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Operational Risk Analysis in Construction Projects (Case Study in PT ABC)

Dedy Ghozim Herdiyanto[1], Chaerul D. Djakman[2]
[1]dedyherdiyanto@gmail.com, [2]chaerul.djakman@ui.ac.id
[1,2]Departement of Accounting, Economics and Business Faculty,
University of Indonesia, Jakarta

Abstract: Construction projects are risky due to big contract value, work complexity and many parties involved. PT ABC has problems in working on a construction project which leads to a dispute and increases in construction costs. In another construction project, PT ABC was unable to complete a project due to soil conditions. The purpose of this study is to assess an operational risk on the implementation of construction projects and make mitigation of key risks. This research uses a qualitative case study method. This study divided the operational risks of construction projects into seven categories. The results of the study found that the top ten risks that have the biggest risk significance index consist of four related contractors, three related consultants and one related owner, project related and external related. Mitigation that can be carried out by PT ABC is choosing projects that are in accordance with company competencies and find experienced partners in implementing construction projects.

Keywords: Construction, Construction Project, Risk Management, Operational Risk.

Introduction

PT ABC is a construction company that is required to be able to manage the project in achieving its goals, such as: completion on time, costs according to budget, quality according to specifications and there are no fatal accidents during construction project implementation. Based on the management report, there was a problem / dispute between PT ABC and PT XYZ which was caused because PT ABC was late in completing work and there was a delay in handing over the land. In other projects there were problems related to soil conditions that made the project unable to complete. The delayed project can lead to cost overrun (Famiyeh, et al. 2017). This study discusses operational risks in construction projects that are significant and have a direct relationship with costs, quality, time and safety at PT ABC's construction project.

Literature Review

Construction Industry

The construction industry is any activity or business related to land preparation and construction processes, changes, improvements to buildings, structures and other related facilities (Hansen, 2015). The construction industry has a very big risk from the contract value and the parties involved. The construction industry is closely related to construction projects. Projects are temporary efforts undertaken to create a unique product, service or outcome (Project Management Institute, 2017). Every project has a definite beginning and ending. The end of a project is when the final goal of a project is achieved, or the project goal will not or cannot be met or the project owner wants to stop the project. In general, there are 4 important criteria in a construction project, such as: cost, time, quality and safety. This means that a project is successful if the project does

not exceed the budgeted cost, the project completion time is according to the agreed schedule, the quality produced is in accordance with the specifications and there are no vital work accidents during project implementation.
One of the elements contained in a construction contract is the value of the construction contract. From the value of the construction contract, the contractor will make a project work plan which includes a budget for working on the project. Costs in a construction project consist of direct costs and indirect costs. Direct costs consist of material costs, wages, tools and subcontractors. Indirect costs consist of costs for secretariat, facilities, personnel and general. Cost deviation will decrease the margin plan. One of the cost increases is caused by an increase in material costs due to inflation or an increase in labor wages (Assaf and Al-Hejji, 2006).
Evey project has a clear start and end which is stated in the construction contract. The risk that often occurs that causes the failure of a project is not to start work on time (Abdul-Rahman et al., 2006). Projects can be said to be successful if they are completed in a timely manner and without excess costs (Anysz and Buczkowski, 2018). Construction delays are an increase in time that exceeds the limit either outside the contract date or outside the date agreed upon by the parties in project construction (Marzouk and El-Rasas, 2014). Construction delays lead to work disruption and loss of productivity, late project completion, increased time-related costs, and third party claims and even termination of construction contracts (Abdul-Rahman et al., 2006). This means that construction delays will result in additional costs and penalty.

