender Documents	The Tender Team prepares the Tender Documents.
c	Submission of Tender Documents	The Tender Team, through a meeting, requests approval from management to submit the Tender Documents for the targeted/followed project.
d	Klarifikasi Dokumen Tender	Tim Tender melakukan presentasi kepada Owner atas hal teknis maupun komersial
2	**Engineering Phase**	
a	Development of DED, MTO, and Detailed Work Breakdown Structure.	Developing Detailed Engineering Design (DED), Material Take-Off (MTO), and Detailed Work Breakdown Structure (WBS)
3	**Procurement Phase**	
a	Procurement Planning according to needs	Based on the Material Taking Over (MTO) and Deliverable List that have been developed, the procurement plan is prepared, including identifying Long-Lead Items.
4	**Construction Phase**	
a	Preparation Before Construction	PT XYZ and the Partner conduct a pre-construction meeting to ensure the execution plan aligns with the fieldwork.
b	Construction Execution	PT XYZ and the Partner carry out the work during the Construction phase together or according to their respective scopes of work.
c	Commissioning Execution	PT XYZ and the Partner allocate resources to supervise the Commissioning process.
5	**Closure Phase**	
a	Resource Allocation during Maintenance Phase	PT XYZ and the Partner allocate resources needed during the project maintenance period.
b	Contract Closure	PT XYZ and the Partner fulfill all rights and obligations of the contract with the Owner or between KSO partners, including matters related to both work and commercial aspects.

In the second stage, Expert in the Table 3 will be used to assign the most relevant risk variables as shown in table 4 to each defined activities This study involves five experts to perform expert validation or expert judgment. The experts are stakeholders in the Construction and EPC Project and experience as a Contractor in PT XYZ. Their educational backgrounds include bachelor's degrees as well as master's degrees in engineering or management. A detailed profile of the experts is provided in Table 3 give validation

Table 3 Expert Profile

No	Expert	Position	Education	Working Experience
1	E1	Vice President	Master's Degree	15 Years
2	E2	Manager	Bachelor's Degree	15 Years
3	E3	Project Manager	Master's Degree	12 Years
4	E4	Expert Engineering	Bachelor's Degree	22 Years
5	E5	Manager	Master's Degree	10 Years

Table 4 Risk Variables

No	Variables	Description	Reference
X1	Inconsistency in Legal and Regulatory Policies	Regulatory uncertainty can lead to changes in rules, permits, or administrative requirements, which impact costs.	(Rizka & Isvara, 2021)
X2	Language Barrier	Decision-making errors and miscommunication that harm one party.	(Rizka & Isvara, 2021)
X3	Social and Security Factors	Social instability can lead to production halts, supply chain disruptions, or damage to physical infrastructure.	(Prasitsom & Likhitruangsilp, 2015)
X4	Conflict of Interest	Conflict of interest can lead to financial losses for the company, whether due to wrong decisions, unfair contracts, or misuse of funds.	Shapiro, S. P. (2005)
X5	Market Price Competition (Feasibility)	Price fairness in project tenders helps evaluate offers from various suppliers. Offers that are too high or too low compared to market prices result in: '- Additional costs due to cost deviations - Failure to secure new contracts	Expert Validation
X6	Deviation of Contract Provisions between Internal Partner and Owner Contract Provisions	Differences in the application of provisions within the agreement between the Owner and Consortium, and between Partners, lead to additional costs due to deviations in contract provisions/requirements.	Expert Validation
X7	Partner Selection	An incompetent partner often requires more time or additional resources to complete the work, which ultimately leads to cost overruns.	(Rizka & Isvara, 2021)
X8	Policy Changes Between Partner Companies	Partners may face increased operational costs when making adjustments to policies.	(Rizka & Isvara, 2021)
X9	Breach in Contractual Agreement	The affected party may be unable to meet the stipulated contract terms, which could lead to delays or an inability to complete the project on time and to the expected quality.	(Rizka & Isvara, 2021)
X10	Disputes in Technology Transfer	Technical issues arising from technological differences can lead to increased costs, whether due to the need for additional consultations, new hardware, or custom solution development. These unexpected costs can burden one or both parties.	(Rizka & Isvara, 2021)
X11	Lack of Communication Between Partners	Poor communication can lead to misunderstandings that need to be corrected, requiring additional costs or extended time to fix the mistakes that have occurred.	(Prasitsom & Likhitruangsilp, 2015)

