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Risk Analysis of Contractor Selection in Construction Work Procurement

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ABSTRACT

This research is about the risk analysis of the selection of contractors in the procurement of construction works. The method used to carry out the existing risk analysis is the Failure Mode and Effect Analysis method. The research was conducted on five Work Units for Procurement of Goods and Services (UKPBJ) with the highest number of failed tenders from 2021 to 2022. Risk identification was carried out by means of literature studies and pilot surveys in the form of interviews with several selection working groups. It was found that there were 26 risks to be analyzed. Data collection was carried out by distributing questionnaires to the selection working group, where the selection working group was asked to fill in the levels of severity, occurrence, and detection for the 26 existing risks. Then analyzed using the RPN method for each risk. The results obtained show that of the 26 existing risks, there are 10 that have an RPN value above the critical value. These risks are delays in procurement preparation documents from PPK SKPD, failed auctions, qualification results that are not the actual ability of participants, shortage of uploading tender documents, goods and services providers not interested in participating in the auction, objections or complaints from bidders, misunderstanding of information in the auction, Details of HPS known by bidders, Intimidation from Providers, NGOs, and law enforcement officials, and Mistakes in choosing a provider Then the level of importance of the risk is also determined by multiplying the frequency with the impact so that there is one risk that is at a moderate level, namely the risk of delay in procurement preparation documents from PPK SKPD. For the ten risks that are above the critical value, mitigation measures are carried out in order to minimize the impact that occurs.

Keywords: *Risk of Contractors Selection; Construction Work Procurement; FMEA Method*

INTRODUCTION

Government Procurement of Goods/Services is an activity of Procurement of Goods/Services by Ministries/Agencies/Regional Apparatus financed by the State Budget (APBN) / Regional Budget (APBD) whose process is from the identification of needs, up to the handover of work results consisting of procurement of goods, procurement of consulting services, procurement of construction work, and procurement of other services (Presidential Regulation Number 12 of 2021) [1].

The process of procuring goods and services makes a significant contribution to the success of sustainable development programmes that are interrelated by several parties starting from planning, scheduling, budgeting, selecting providers, implementing contracts and payments, to use and maintenance [2]. Procurement of goods and services (PBJ) in the government environment is currently perceived as a high-risk process, risky for the achievement of

Journal of Civil Engineering and Vocational Education
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Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

procurement objectives and risky for those involved in the process, while while risk management has become a common practice for procurement actors, its use is still very heterogeneous and less controlled and documented [3].

Based on data obtained from the Electronic Procurement Service (LPSE) website for each Regency / City in West Sumatra Province, it was recorded that from 2021 to 2022 there were several regions that experienced an average of failed tenders above 20% of all existing tender packages. These areas include Agam Regency, Lima Puluh Kota Regency, Sawahlunto City, West Pasaman Regency, Pariaman City and finally Pasaman Regency [4].

The high risk in the procurement of goods and services affects the results of the procurement of construction work, so risk management is needed to minimise adverse consequences so that it can support the realisation of procurement in accordance with the ethics and principles of procurement of goods / services in the UKPBJ Regency / City with the highest average of tender failures [5]. Risk analysis is a process for choosing what kind of security is suitable or feasible for a system or environment (ISO 1799, "An Introduction To Risk Analysis", 2012) [6].

METHOD

This research is taken based on the population of UKPBJ at the Regency / City level in West Sumatra Province. The number of pupulations is the same as the total number of UKPBJ in West Sumatra Province, which is 19 Regency / City UKPBJ.

Table 1. UKPBJ

No	UKPBJ	No	UKPBJ	No	UKPBJ
1	West Sumatra Province	8	Sawahlunto City	15	Pesisir Selatan Regency
2	Padang City	9	Agam Regency	16	Sijunjung Regency
3	Pariaman City	10	Dharmasraya Regency	17	Solok Regency
4	Padang Panjang City	11	Mentawai Islands Regency	18	South Solok Regency
5	Bukittinggi City	12	Lima Puluh Kota Regency	19	Tanah Datar Regency
6	Solok City	13	Pasaman Regency		
7	Payakumbuh City	14	West Pasaman Regency		

