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Original Article

Risk Analysis and Risk Response in the Implementation of the Construction of a Special Oncology Hospital in Bojonegoro

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Abstract

This study aims to identify risks, conduct risk analysis with the severity index method, and determine responses to risks that occur in the implementation of the Bojonegoro Regency Oncology Special Hospital Phase 2 construction work. From the results of risk identification, there are 31 risks grouped into 8 variables. After analysing the data with the severity index method, which is a technique used in calculating the probability value and also the impact, the results obtained were 3 risks in the medium category and 2 risks in the high category. The 5 dominant risks require a risk response. Risk responses to reduce the negative impact of project delays, especially for risks in the high category, include the risk of uncertain weather by planning the scheduling of large works such as casting so that they are not carried out during the rainy season. The risk of unavailability of labour in the field by cooperating with other subcontractors to help complete certain parts of the project.

Keywords: Risk Identification, Risk Response, Severity Index.

1. Introduction

Currently, construction projects are growing larger and more complex in terms of both construction and cost in Indonesia. Significant development occurs in the road, building and bridge infrastructure sectors (Gautam, 2020). Construction itself includes a series of activities that are related to efforts to build an infrastructure to support our daily activities (Jackson, 2020). In the activities of the construction project development process, there are several things that must be considered for the smooth running of the construction project, one of which must be considered in the construction project development process, namely risk, risks that can occur when in the field are likely to be able to affect activities during the construction development process (Sopiyah, 2020).

The journal published by Afiq (2021) entitled "Risk Management in the 2021 Uin Walisongo Student Dormitory Building Construction Project" explains that the construction project for the UIN Walisongo Student Dormitory Building in 2021 has been meticulously planned, but risks are inevitable during its execution. This investigation aims to pinpoint the potential risks in the construction process of the UIN Walisongo Semarang Student Dormitory building project and suggest strategies to address them. An evaluation of risks is carried out using a questionnaire with a Likert scale. Participants were chosen through purposive sampling, specifically those involved in the development of the 2021 UIN Walisongo Student Dormitory construction project.

The participants involved in this study include the directors of PT Chimarder 777 and the supervisory consultant of construction management, CV. Prambanan. Determining the acceptance of risks is based on the calculation of the probability multiplied by the consequence. In summary, a total of 43 risks were identified during the construction of the UIN Walisongo Student Dormitory in 2021. Among these risks, there were 37 major ones, including 5 unacceptable risks and 32 unexpected risks originating from the project itself. To address these, there are 10 actions planned to mitigate unacceptable risks, and 41 actions for unexpected risks. The risk mitigation measures are aimed at reducing the likelihood of contractual disputes arising from differences in cost, quality, and time, as well as avoiding any potential penalties or fines.

There is also a journal that has been published by Rahman and Tjendani (2022) entitled 'Risk Identification for the Implementation of Highrise Building Project Construction at Grand Dafam Signature Hotel Yogyakarta'. The purpose of the study was to pinpoint the main hazards and how they are managed in the construction project of the Grand Dafam Signature Yogyakarta Hotel Building. Quantitative methods were used for this research. The study included 18 participants, consisting of expert staff from the contractor and supervisory consultant. The data was gathered through questionnaires and interviews with selected individuals, as well as research literature and data from previous projects. The analysis of the data revealed the prominent risks that were present.

From the analysis, it was found that out of 27 risk variables considered, 6 were identified as the most prominent. These include the rise in material costs, potential damage or loss of materials, issues with occupational health and safety (K3) at the project site due to non-compliance with safety regulations, alterations in design, changes in work schedules, and delays in payment under the contract. Following the risk assessment, it was determined that 17 risks should be shouldered by the contractor, 3 by the owner, and 7 were to be shared equally. The contractor was assigned a 63% share of the risk, whilst the owner was given 11%, and the shared risks were evenly distributed at 26%.

Several construction projects in Indonesia, especially building construction, occur in big cities, one of which is in Bojonegoro Regency. In development projects have limited resources, both in the form of people, materials, costs and tools. The implementation process in building projects usually takes a long time and faces complex problems, so it can cause uncertainty which will eventually lead to various kinds of risks. The impact of risk affects productivity, quality and project cost budgets. A successful project involves effective management from the beginning to the end. As projects become more complicated and resources become scarcer, it is important to enhance the project management system.