Project Risk Management

Risk is an effect of uncertainty in objectives (Green, 2015). Meanwhile, according to Serpell (2015) risk is an uncertainty that has a negative impact. PT ABC defines risk as the probability of an event that brings undesirable consequences for the things to be achieved which have been formulated in the objectives, strategies, objectives and / or activity results plan. In running a business, there is always uncertainty that can come from the internal or external environment. Business and risk are like two inseparable sides of a coin. According to Hanggraeni (2016) risk has several characteristics such as a risk that usually has a tendency to recur, there is a new risk that has never happened before and a risk that is interdependent with others.
Project risk management includes the process of implementing risk management planning, identifying, analyzing and planning responses, implementing and monitoring risks in a project (Project Management Institute, 2017). Project risk management itself has the aim of increasing the probability and / or impact of positive risks and minimizing the probability and / or impact of negative risks and increasing the success of a project. The success of a project itself can be measured by four elements, namely: time, quality, cost and work safety. Construction project risk management must be carried out to minimize construction risk and make a project a safe, efficient and quality construction activity (Zou, et al. 2007).

Methods

The research method used in this research is a qualitative method with a case study approach in PT ABC. This research was conducted by identifying operational risks in construction projects. The list of construction project risks is obtained from content analysis on previous research. The risk list that has been created then reviewed by the Project Manager who is directly related to the construction project at PT ABC to ensure that all risks have been covered during the implementation of the construction project. The result is that there are 43 types of risk and are divided into 7 categories.
A questionnaire with a sample of the project team at PT ABC was conducted to determine the probability and impact value which consists of four aspects: Cost, Time, Quality and

Safety. There are 4 scales in assessing Probability (Very Unlikely, Unlikely, Likely and Very Likely), 5 scale aspects of Cost (Very Big, Big, Small, Very Small, and Non-Influence), 5 time aspect scales (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree), 5 scales for Quality aspects (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree) and 2 scales for safety aspects (Causing an Accident and Not Causing an Accident). The questionnaire is used to determine the top ten risks that represent the key risks in the construction project at PT ABC. Furthermore, after the key risks are obtained, interviews are conducted with the Project Manager to determine the effective mitigation for key risks.

Findings

Risk Significance Index

This study not only make a list operational risks in the implementation of a construction project, but also assesses risks that will have a significant impact on achieving the project objectives. In general, a project can be said to be successful if the costs incurred do not exceed the budget, the implementation time does not exceed the agreed time, the services produced are in accordance with the criteria and there are no vital work accidents during the construction time. After the list of causes for project risk is assessed to cover all the risks that exist during project implementation, the next step is to create criteria for assessing probability (P) and impacts consisting of Cost (C), Quality (Q), Time (T) and Safety (S).

The next step is to determine the amount of the Risk Significance Index that can be used to rank all project operational risks. The determination of project operational risk is based on the value of the Risk Significance Index which is the sum of the impacts consisting of Cost, Quality, Time and Safety multiplied by the probability of a risk occurring in the project.

$$R = \frac{1}{n}\sum_{n}(C + Q + T + S)P$$

Table 1. **Risk Significance Index**

No	Risk	Category	Risk Significance Index (R)	No	Risk	Category	Risk Significance Index (R)
1	Inadequate contractor experience	*Contractor related*	32,80	23	Poor project site supervision and management	*Contractor related*	25,90
2	Delays in subcontractor	*Contractor related*	30,40	24	Changes in material types and specifications during the construction process	*Material related*	25,80
3	Delay in preparing shop drawings	*Contractor related*	30,20	25	Effects of soil conditions and utility underneath	*Project related*	25,60

4	Long decision making	*Owner related*	29,60	26	Environmental problems	*Project related*	25,40
5	Errors and differences in design documents	*Consultant related*	29,10	27	Poor document administration	*Contractor related*	25,30
6	Inadequate consultant experience	*Consultant related*	29,00	28	Short duration	*Owner related*	25,00
7	Accidents during the construction process	*Project related*	29,00	29	Project owner intervention	*Owner related*	25,00
8	Delay in shop drawing and sample material approval	*Consultant related*	28,70	30	Scarcity of construction materials	*Material related*	24,90
9	Ineffective project planning	*Contractor related*	28,60	31	Penalties are not in accordance with the provisions	*Owner related*	24,40
10	Force Majure	*External related*	28,40	32	Weather	*External related*	23,90
11	Lack of communication	*External related*	28,30	33	Difficulty in projects financing	*Contractor related*	23,80
12	Delay in revision and approval of design documents from project owners	*Owner related*	28,10	34	Change in scope of work during construction / variation orders	*Owner related*	23,40
13	Unqualified labor	*Labor & equipment related*	28,10	35	The delay in permits from the government	*External related*	22,70
14	Delays in handing over	*Owner*	27,90	36	Delay in inspection by the	*External*	22,60