According to Gay, Mills, and Airasian (2009: 133) in Idris Alwi's article "Empirical Criteria for Determining Sample Size in Statistical Hypothesis Testing and Item Analysis", for descriptive method research, a minimum sample size of 20% of the population is taken, so the minimum sample size for this study is:

$$n = 20\% \times N$$
$$= 20\% \times 19$$
$$= 3{,}8 \approx 4$$

Based on the theory above, the number of samples to be taken is 5 UKPBJ Regency / City which has the highest percentage of failed tenders and cancelled tenders, namely:

Table 2. Table of Highest Percentage of Failed Tenders and Canceled Tenders

No	UKPBJ
1	Agam Regency
2	Lima Puluh Kota Regency
3	Sawahlunto City
4	West Pasaman Regency

5	Pariaman City

The next method is the literature review stage by collecting risk events that occur during the provider selection process in the procurement of construction work. This risk event was obtained through several related sources, including research by Elvita Darma in 2017, research by Donny A.D. Mamesh, Cindy J. Supit and Steeve G. Rondonuwu in 2022, level 1 government goods / services procurement competency training module, Meeting Materials on Risk Management in the Procurement of Goods / Services within the KKP by the Inspector General of the KKP and the Bangka Belitung Islands Province Risk Mapping Helpdesk Service Website. Based on the literature review, it can then be concluded that risk events often occur for the sake of the pilot survey.

This pilot survey aims to find risk event research samples in line with the conditions of the selection working group at UKPBJ in the Regency / City, where the risk events obtained will be a reference for making research questionnaires. This pilot survey was conducted by interviewing several members of the Selection Working Group at UKPBJ in the Regency / City which became the research sample. This survey was conducted to prove the initial risk events obtained from the literature review as in Table 1. In addition, with the pilot survey, it is possible to get some risk events that are not visible from the initial risk events as shown in Table 1.

The data collection method used in this research is a questionnaire, the questionnaire will be given to the research sample, namely members of the selection working group at UKPBJ in districts / cities in West Sumatra Province. The questionnaire distributed in the form of questions regarding risk events that have been experienced by the selection working group and their impact on the results of the selection of providers in the procurement of construction work. The questionnaire will be distributed in the form of a google form containing questions related to risk events, occurrence, severity, detection. The risk factors themselves are obtained from several sources of literature and also from the results of the pilot survey that has been carried out. Questions on the level of risk probability, risk impact and detention will be divided into 5 levels according to the Likert's scale weighting. Respondents are asked to provide a value according to the rating scale for each existing risk event according to the risk events that have been experienced or found by members of the Selection Working Group that can affect the results of the selection of providers in the procurement of construction work.

There are six data processing techniques used as follows:

1. Determining the average severity value, is an assessment of the seriousness of an effect of a potential failure on a component that affects the selection of providers for the procurement of construction work that is analyzed or examined.
2. Determining the average occurrence value, is an assessment with a certain level where there is a risk in the selection of providers in the procurement of construction work. From this occurrence number / level, it can be seen that there is a possibility of risk in the selection of providers in the procurement of construction work.
3. Determining the average detection value, is an assessment of the ability to control / control failures that can occur in the selection of providers for the procurement of construction work.
4. Calculating the Risk Priority Number (RPN), is the result of multiplying severity (S), occurrence (O), and detection (D), where the mathematical equation can be expressed as follows:

EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

RPN = (S) x (O) x (D) (Robin, Rayomond and Michael: 1996)

A risk is categorized as a critical risk if it has an RPN value above the critical value. The critical value of RPN is determined from the RPN values of all risks.
Total RPN

$$\text{Critical value} = \frac{Total\ RPN}{Number\ of\ Risk}$$

(Robin, Rayomond and Michael: 1996)

5. Determine Risk Analysis, to rank the risks resulting from the multiplication of the frequency and impact scales, arranged from the largest to the smallest and vice versa. From the results of the above analysis, risks can be grouped based on their level of importance and obtain an interval that states the level of risk, high, medium and low as described in table 4.

Table 4: Risk Value Interval

Interval	**Risk Score**
12-25	High
8-12	Medium
1-8	Low

6. Prioritizing for follow-up, if the RPN value is high, then the risk must be followed up so that the risk does not recur, but at this stage there is a possibility that risks that have risks and RPN above the critical value have priority for follow-up, where the critical value is obtained from reviewing RPN. There is a high risk value but because it can be anticipated in advance so that the detection value is small, the RPN value is low. Risk and RPN must be re-evaluated because they have different purposes.