No	Variables	Description	Reference
X12	Differences in Organizational Structure and Culture Between Partners	If both parties fail to adapt to differences in culture and organizational structure, it can affect the quality of project outputs. A lack of shared understanding regarding quality standards, workflows, and expectations may result in products that do not meet expectations.	(Prasitsom & Likhitruangsilp, 2015)
X13	Distrust Between Partners	Distrust directly increases the potential for conflicts, whether related to strategy, resources, or profit sharing.	(Prasitsom & Likhitruangsilp, 2015)
X14	Partner's Financial Capability	Cash flow issues can cause delays in project execution. If a partner is forced to take loans to cover cash flow shortages, they may face higher interest costs and stricter loan terms, further worsening their financial condition.	(Prasitsom & Likhitruangsilp, 2015)
X15	Inappropriate Intervention by Partner	Inappropriate interventions often trigger conflicts between partners, potentially damaging relationships and creating tension in the collaborative environment.	(Prasitsom & Likhitruangsilp, 2015)
X16	Price Intervention by Partner	Cost Overruns Due to Intervention	Expert Validation
X17	No Representative Office in Indonesia	Additional Costs if: '- A dispute occurs, causing PT XYZ to seek a partner company in the home country. - Potential tax penalties arise due to the company not being established locally.	Expert Validation
X18	Differences in the Choice of Law for Dispute Resolution	Cost Losses Due to Disputes	Expert Validation
X19	Redesign Work, Design Errors or Defects, and Poor Design Variation Process Management	Redesign requires additional resources, both in terms of time and cost. This may include costs for redevelopment, testing, and implementation.	(Zhang et al., 2018)
X20	Poor Coordination Process Between Design, Procurement, and Construction	Inefficiency in coordination can lead to additional costs, such as extra labor costs to correct mistakes or costs for incorrect materials.	(Zhang et al., 2018)
X21	Inaccurate Procurement Timing	Delays in procurement can lead to additional costs, including extra labor to manage the delays and potential increases in material costs.	(Nurdiana & Susanti, 2020)
X22	The Vendor Chosen by the Partner Lacks Competence	Errors or poor quality from the vendor can result in additional costs to fix issues, exceeding the project budget.	(Nurdiana & Susanti, 2020)
X23	Disagreement on Certain Contract Provisions	Resolving disagreements through negotiation or litigation can lead to	(Rizka & Isvara, 2021)

No	Variables	Description	Reference
		unexpected additional costs, affecting the project budget.	
X24	Poor Partner Relationship in the Project	A poor relationship can lead to miscommunication and escalate into disputes. additional costs may to resolve arising issues.	(Rizka & Isvara, 2021)
X25	Incomplete Provisions in the Contract	Resolving conflicts or disagreements due to incomplete provisions can lead to additional costs, both in terms of time and finances.	(Rizka & Isvara, 2021)
X26	Changes in Materials and Equipment Due to Design	Replacement of materials or equipment often brings unexpected additional costs, impacting the overall project budget.	Li et al., 2023
X27	Differences in Technological Capabilities	PT XYZ has no bargaining position if the partner with the technology undergoes changes that affect the technology to be used. If the technology fails to be implemented in the project, it will have consequences for PT XYZ.	Expert Validation

In the Third Stages respondents will perform a risk assessment by assessing the likelihood and severity of each risk factor for each activity mention above, using the measurement scales outlined in Tables 5 and 6. This evaluation will be conducted through a questionnaire given to 47 individuals involved in the project. Following this, the risk analysis will be carried out by computing the risk value, which is derived by multiplying the probability score with the impact score.

Table 5 Scale of Probablitily

Scale	PT XYZ Scale	Grade	Explanation
1	$\leq 10\ \%$	Very low	Very unlikely to occur
2	$10\ \% < P \leq 40\ \%$	Low	Unlikely to occur
3	$40\ \% < P \leq 60\ \%$	Moderate	Somewhat likely to occur
4	$60\ \% < P \leq 80\ \%$	High	Likely to occur
5	$> 80\ \%$	Very High	Very likely to occur

Table 6 Scale of Impact

Scale	Grade	Explanation
1	Very Low	Decline in EBIT/Net Income Deviation < 5%
2	Low	Decline in EBIT/Net Income Deviation 5% < Deviation ≤ 10%
3	Moderate	Decline in EBIT/Net Income Deviation 10%< Deviation ≤ 15%
4	High	Decline in EBIT/Net Income Deviation 15%< Deviation ≤ 20%
5	Very High	Decline in EBIT/Net Income Deviation Deviation >20%

After obtaining the risk values, the risks will be categorized based on the PT XYZ Risk Heat Map as shown in Figure 1. The final step involves ranking the risk factors from the highest

to the lowest risk values to establish priorities. This risk assessment method is qualitative and shall be an input to establish a strategy to prevent such risk occurring.