The construction of the Oncology Hospital Phase 2 has now reached 50 per cent. The hospital, which occupies the former The Residence office building on the Bojonegoro - Cepu National Road in Talok Village, Kalitidu District, Bojonegoro Regency, East Java, is targeted for completion in 2025. The secretary of the Bojonegoro Housing, Settlement and Human Settlement Office (PKPCK) said that the construction of the cancer speciality hospital is still continuing. In the Bojonegoro electronic procurement service (LPSE) page, the construction of the Oncology Hospital in phase two is budgeted in the 2024 APBD with a ceiling of Rp 19 billion from a contract value of Rp 18.8 billion. Meanwhile, in the first phase, according to LPSE, the construction of the Oncology Hospital cost Rp 240 million from a contract value of Rp 239 million in the 2023 regional revenue and expenditure budget (APBD). The Head of the Building Planning Division of the Bojonegoro Housing, Settlement Areas and Cipta Karya (PKPCK) Office said that currently the construction process is around 40 to 50 per cent for phase two this year.

Rescheduling or re-scheduling of the initial schedule carried out on this project has an impact on increasing the duration of work, causing the project completion target to be delayed from the time it should be. The current condition of the Talok Hospital Construction progress is in week 14 or month 3 with a cumulative progress of 48.68% while the planned cumulative progress or stated on the S curve is 56.19%. From these figures there is a considerable difference of 7.51%. This resulted in the project experiencing a considerable delay from the plan.

When building hospitals, there are many dangerous factors involved that can impact the construction process, affecting productivity, quality, and cost limits. Unexpected outcomes, known as risks, are always a possibility even with thorough planning. It is impossible to completely eliminate risks in construction projects, but they can be minimised or shifted to different parties involved.

Risk analysis is becoming more and more important nowadays, there are many cases where failure to manage risks properly can result in considerable losses, both for companies, and even individuals (Aven, 2015). We see incidents such as losses incurred by companies due to misappropriation of employees or management, failure to anticipate overhead costs, and others. We also often see events that harm individuals because they fail to comply with existing regulations. Potential losses from risk will be even greater if people in the company do not have prudent behaviour. These events can be avoided if we understand and manage risk properly (Johari & Fazriani, 2021).

Risk reduction involves strategic and long-term measures aimed at minimising the consequences of a potential or existing adverse event. (Walker et al., 2011) The purpose of risk mitigation is to manage or handle the types of risks that have been identified, so that solutions and those responsible for the risks can be determined. In risk mitigation, it provides other options in solving problems in the project, but from the alternative solutions there must be an effect on project costs. The purpose of this research is to identify the results of risk analysis with the severity index method. As well as, determine the risk response that occurs in the implementation of the construction of the Bojonegoro Regency Oncology Specialised Hospital Phase 2.

2. Methods

This research uses literature study and field study methods to understand effective construction project time management. Literature study was conducted through literature such as books and journals as a theoretical basis as well as the preparation of interview questions. Field studies are in the form of informal observations, direct interviews with project staff, and experts related to the process of scheduling, implementing, controlling, and updating project schedules.

The collection of data involves obtaining both primary and secondary sources of information. Primary data was gathered through conducting on-site surveys and reviewing relevant documents to track the advancement of the project and pinpoint any challenges. Secondary data comprised of various documents such as the projected cost budget plan (RAB), timeline, and weekly reports detailing the progress of work. The study population was 75 people involved in the project, with a minimum sample of 20 respondents determined using the Slovin technique.

Data analysis began with risk identification to classify risks based on their impact on the project. This process involved techniques such as questionnaires, field investigations, and project data collection. Risk analysis was conducted to determine the level of significant risks

that could affect project execution and timing. This approach aims to reduce the impact of risks through adjustments to project scheduling, budget, and quality.

3. Results and Discussion

3.1. Risk Identification

This risk identification was previously obtained from a literature review. To ascertain whether there is any relevance of the initial risks from the literature review to the Oncology Hospital construction project in general, a preliminary survey was conducted in the form of distributing questionnaire 1 (one). In questionnaire 1 (one) of this study, respondents were asked to provide an assessment of whether the risk variables obtained from the literature review had relevance to the Oncology Hospital construction project that had been handled by the respondent. And respondents were asked to provide additional input on risk variables that might occur in the Oncology Hospital project that were not included in the questionnaire list.