	land to contractors	*related*	
15	Low productivity	*Labor & equipment related*	27,90
16	Image details are unclear and inadequate	*Consultant related*	27,60
17	Repair due to an error during construction	*Contractor related*	27,30
18	Late payment by project owner	*Owner related*	27,10
19	Inadequate quality assurance	*Consultant related*	27,10
20	Work delays	*Owner related*	27,00
21	inaccurate budgeting	*Consultant related*	26,80
22	Social problems	*External related*	26,10

	supervisory consultant	*related*	
37	Availability of equipment	*Labor & equipment related*	22,30
38	Delay in materials delivery	*Material related*	22,20
39	Price fluctuation (currency, inflation)	*External related*	22,10
40	Delay in tool mobilization	*Contractor related*	22,00
41	Labor scarcity	*Labor & equipment related*	21,90
42	Changes in government regulations and / laws	*External related*	21,30
43	Traffic restrictions and control at the project site	*Project related*	19,50

Inadequate Contractor Experience

The risk mitigation is choosing a project that is in accordance with the competence of the contractor and choosing a partner who has enough experience. Based on the experience of the contractor, if you take a project outside the competency, it will cause difficulties in budgeting, implementation methods, control and supervision because of the lack of experience and minimal references. Therefore, in choosing new projects, where the contractor does not have the competence, contractor can choose a partner to share experiences and references.

Delays in Subcontractor

Determining another subcontractor to anticipate delays from subcontractors and a strong contract between contractor and subcontractor is a mitigation that can be made. When

a subcontractor is delayed, it means that the subcontractor's work capacity is limited while the scope of work is large. Therefore, the contractor should reduce the scope / volume of work to be assigned to another subcontractor in hope that there will be competition between the subcontractors. Minutes of clarification between the subcontractor and the contractor are made clear, especially regarding labor, productivity and implementation time. In addition, the contract made with the subcontractor must also consider the penalty.

Delay in Preparing Shop Drawings

Mitigation that can be made is the finalization of the Detail Engineering Drawing (DED). Shop drawing is a derivative of DED, so if the finalization of DED is late it will result in shop drawing delays. There is a need for good communication between the contractor and the project owner to speed up the DED finalization process. In addition, if there is a change in DED, contractor can increase the engineering workforce to catch up with delays.

Long Decision Making

Project owners often take a long time in making decisions, especially when they need to modify the initial design. The contractor must make a confirmation letter to the project owner on a regular basis. Notification can be in the form of a letter containing the consequences when the project owner is late in making decisions. In addition, if a project delay occurs due to the project owner, the confirmation letter can be used as a good basis for the contractor to extend the construction time without any penalties.

Errors and Differences in Design Documents

Ensuring the conformity between documents and confirming immediately if there are documents that are not suitable are risk mitigation that can be carried out by PT ABC. Errors and differences in the design documents are caused by mismatches between actual conditions in the field and document, so it is necessary to ensure that all documents are in accordance. This is usually because at the beginning of the tender there were still documents that had not been issued by the project owner. Therefore, it is necessary to have good communication with the project owner even at the beginning of the tender.

Inadequate Consultant Experience

The consultant is usually appointed by the project owner. Inadequate consultant experience will hinder the performance of the contractor because an inexperienced consultant will take a long time to provide approval. If there is an inadequate consultant, the contractor must be more active to ensure that all work plan documents are in accordance. In addition, contractors need to strengthen and clarify work documents such as (construction methods, quality plans, quality assurance, and HSE plans).

