

Budget Optimization using ISO 31000 Risk Assessment Method

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ABSTRACT

Cost is always associated with complexity and risk. Project that has high complexity increases the associated risks along with the costs. The article takes case study of a state-owned energy company, XYZ that builds electricity transmission projects around Indonesia. Transmission project has high complexity since it involves various expertise of contractors and subcontractors. Using subcontractors in a transmission project is a common thing and it poses many risks associated with the chain of contractors and her subcontractors. Indonesia is surrounded with variety of topology such as forests, mountains, rural areas, and islands, has variety of risks associated with them. The article proposes the use of ISO 31000 risk assessment method to identify dan mitigate all possible risks along with further budgeting policy. Budgeting policy is needed to assist the project owner to assess the scope of work of each work-breakdown task within the chain of contractors/subcontractors. By learning all costs within each task, project owner can develop effective cost measures that can be applied in various project conditions.

Key words: Project Risk and Budget Management, Electricity transmission system project, Chain of Contractors/ Subcontractors, ISO 31000 risk assessment method, Budgeting policy.

1. INTRODUCTION

Budget optimisation is a mandatory program that every project owner plans and executes. Although it sounds trivial, the budget optimisation process is not easy, especially dealing with the high-risk projects. The article takes case study of a state-owned energy company, XYZ, that builds electricity transmission system around Indonesia area and involves variety expertise of contractors along with its subcontractors. Transmission projects have high complexity and associated risks with them, so those risks need to be shared amongst contractors and subcontractors.

One of the common risks of transmission projects relates to budget plans and execution. The common risk within budgeting relates to poor planning, lack of project framework, longer duration of the project, poor quality of

work, miscommunication amongst contractors and so on. The risks increase along with the use of chain contractor(s) and subcontractors. The use of chain of contractor and subcontractors is unavoidable thing for transmission construction project since it has many objectives need to be accomplished such as: limited budgets and duration of project, high complexity of transmission system construction, and availability of qualified contractors/subcontractors on the sites during specific time. Project owner needs to ensure the use of budget to cover all potential risks associated with the project. In 2021, XYZ's annual report shows that the achievement rate of entire project has reached 79.74%, with more improvements compared to previous years. Although it shows some improvements, XYZ's management has paid special attention to the use of budgets that exceed expectations. The article examines the use of the ISO 31000 risk assessment method to assist budget management, to identify and propose budget preventive measures to assist project owners to lower project risks. XYZ corporate policy has required all project owners to pay special attention to category risks: high, very high and extreme.

Based on ISO 31000 method, all project owners should develop budget preventive and mitigation plan along with risks preventive measures.

2. THEORETICAL FRAMEWORK

2.1. Project Risk.

A project is always associated with uncertainty. The more uncertainty of a project, the more risks associated with the project. Project management assumes a high degree of certainty and levels of complexity sufficiently low that can be buffered by adding time to schedules and money to budgets and keep projects economically viable [1]. Wideman defines several definitions of a risk as: [2]

1. Unrecognized, unmanaged, or ignored (by default).
2. Recognized but no action taken (absorbed as a matter of policy).
3. Avoided (by taking appropriate steps).
4. Reduced (by an alternative approach).
5. Shared (with others, eg. By joint venture).

6. Transferred (to others through contract or insurance).
7. Retained and absorbed (by prudent allowances).
8. Handled by a combination of the above.

Based on the risk definition above, each project owner should make a cost assessment based on the possibility risk. In transmission projects, the risks can take more complex forms, especially related within contractor and subcontractors' relationships. The article examines each risk with budget preparation and measures.

2.2. Project Budget.

Project budget usually refers to the amount a client is willing to pay for work and it depends on constraints and allowable cost. The logic of project budget preparation is illustrated as:

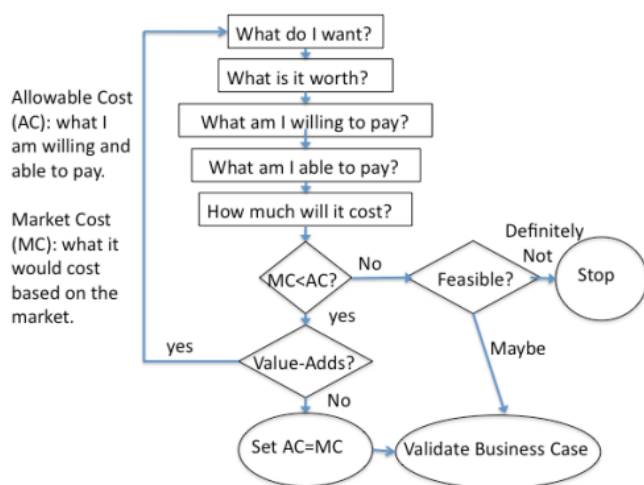


Figure 1: Determining the project budget [1].