The risk variable derived from questionnaire 1 cannot be definitively determined as the research variable until it is confirmed to align with the research objective. respondents showed a minor decrease in risk variables. Respondents from questionnaire 1 (one) were the contractor, MK, PKP Office and the relevant MK Expert Team.

From the selected respondents we send a google form link and then each respondent fills in online. From the google form, we automatically get answers from each respondent. Each respondent provides an assessment of the risk variables given. In the oncology hospital construction project, variables are considered important if any respondent provides a 'Yes' or 'No' assessment. This ensures that all pertinent variables are included for thorough risk analysis. The distribution of Questionnaire 1 (One) online through the google form link that we sent to the respondents as shown in the picture below.

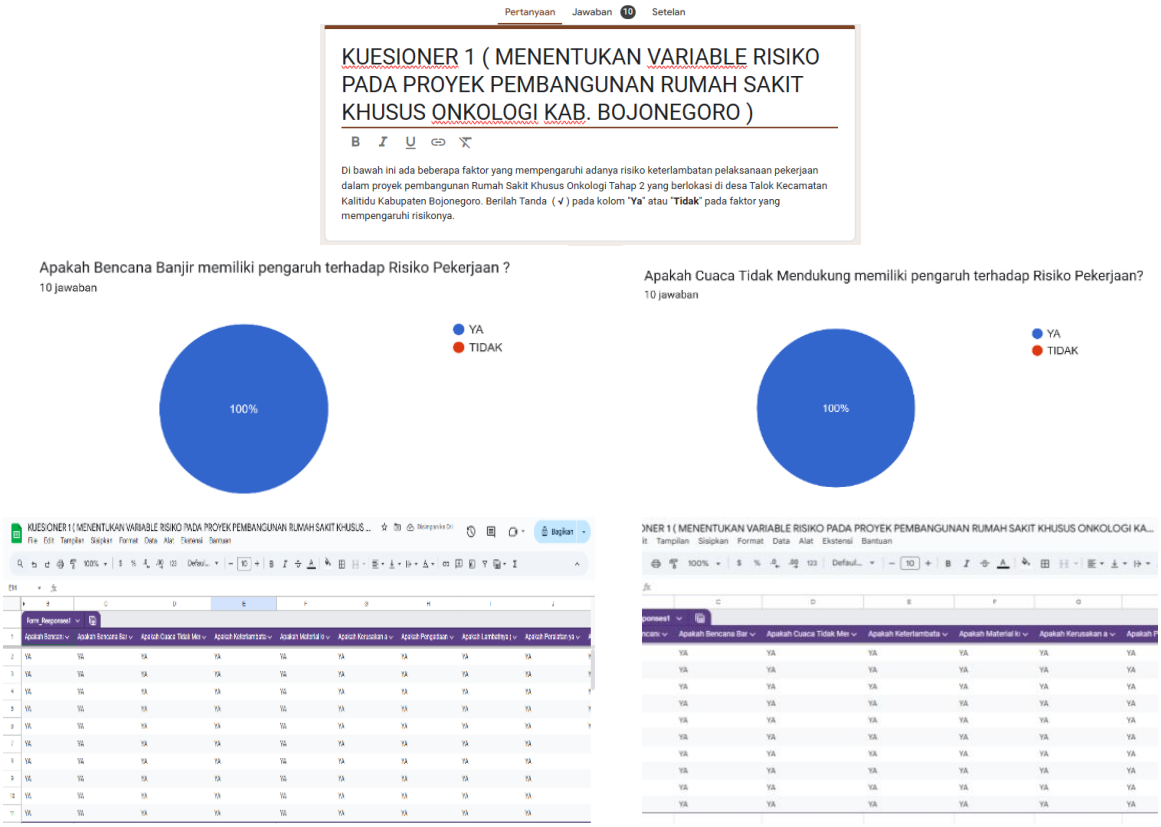

Figure 1. Google form Questionnaire 1 (One) and the response

Based on the results of the recapitulation of questionnaire 1 (One), 10 answers were obtained from each respondent. Of the 31 questions that constitute risk indicators, all indicators are agreed by respondents. So that the researcher recapitulates from 8 selected variables as many as 31 indicators that have relevance to the Oncology Specialised Hospital construction project.