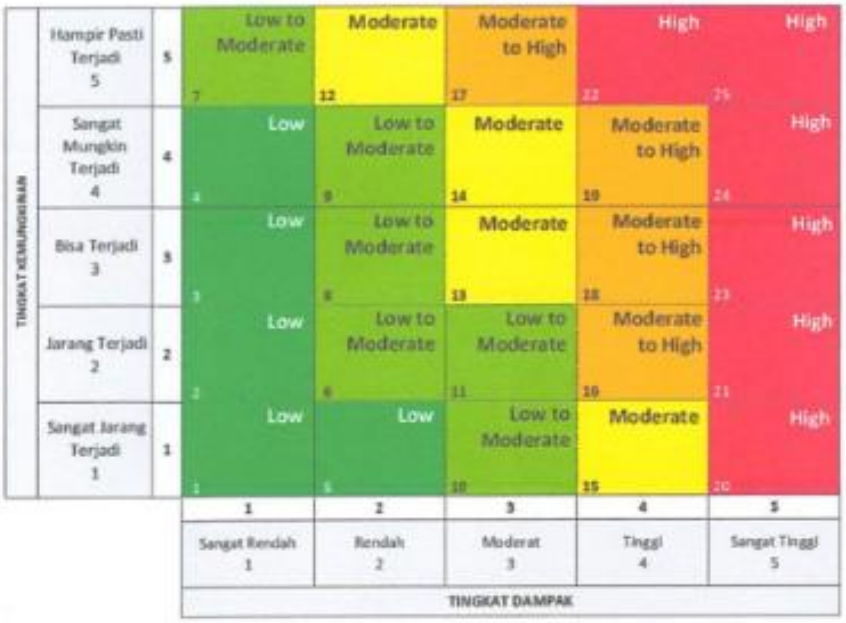

Figure 1 PT XYZ Risk Heat Map

RESULT AND DISCUSSION

The respondent survey phase involves 47 individuals from various institutions participating in the project, including the government as the project owner, contractors, supervision consultants, and academic professionals. The profile of the respondents is as follows:

a. Each selected respondent must have a minimum of 5 years of experience in the construction field, either in state-owned enterprises (BUMN) or private sectors, with knowledge or experience handling EPC projects;
b. The minimum education level for respondents filling out the questionnaire is a Bachelor's degree (Strata-1 or S1) in any field, provided they meet the requirements outlined in point (a);
c. There is no specific preference regarding gender.

The detailed profile of the respondents completing the questionnaire is shown in Figures 1 The majority of respondents have between 10 and 14 years of work experience in the construction field (41%), followed by 5 to 9 years (32%), with the remainder having 15 to 39 years of experience. Out of the 39 respondents, 31 hold a Bachelor's degree (S1), while 8 have a Master's degree (S2). In terms of gender, 40 respondents are male, while 7 are female.