Figure 1 shows the steps in determining the project budget:

1. What do I want?
Project plan should include details of the expectation of transmission system objectives including long-term plan (national and local government planning).
2. What is it worth?
How many contractors/ subcontractors are allowed in the cooperation: qualification, previous works, outcome of the works, trend of technology, etc.
3. What am I willing to pay?
How much costs are allocated for the project: contractor and subcontractors. What is the breakdown costs of each work.
4. What am I able to pay?
How do project owners prepare the possibility payment scheme: joint venture, profit sharing, leasing, etc.
5. How much will it cost?
Project owners should determine the range of costs (pessimistic and optimistic views), measure the effective cost utilization, and reuse scheme for next project.

Every project needs budget allocation to ensure the project objectives are kept on-track. This budget preparation is needed by the project owner to monitor and control any possible deviation from the initial project plan. High risk projects are always associated with uncertainty costs. To deal with additional uncertainty, cost preventive measures should be introduced from the earliest stage of Project Life Cycle (PLC), and hopefully to be used as a reference for incoming projects. Project owners and budget staff should work together to prepare an effective budget to anticipate all possible unavoidable risks.

There is uncertainty in five areas such as:[3]

1. Variability associated with estimates. Indonesia area surrounds with forests, mountains, rural areas, and islands. Each topographic has its own associated risks that may differ from one place to another. Each of the risks should be quantified as costs within the project.
2. Uncertainty about the basis estimates. The quality of estimates depends on who (contractor/ subcontractor) builds them (transmission project); what form (materials/equipment) they are in; why, how, and when they were built (project methods); from what resources and experience base (knowledge from previous projects); and what assumptions underpin them (best practices). Each subcontractor may develop its own project method that may differ from other subcontractors; although they are managed by their contractors, their work may deliver uncertainty impacts to some or entire projects. Transmission project has rigid schedule and target to accomplish. Project owners should deal with all kinds of uncertainty to ensure the project can be completed according to schedule.
3. Uncertainty about design and logistics. Design and logistics in transmission projects are very important. Improper design and logistics usually increase risks and has potential to delay or halt transmission projects.
4. Uncertainty about objectives and priorities. Although contractors and subcontractors are managed within the same works, they may have different objectives and priorities. Failure to anticipate common objectives and priorities may lead to project delays and poor quality of work. Any project deviation may relate to project costs (hidden or actuals).
5. Uncertainty about fundamental relationships between project parties. The involvement of multiple parties in a project raises the ambiguity of: (1). Specification of responsibilities; (2). perceptions of roles and responsibilities; (3). capability of parties; (4). Formal contractual conditions and their effects; (5). Informal understanding on top of. or instead of, formal contracts; (6). Mechanism for co-ordination and control. A transmission project may have multiple contractors/ subcontractors and third parties such inhabitants around transmission area, and local governments; In many cases the relationships amongst those project parties may not work well.

2.3. Project Risk and Mitigation Strategies

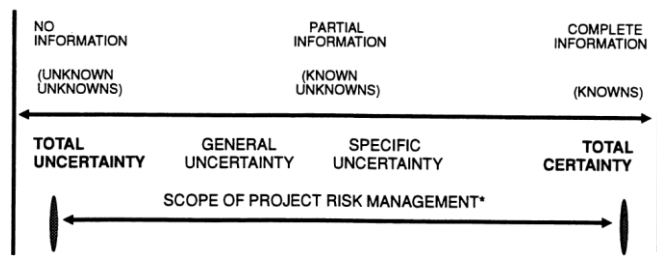


Figure 2: Scope of Project Risk Management [2].

Project budget is designated to address all possible risks along their mitigation strategy. It can be seen in the scope of project risk management, that has four domains: (see Figure 2. Scope of Project Risk management).