3.2. Risk Level Calculation Results Using Probability Impact Matrix

Based on the results of the Severity Index calculation of probability and impact, the next analysis is carried out by converting the risk categories that have been obtained into a Likert scale (scale 1-5). Scale 1 for the Very Low/Rare (SR/SJ) category, Scale 2 for Rare/Low (J/R), Scale 3 for Moderate (S/C), Scale 4 for Frequent/High (S/T), and scale 5 for the Very Frequent/Very High (SS/ST) category.

After obtaining the categories of probability and time, the risk value is analysed. The risk value is obtained by plotting the value into the probability and impact matrix against time. And the categories of probability and impact on time there are five categories namely Negligible, Low, Medium, High and Extreme can be seen in the following figure:

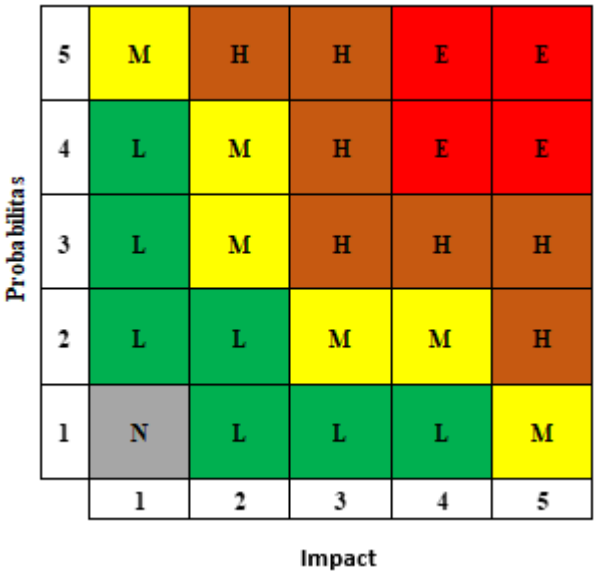

Figure 2. Probability and Impact Matrix

Description:

- N : Negligible
- L : Low
- M : Medium
- H : High
- E : Extreme

The following results of the calculation of risk to probability and impact can be seen in table 1 below:

Table 1. Calculation of Probability x Impact

Kode		Indicator	Probabilitas X Impact		Category Risk
			P	I	
A.	1	Flood	2	23	L
A.	2	Unfavorable weather	4	2	H
B.	1	Delay in material delivery	2	2	L
B.	2	Materials are less qualified	2	2	L
B.	3	Damage or loss (theft) of materials	2	2	L
B.	4	Procurement of special materials that require ordering time	2	2	L
C.	1	Slow equipment mobilization process	2	2	L
C.	2	Equipment used is often damaged	2	2	L
C.	3	Operators lack discipline so that productivity is not maximized	2	2	L
D.	1	Lack of discipline of workers using PPE	3	2	M
D.	2	Unskilled labor	2	2	L
D.	3	Lack of available manpower in the field	4	3	H
D.	4	Low labor productivity	2	3	M
D.	5	Less effective working hours	2	2	L
E.	1	Lengthy administrative process related to employment contracts	2	2	L
E.	2	Different interception of specifications between owner and contractor	2	2	L
F.	1	Worked dimension conformity (length, width, height)	2	2	L
F.	2	Fixing errors (iron dimension, iron spacing, and quality)	2	2	L
F.	3	Concrete quality does not meet technical specifications	2	2	L
F.	4	Permitting process related to electrical work	2	2	L
F.	5	Proses pekerjaan plumbing yang tidak sesuai atau terjadi kebocoran	2	2	L
G.	1	Design changes	3	2	M
G.	2	Wrong implementation method	2	2	L
G.	3	Incomplete design data	2	2	L
H.	1	Cost estimation error	2	2	L
H.	2	Time estimation error	2	2	L
H.	3	Inexperienced staff	2	2	L
H.	4	Poor contractor performance	2	2	L
H.	5	Low level of contractor management discipline	2	2	L

Source: Researcher's Processed Results, 2024

Based on the assessment of the probability and impact of table 1 above, if plotted into a matrix, it will look like in Figure 2. From this figure, there are 3 risk categories and 29 risk variables, where there are 2 high risk categories, 3 medium risk categories, 24 low risk categories.