Accidents During the Construction Process

Making an HSE plan according to the construction method and carrying out a Toolbox Meeting are mitigation that can be made by PT ABC. Daily reports covering work conditions and ensuring safety equipment is in accordance with standards will prevent accidents during the construction process. Toolbox Meeting is an introduction to safety risks that can occur in the project field. With the toolbox meeting, workers will be more careful in carrying out their work.

Delay in Shop Drawing and Sample of Material Approval

Delays in shop drawing approval and sample of materials can be mitigated by having a Service Level Agreement. If there is a delay in field implementation due to a delay in the shop drawing approval that has been agreed in the SLA, the contractor can get additional time and avoid penalties.

Ineffective Project Planning

Making plans and work details in the form of a work breakdown structure (WBS) into the most detailed level then making a schedule according to the WBS are steps that can be taken by PT ABC. With a detailed WBS, contractor can be easier for the technical part to calculate the implementation time required for each work stage.

Force Majure

When force majure occurs, the company and the project owner will share the losses caused by the force majure. Therefore, it is necessary to have clarity regarding conditions that can be said to be force majure. In addition, insurance for project implementation is one of the methods of risk transfer when a force majure occurs.

Conclusion

The project manager assesses the risk of implementing a construction project as the first line of defense in implementing risk management at PT ABC. Risk management assessment in the implementation of construction projects at PT ABC can be carried out using a probability and impact matrix which is measured based on 4 aspects: Cost, Time, Quality and Safety. Based the top ten risks with the largest risk significance index consist of four contractors related, three consultant related and one owner related, project related and external related. Risks with the largest risk significance index include: Inadequate Contractor Experience, Delays in Subcontractor and Delays in Preparing Shop Drawing.

The mitigation that can be carried out by PT ABC is by choosing projects that are in accordance with the company's competence and can collaborate with experienced partners. In addition, PT ABC can strengthen contract administration both with the project owner and with subcontractors to resolve disputes that may occur during construction project work. This research is not only to make a risk register (risk register) in a construction project, but to find out which risks have a significant impact on a project.

References

Abdul-Rahman, H., Berawi, M. A., Berawi, A. R., Mohamed, O., Othman, M., & Yahya, I. A. (2006). Delay mitigation in the Malaysian construction industry. *Journal of construction engineering and management*, 132(2), 125-133.

Anysz, H., & Buczkowski, B. (2018). The association analysis for risk evaluation of significant delay occurrence in the completion date of construction project. *International Journal of Environmental Science and Technology*, 1-6.

Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International journal of project management*, 24(4), 349-357.

Famiyeh, S., Amoatey, C. T., Adaku, E., & Agbenohevi, C. S. (2017). Major causes of construction time and cost overruns: A case of selected educational sector projects in Ghana. *Journal of Engineering, Design and Technology*, 15(2), 181-198.

Green, P. E. (2015). *Enterprise Risk Management: A Common Framework for the Entire Organization*. Butterworth-Heinemann.

Hanggraeni, Dewi. (2016). *Manajemen Risiko Perusahaan Terintegrasi Berbasis ISO 31000: Teori dan Hasil Penelitian*. Jakarta: Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia.

Hansen, Seng. (2015). *Manajemen Kontrak Konstruksi*. Jakarta: PT Gramedia Pustaka Utama

Marzouk, M. M., & El-Rasas, T. I. (2014). Analyzing delay causes in Egyptian construction projects. *Journal of advanced research*, 5(1), 49-55.

Project Management Institute. (2017). *A Guide to The Project Management Body of Knowledge* (Vol. 6).

Serpell, A., Ferrada, X., Rubio, L., & Arauzo, S. (2015). Evaluating risk management practices in construction organizations. *Procedia-Social and Behavioral Sciences*, 194, 201-210.

Zou, P. X., Zhang, G., & Wang, J. (2007). Understanding the key risks in construction projects in China. *International journal of project management*, 25(6), 601-614.