- Total uncertainty (No information). No risk is identified, and no further preventive measures are introduced. It is a risky project where a cost mitigation plan needs to be introduced.
- General uncertainty and Specific uncertainty (partial known or unknown information). Some of the risks are identified and preventive cost measures are introduced limited.
- Total certainty (complete information). All possible risks are identified in the early stage, and preventive cost measures are introduced in all stages of the project.

Mitigation strategies are common strategy that needs to embed in budgeting plan. Having an effective mitigation strategy ensures effective budget application. Tesch et.al.[4] examines the mitigation strategy as:

- Staff to meet requested deliverables or reduce requirements. The common problem faced by project owner such as unqualified staff within the contractors/subcontractors.
- Try to get cross-project experience or external support on a temporary basis. Knowledge from previous projects may assist the successful of the incoming project.
- Document staffing gaps and secure approval to address them. Project owner should make sure that document staffing gaps narrows within contractors and subcontractors in term of qualifications, understanding project framework, and budget implementation.
- Replace team members or, if there is enough time, retrain them. A subcontractor may work with several contractors, and a contractor also may have several contractors. Staff exchange between project is common in the transmission project. Project owner needs to make sure staff exchange between project runs smooth. Knowledge of a project can be reused for other projects.
- Re-assign people. Project owner needs to carefully re-assign contractors/subcontractors within the project. The transmission project may take place in several locations with the same contractors/subcontractors.
- Work with the project team to determine how to get

around the shortage. Shortage in certain projects may appear to many reasons, the project owner needs to make sure all contractor/ subcontractors can manage the shortage within in the project schedule.

2.4. Risk Register and Budgets

All unidentified risks should be recorded and calculated, since it is very difficult to determine accurate real risks. In many cases, the project owner may not be able precisely predict the number of probabilities and the impact in the early stage [4] . The variances between budgets and actual costs in each transmission project may differ significantly. Project owners should submit risk register and estimate cost allocations within the budget. The common category of risk registers and risk budgets versus actual costs is illustrated below.

Table 1: Risk Register and Risk Budgets versus Actual Costs [5].

Category	Risks
Natural and Environmental	Weather impacts.
Political	Regulation changes against constructors.
Financial	Exchange rate change. Capital funding impacts. Cash flow impacts. High costs due to improper bidding parties. Poor estimating. Increased labor costs. Increased material and equipment costs.
Technical	Design changes. New risks due to new technologies. Failures in production equipment. Scope change. Technology selection. Implementation methodology. Delay due to excessive approve procedures.
Managerial	Quality management risk. Strikes of subcontractors. Poor communications. Assigning unqualified project participations. Late making decisions. Lack of coordination between projects participants. Lack of professional pre-planning studies. Capability of owner’s project group. Contractor capability. Vendor’s capability. Others.

Project owner should submit risk register and risk budget along with budget plan. We use ISO 31000 risk assessment techniques to assist in issuing budget policy.

2.5. Risk Assessment Techniques

The article applies ISO 31010 risk assessment techniques to identify and manage all potential risks of project and

optimize cost usage. Whenever the risks are managed properly, the use of budget becomes more productive. The benefits of ISO 31010 risk in budget optimization are summarized as: [6], [7]:

- Providing objective information for cost allocation of each work.
- An understanding of the costs of uncertainties, risks and opportunities, their potential impacts upon objectives and success.
- Identifying, analyzing, and evaluating risks and determining the need for their treatment costs.
- Quantification of ranking of risks and cost preventive measures.
- Contributing to the understanding of risks to assist in the selection of treatment and cost-effective options.
- Identify important contributors to risks and weak links in systems and organizations. It relates to the flow of budgets from project owner to contractor, and contractor to subcontractors. Project owners should be able to monitor these flows to ensure the project runs smoothly.
- Comparing the risks in alternative systems, technologies, or approaches, along with the costs.
- Rationalizing a basis for preventive maintenance and inspection. It relates to preventing all necessary project penalties.