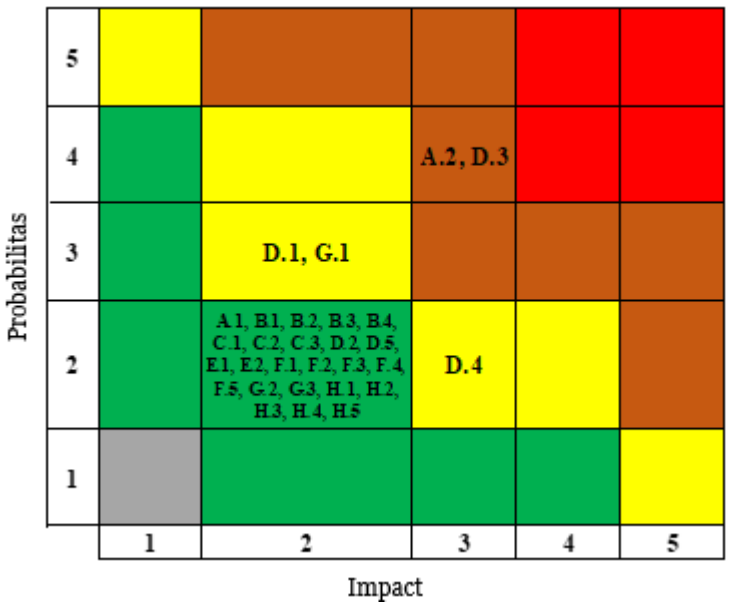

Figure 2. Plotting Risk Variables in Probablity and Impact

1. Risks that affect time

a. Low Risk Level

Risks that are at a low level usually tend to be ignored, but it can be seen in table above, there is a risk of 'Flood'. Flood risk as we know if it occurs will certainly have an impact on the delay of the planned project schedule. However, this risk is classified at a low level.

From the research analysis, this is due to the small probability of flooding based on the respondents' answers, namely Rarely (23.91%), for the impact itself in the Low category (28.75%). So low risk can be influenced by a small probability and also a low risk impact.

b. Medium Risk Level

Risks classified as medium risk necessitate management in order to lower the risk level to an appropriate level. Medium level risks often involve either a high likelihood with low consequences or a low likelihood with high consequences, and in some cases, both likelihood and impact fall in the same category.

For example, the risk of 'Design changes' has a Moderate category (C) and the impact on time has a Low category (R) then when converted into a Likert scale is worth 3.

c. High Risk Level

Risks that belong to the High risk level require more intensive handling to reduce the risk level to an acceptable level. Risks that are at a High level can occur if they have a high level of probability but low impact, or low probability but high impact.

Examples such as the risk of 'unfavourable weather' which has a category of Frequent (S) and the impact on time has a category of Medium (S) then when converted into a Likert scale is worth 4.

2. Dominant Risk

A risk is said to be dominant is seen from the percentage of the probability of occurrence, which is large> 50% which is obtained from processing probability data using the severity index which can be seen in Figure below:

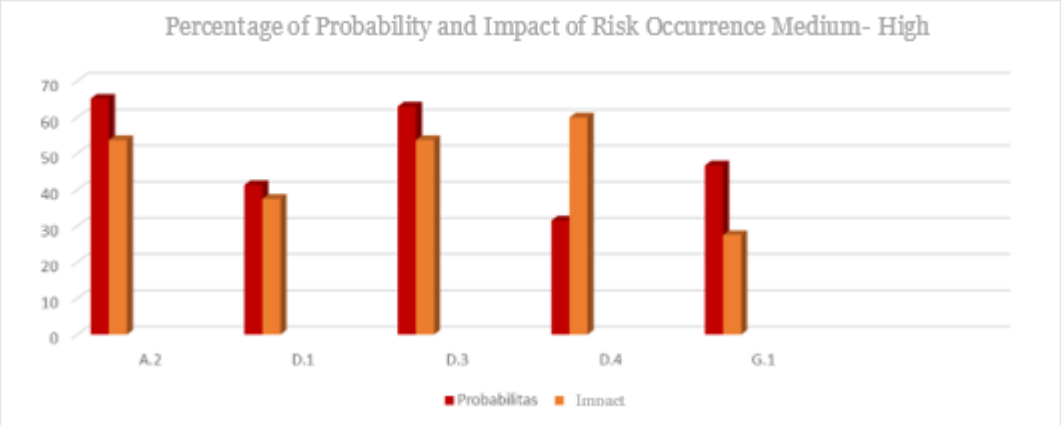

Figure 3. Percentage of Probability and Impact of Dominant Risk Occurrence

Based on Figure 3, it is shown that the dominant risk (probability > 50%) is the risk with the code A.2 Unsupportive Weather, which is 65.22% and D.3 Lack of availability of labour in the field, which is 63.04%. While the risks that are close to doniman are the risk of lack of discipline of workers using PPE, which is 41.30%, the risk of low labour productivity, which is 31.52% but has a risk impact of 60.00% and the risk of design changes, which is 46.74%.