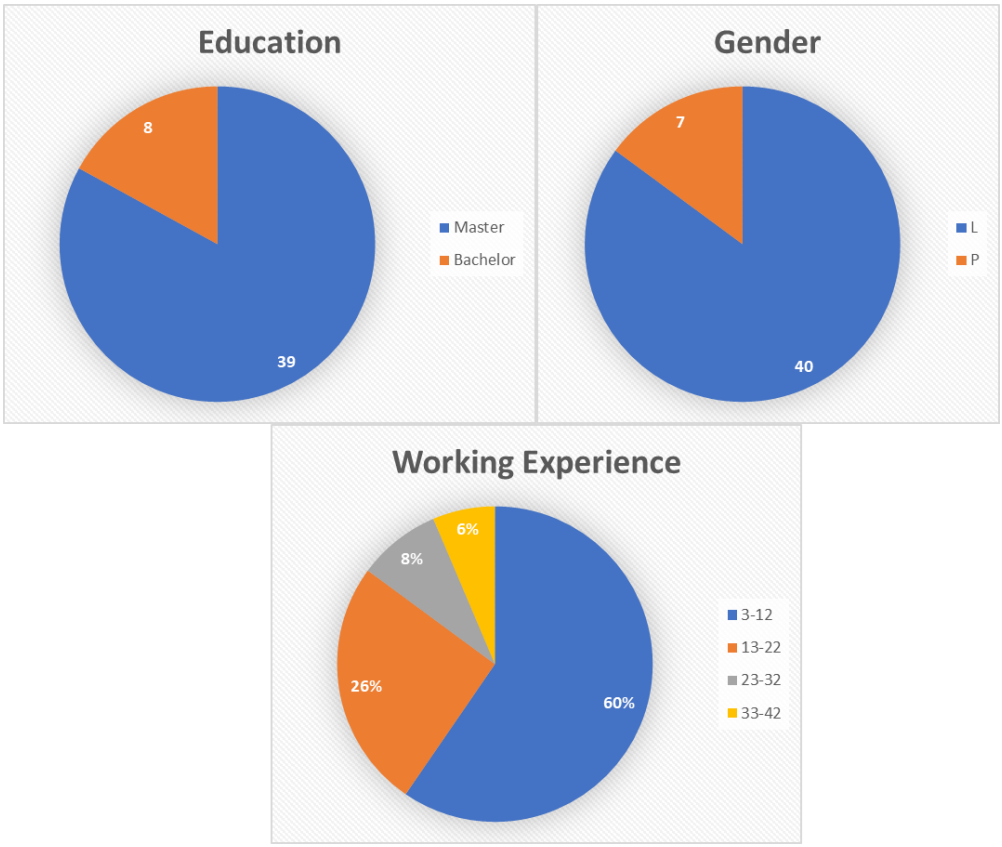

Figure 2 Respondent Profile

It can be concluded that most respondents meet the qualifications set by the criteria. Their extensive experience in construction, adequate formal education, and diverse gender representation provides a comprehensive and representative basis for the risk analysis of EPC projects in this study.

Risk Assessment

Table 7 Risk Assesment Result for each Activity

Activity 1							
Var	**Mean Probablility**	**Probability Scale**	**Impact**	**Impact Scale**	**Eksposure**	**Rank**	**Conclusion**
X4	3,83	Somewhat likely to occur	3,87	Moderate	14,83	1	Moderate
X5	3,83	Somewhat likely to occur	3,62	Moderate	13,85	3	Moderate
X7	3,79	Somewhat likely to occur	3,85	Moderate	14,58	2	Moderate
X14	3,57	Somewhat likely to occur	3,62	Moderate	12,93	5	Moderate
X23	3,79	Somewhat likely to occur	3,43	Moderate	12,97	4	Moderate
Activity 2							
Var	**Mean Probablility**	**Probability Scale**	**Impact**	**Impact Scale**	**Eksposure**	**Rank**	**Conclusion**
X19	3,96	Somewhat likely to occur	3,87	Moderate	15,32	1	Moderate
X14	3,98	Somewhat likely to occur	3,68	Moderate	14,65	2	Moderate
X5	3,77	Somewhat likely to occur	3,72	Moderate	14,02	3	Moderate
X22	3,70	Somewhat likely to occur	3,60	Moderate	13,31	4	Moderate
X21	3,72	Somewhat likely to occur	3,30	Moderate	12,28	5	Moderate
Activity 3							
Var	**Mean Probablility**	**Probability Scale**	**Impact**	**Impact Scale**	**Eksposure**	**Rank**	**Conclusion**
X13	3,89	Somewhat likely to occur	3,47	Moderate	13,50	1	Moderate
X4	3,79	Somewhat likely to occur	3,53	Moderate	13,38	2	Moderate

X5	3,62	Somewhat likely to occur	3,57	Moderate	12,93	3	Moderate
X14	3,80	Somewhat likely to occur	3,35	Moderate	12,74	4	Moderate
X22	3,55	Somewhat likely to occur	3,53	Moderate	12,55	5	Moderate

Activity 4

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X16	3,49	Somewhat likely to occur	3,32	Moderate	11,58	1	Moderate
X11	3,43	Somewhat likely to occur	3,34	Moderate	11,44	2	Moderate
X14	3,34	Somewhat likely to occur	3,40	Moderate	11,37	3	Moderate
X6	3,40	Somewhat likely to occur	3,34	Moderate	11,37	4	Moderate
X13	3,43	Somewhat likely to occur	3,32	Moderate	11,37	5	Moderate

Activity 5

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X19	3,91	Somewhat likely to occur	3,74	Moderate	14,66002716	1	Moderate
X22	3,79	Somewhat likely to occur	3,74	Moderate	14,1819828	2	Moderate
X20	3,70	Somewhat likely to occur	3,83	Moderate	14,13988658	3	Moderate
X5	3,72	Somewhat likely to occur	3,55	Moderate	13,22996831	4	Moderate
X26	3,64	Somewhat likely to occur	3,57	Moderate	13,00497963	5	Moderate

Activity 6

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X26	3,98	Somewhat likely to occur	3,62	Moderate	14,39	1	Moderate
X22	3,81	Somewhat likely to occur	3,66	Moderate	13,94	2	Moderate
X5	3,74	Somewhat likely to occur	3,66	Moderate	13,70	3	Moderate
X14	3,62	Somewhat likely to occur	3,77	Moderate	13,62	4	Moderate
X19	3,62	Somewhat likely to occur	3,74	Moderate	13,54	5	Moderate