3. RESEARCH METHOD

3.1. ISO 31010 Risk Assessment Framework

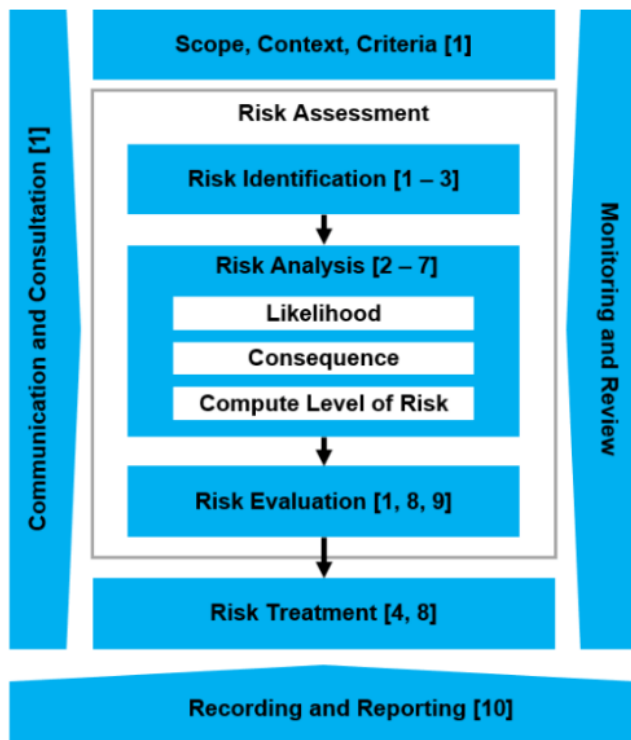


Figure 4. ISO 31010 Risk Assessment Techniques [8].

The article examines the case study of XYZ company that has applied the ISO 31010 Risk Assessment Techniques to manage and mitigate all possible risks within transmission project. The article examines several techniques that are related to managing costs are highlighted as:

1. Techniques for understanding consequences and likelihood. Project owner should examine all pessimistic and optimistic views of the project, and introduce preventive measures in each step of design and implementation.
2. Techniques for analysing dependencies and interactions. Since the transmission project includes contractor and subcontractors, so each of scope of work that conducted by subcontractors should be quantified based on their risks/budgets.

Table 2: Risk Level Description.

Risk Level	Description
Low	Has no impact to the project objective. There is no further risk prevention measurement is required. No cost measure is required.
Moderate	Has little impact to project objectives. Current control measurements is still effective to manage the risk; however it needs further prevention steps (to higher degree). Some cost measure may introduce such warnings. No further cost measure is needed.
High	Has direct impact to project objectives. Current control measurement is ineffective to lower the risk. It requires additional risk and cost control measurements.
Very High	Has high potential to disrupt the project. Probability of project failures is high. Urgent project control and cost measurement needs to apply immediately.
Extreme	Risk has disaster impacts to strategic objectives and systematic plan, and has high potential to halt entire business process and project implementation. Cost mitigation plan is introduced.

Table 3: Risk Parameter and Probability.

Level	Risk Parameter	Probabilities	Description	Previous events
E	Very High	> 90%	Almost certain to occur.	Occurrence more than once within last 6 months.
D	High	70% - 90%	Most Likely to occur.	Occurrence once within last 6 months.

C	Moderate	>30% - <70%	Likely to occur.	Occurrence once within last 1 year.
B	Low	10%-30 %	Less Likely to occur.	No Occurrence within last 1 year.
A	Very Low	<10%	Almost no chance to occur.	No Occurrence more than 1 year.

3. Techniques for selecting between options. Adjustments are made to make to lower all risks are categorised in high, very high and extreme risks to moderate and low area. The XYZ has developed a project risk management reference for all project owners. It is summarised as follow: [9]

- Risk Level description (see Table 2).
- Risk Parameter and Probability (see Table 3).

3.2. Data Gathering Methods

The article conducts data gathering in the electricity transmission construction area that involves contractors and subcontractors. The data gathering methods involves observation and interviews with key stakeholders such as project owners, project budget planners, project managers in the contractors and subcontractors. The data gatherings were conducted in 2022, and the findings were further compared with history records in last 5 years, literature studies, and standard risk profile in XYZ company.

4. FINDINGS AND DISCUSSION

Based on the data gathering results, we elicit views from project owner and project managers, and identify the risks as follows:

4.1. Risk Analysis

We examined the risk assessment in the category (see Table 4): high, very high, and extreme (No.1, 2, 5, 7, 8, 11, 12, 13).

Table 4. Current Risk Assessment.