3.3. Risk Response

After examining the data, it is clear that there are numerous risks of significant and moderate levels that require management to ensure they are controlled. The analysis highlights key high and medium risks that need to be addressed in the research project focusing on the development of the Oncology Special Hospital. :

1. Unfavourable Weather (A.2)

In the risk of unfavourable weather, the main cause is due to the changing weather climate or climate change. In October there was a change of two seasons, which was originally hot with a high ultraviolet index of sunlight on the island of Java. But in the following week there was rain that was quite heavy in intensity. The erratic weather on the project generally disrupted the implementation of the work. The response given to the implementing contractor was to plan the scheduling of major works such as casting so as not to be carried out during the rainy season.

2. Lack of discipline of workers using PPE (D.1)

Workers' compliance in the use of PPE can reduce the risk of accidents and diseases caused by work, such as scratches, collision wounds, etc. But in practice, workers often do not implement it. But in practice, workers often do not carry it out. The reason is generally due to a lack of self-awareness on the part of each worker. In addition, the use of non-compliant PPE can affect the company's electability, because recently it has been in the spotlight in the media in the implementation of development projects in Bojonegoro, which often do not apply SMKK, while the RAB contains SMKK costs. The response given by MK is to conduct daily inspections of the use of PPE and every week field monitoring is carried out by the PKP Office.

3. Labour shortage in the field (D.3)

Labour shortages at subcontractors may result from high absenteeism rates, difficulties in recruiting competent labour, or problems in employee retention. Labour shortages can cause the project to not proceed as scheduled because there is not enough manpower to

complete the required tasks on time. As a result, the project schedule is disrupted and the completion of the work is jeopardised. Example: on the Oncology Speciality Hospital Construction project there are 17 buildings in the works, some parts of the project may not be done or done slowly, resulting in overall delays. Whereas in its implementation each building can be done side by side without waiting for the work of one building to be completed first. The risk response given to the implementing contractor is to impose sanctions or warnings and sanctions on the subcontractor's workforce and / or subcontractor parties in the form of verbal or written warnings, administrative sanctions, or contract termination. Engaging other subcontractors to help complete certain parts of the project.

4. Low labour productivity (D.4)

Low productivity of subcontractor labour can be caused by various factors such as lack of motivation, poor time management, or lack of onsite equipment or materials. Low productivity can hinder project progress and cause delays in work completion. This can have a direct impact on the overall project schedule and can lead to increased costs due to work taking longer than planned. Example: the implementation of red brick masonry in the management building with a volume of 597.84 m² which should have been completed in 1 month but because the red brick material was not onsite according to the volume, the work could be delayed for several weeks. Risk Response given to the executing contractor Conduct regular monitoring of labour performance and evaluate their work to ensure quality and productivity are maintained. Improve communication between the main contractor and subcontractors to ensure all parties understand the project schedule and targets by holding coordination meetings. And immediately bring materials Onsite

5. Design changes (G.1)

In the implementation of a project, there are often changes to the design plan. The cause of the risk is not only at the request of the owner, but there are also parts or zones that are not suitable during the work and there are calculation errors. For example, for the Oncology Hospital Fence work, the Strous Drill work item was planned with a depth of 3 m but in its implementation, it was only carried out 2 m, due to rocky soil conditions. The Risk Response given to the implementing contractor is to calculate the added work and redraw it by considering the parts that are less suitable so that there are no more mistakes. Adding less work is done without changing the contract value.

4. Conclusion

The outcome of the severity index method used in risk analysis indicates that there are 24 risks categorized as low risk, 3 risks falling in the medium risk category, and 2 risks classified as high risk. Risk responses to reduce the negative impact of project delays, especially for risks in the high category, include the risk of uncertain weather by planning the scheduling of major work such as casting so that it is not carried out during the rainy season. The risk of unavailability of labour in the field by cooperating with other subcontractors to help complete certain parts of the project.

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