Activity 7

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X22	3,89	Somewhat likely to occur	3,72	Moderate	14,50	1	Moderate
X26	3,66	Somewhat likely to occur	3,62	Moderate	13,24	2	Moderate
X3	3,45	Somewhat likely to occur	3,60	Moderate	12,39	3	Moderate
X21	3,36	Somewhat likely to occur	3,36	Moderate	11,30	4	Moderate
X14	3,32	Somewhat likely to occur	3,26	Moderate	10,80	5	Moderate

Activity 8

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X22	4,11	Likely to occur	4,06	High	16,69	1	Moderate to High
X19	4,02	Likely to occur	4,04	High	16,26	2	Moderate to High
X20	3,94	Somewhat likely to occur	4,06	High	16,00	3	Moderate to High
X3	3,89	Somewhat likely to occur	3,87	Moderate	15,08	4	Moderate
X5	3,85	Somewhat likely to occur	3,68	Moderate	14,18	5	Moderate

Activity 9

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X22	3,66	Somewhat likely to occur	3,70	Moderate	13,55	1	Moderate
X15	3,66	Somewhat likely to occur	3,38	Moderate	12,38	2	Moderate
X11	3,57	Somewhat likely to occur	3,40	Moderate	12,17	3	Moderate
X24	3,45	Somewhat likely to occur	3,45	Moderate	11,88	4	Moderate
X5	3,55	Somewhat likely to occur	3,26	Moderate	11,57	5	Moderate

Activity 10

Var	Mean Probablility	Probability Scale	Impact	Impact Scale	Eksposure	Rank	Conclusion
X4	3,51	Somewhat likely to occur	3,32	Moderate	11,65	1	Moderate
X6	3,23	Somewhat likely to occur	3,23	Moderate	10,46	3	Moderate
X6	3,23	Somewhat likely to occur	3,23	Moderate	10,46	3	Moderate

X26	3,19	Somewhat likely to occur	3,23	Moderate	10,32	4	Moderate
Activity 11							
Var	**Mean Probablility**	**Probability Scale**	**Impact**	**Impact Scale**	**Eksposure**	**Rank**	**Conclusion**
X1	3,57	Somewhat likely to occur	3,28	Moderate	11,71	1	Moderate
X9	3,40	Somewhat likely to occur	3,36	Moderate	11,44	2	Moderate
X6	3,30	Somewhat likely to occur	3,13	Moderate	10,31	3	Moderate

From the research conducted, the five highest risk values for each activity are presented in Table 7, During the Tendering, Engineering, Procurement, Construction, and Closing phases, the majority of partner-related risks for PT XYZ were categorized as Moderate. However, an exception occurred during the Construction phase, specifically in Activity 8, where risks X22 (The Vendor Chosen by the Partner Lacks Competence), X19 (Redesign Work, Design Errors or Defects, and Poor Design Variation Process Management), and X20 Poor Coordination Process Between Design, Procurement, and Construction were classified as "Moderate to High."

Design changes is one of the most vital factors that affect construction performance, specifically in the construction phase. These changes in construction projects are almost inevitable, and they usually bring excessive claims, disputes, additional work, and duplication of efforts contributing a project to experience a delay (Habibi et al., 2019).

Further risk treatment is essential as PT XYZ has established a policy to reduce impact risks from “Moderate” and above to the levels of "Low" or "Low to Moderate." Consequently, any risk categorized as "Moderate" or higher will be addressed in accordance with the company's internal procedures. Specifically:

- Moderate risks will be managed through reduction or mitigation strategies.
- Moderate to High risks will be addressed through reduction, mitigation, or risk transfer/sharing strategies.

CONCLUSION

This study concluded by gathering responses from individuals with experience in EPC projects and knowledge in managing project partnerships. It acknowledges that some risks are inherently tied to collaborating with partner companies. The findings highlight that the outcomes are primarily shaped by the risk criteria and parameters set by PT XYZ, as detailed in Tables 5 and 6. For a "Moderate" impact scale, risks are identified as potentially reducing PT XYZ's profits by 10% to 15% of the project. However, during Activity 8 of the Construction phase, a critical risk attributed to the partner—caused by design-related issues under their responsibility—is ranked as "Moderate to High." This classification indicates a potential revenue impact ranging from 15% to 20% of the contract value, which is the highest by the time this study conducted. Appropriate measures, aligned with the company's internal procedures, are necessary to manage this risk effectively.

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