No	Risk Identification	Risk Assessment			
		Possibility Level	Impact Level	Risk Level	
Information Flows	1	Incomplete information scope of work that transfers to subcontractors (initiation plan).	Mode-rate	Mode-rate	High
	2	Weakness in contract that manages criterion and specification of subcontractors.	Mode-rate	Mode-rate	High

3	Information manipulation oleh subcontractors	Low	Mode-rate	Mode-rate
4	Lack of resources that fulfill specification of subcontractors.	Low	Mode-rate	Mode-rate
5	No SOP control transfer work to subcontractor from project owner to main contractor.	High	Mode-rate	High
10	Lack of monitoring and work supervision	Mode-rate	Minor	Moderate
13	Monetary policy changes cause pending payment to contractors /subcontractors.	Low	In-significant	Low

Table 4. Current Risk Assessment (continued).

No	Risk Identification	Risk Assessment			
		Possibility Level	Impact Level	Risk Level	
Flow of Materials/ Equipment	6	Technical change of Project Owner	Moderate	Minor	Mode-rate
	7	Work of subcontractors do not comply with contract requirements	Moderate	Significant	High
	8	Subcontractor lateness in completing work	High	Significant	Extreme
	9	Lack allocation of workforce done by subcontractor	Moderate	Minor	Moderate
	10	Lack of monitoring and work supervision	Moderate	Minor	Moderate
Flow of Budgets	11	Pending payment from Project Owner to contractors.	Mode-rate	Significant	High
	12	Inappropriate internal financial management contractors that cause delay to subcontractors.	Mode-rate	Mode-rate	High
	13	Monetary policy change that cause pending payment to contractors /subcontractors.	Mode-rate	In-significant	High

4.3. Risk Mitigation

We evaluate the significance of risks and select between possible options. Risk mitigation is introduced to address the risk level high, very high, and extreme as follows:

A. Flow of Information.

No	Risk Identification	Mitigation measurements	Budgeting Policy
1	Incomplete information scope of work and specification at the initial stage.	Setup minimum requirements/ criterion type of works that can be delegated (initial technical planning).	A detailed budget for each scope of work should be introduced in the initial stage. It assists project owners to monitor the implementation of scope of work.
2	Weakness in contract content that manages criterion and specification of the subcontractors.	Setup minimum requirements/ criterion qualification of subcontractor in tender contracts	List of minimum requirements/ criterion qualification of subcontractor should be mapped into budget lists.

A. Flow of Information (continued).

No	Risk Identification	Mitigation measurements	Budgeting Policy
3	No SOP controlling work-transfer from project owner and contractor to subcontractors.	Make SOP transfer work and agreement to use contractors/ subcontractors.	SOP transfer work and agreements, along with budget lists should be attached. Budget lists will assist project owner to assess the risk of projects.

B. Flow of Materials/ Equipment.

No	Risk Identification	Mitigation measurements	Budgeting Policy
7	Subcontractor results do not meet specification of contract.	Intensify monitoring/ control and legal awareness to contract compliance and regulation.	Penalty warnings should be issued whenever results progress deviates to specification of contract. Project owner can assist further mitigation steps.

8	Lateness to complete the work.	Intensify monitoring/control and legal awareness to contract and regulation.	Project owners should develop monitoring evaluation (money) plan in each stage and mitigation steps to prevent any possible lateness.
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C. Flow of Budget.

No	Risk Identification	Mitigation measurements	Budgeting Policy
11	Payment pending from contractor to subcontractors.	Impose a penalty and delay payment according to the contract agreement.	Penalty warning should be issued for any potential payment pending for third party (subcontractors).
12	Inappropriate internal financial management contractors that cause delay to subcontractors.	Contractor should report progress of each of task. It is stated in Work-Break-Down.	Warning should be issued whenever the contractor fails to submit progress of each task.
13	Monetary policy change that causes pending payment to contractors /subcontractors.	Contract amendment should be introduced to policy change.	Budgeting term should be updated according to amendment.

Applying further budget measures and risk mitigation methods has enabled to increase the project achievements to 93.93%, in end of December 2022, from 79.74% in 2021. Project managers of contractors/ subcontractors have developed adjustment programs to any project change. Project owners are enabled to remove all hidden costs associated within contractors/ subcontractors.

5. CONCLUSION

The use of contractors and subcontractors in the transmission project is unavoidable thing since it requires various expertise. Project owner needs to ensure the risks associated within the chain of contractors/ subcontractors can be managed properly. The article uses the ISO 31000 risk assessment method to assist managing project risks along with further budgeting policy. By applying ISO 31000, the project owner has succeeded in increasing project achievements to 93.93% in 2022. Budgeting policy has created awareness amongst project owners and project managers related to all associated risks (perceived and actual).

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