A follow-up interview with several members of the selection working group was conducted to ask how they responded to the handling of risks that had a medium to high level was the last method used in this research. The interviews were conducted using the guided interview method where the same questions were repeated for all risks that had RPN values above the critical value. With this interview, it can produce various ways to handle risks that have a high level.

RESULTS AND DISCUSSION

The analysis technique method used is the risk ranking method by determining the value of each risk through the risk priority value (RPN) obtained through the multiplication of the impact value (Severity), frequency value (Occurrence), and detection value (Detection).
The first step taken is to determine the total value of the questionnaire for each existing risk. Then after obtaining the total value, the average severity value for each risk item is sought. The following is the calculation of the average severity value in figure 1.

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

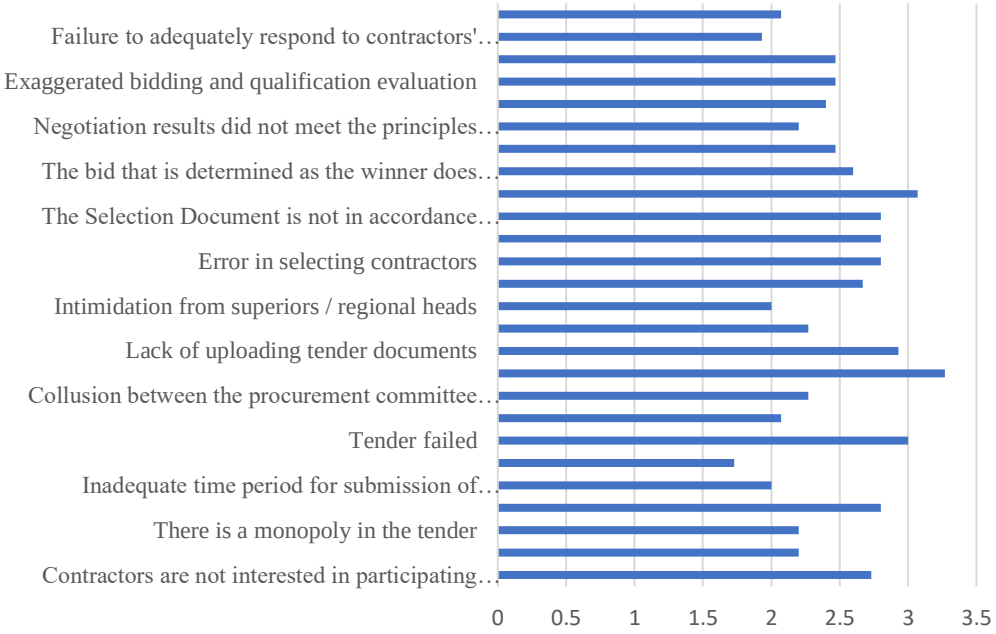

Figure 1. Average Severity Score

The second step taken is to determine the total value of the questionnaire for the occurrence value. Then after obtaining the total value, the average occurrence value for each risk item is sought. The following is the calculation of the average occurrence value in figure 2.

Figure 2. Average Occurrence Value

The third step is to find the total detection value for each risk item. Then after obtaining the total value, look for the average detection value for each risk item. The following is the calculation of the average detection value in figure 3.

EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

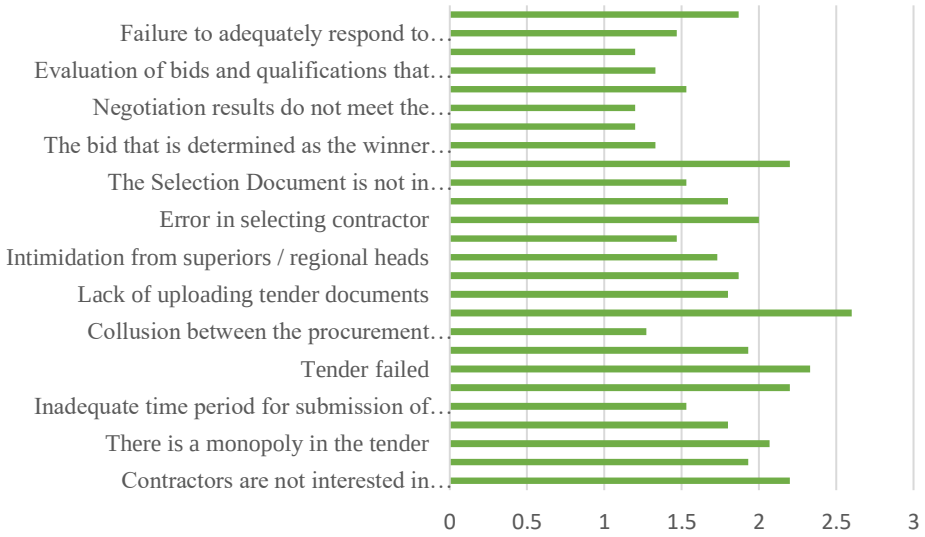

Figure 3. Average Detection Value

After obtaining all averages of severity, occurrence, and detection values, the RPN value is calculated by multiplying all averages of severity, occurrence, and detection that have been obtained. The following is presented in figure 4 the calculation of the RPN value which has been sorted based on the priority level.

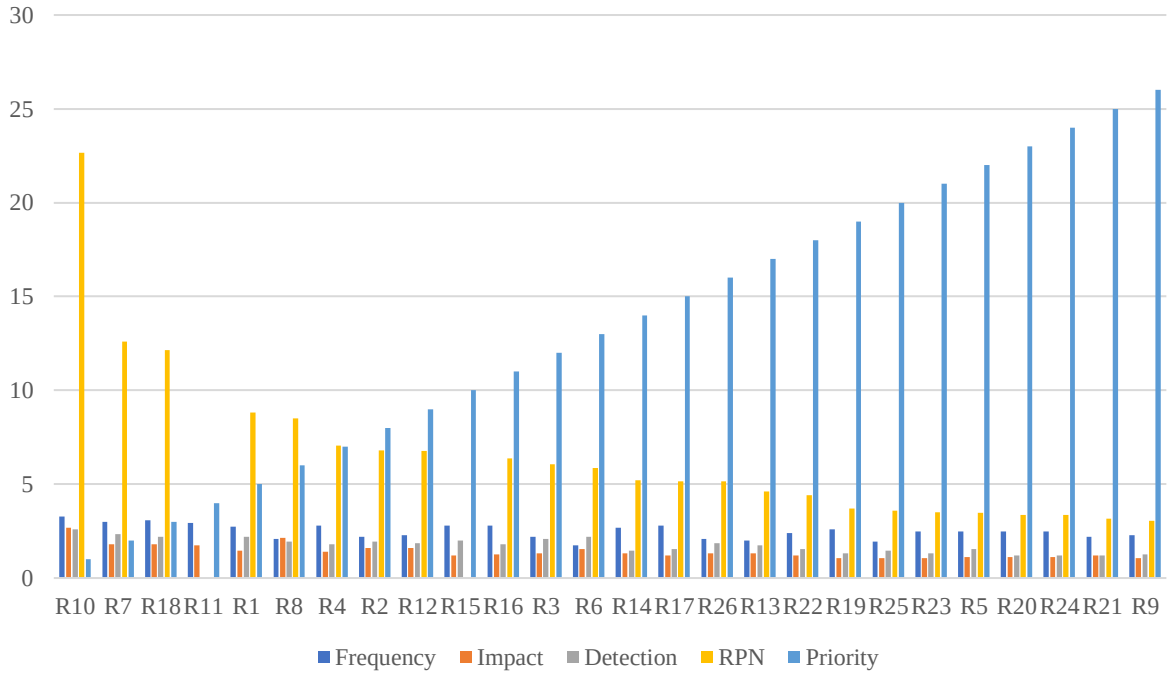

Figure 4. Calculation of RPN Value

Based on the results of the calculation of the RPN value, each critical risk can be determined. The critical risk will be analyzed further as the first step of the risk management action. A risk is categorized as a critical risk if it has an RPN value above the critical value. The RPN critical value is determined from the RPN values of all risks.

Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

$$\text{Critical value} = \frac{Total\ RPN}{Number\ of\ Risks} = \frac{171{,}29}{26} = 6{,}59$$

The RPN critical value above obtained 10 critical risks to the selection of construction work procurement providers in the five UKPBJs studied. This is because the value of the three risks is above the critical value sought. The three risks that are above 6.59 which is the critical value limit can be seen in figure 5.

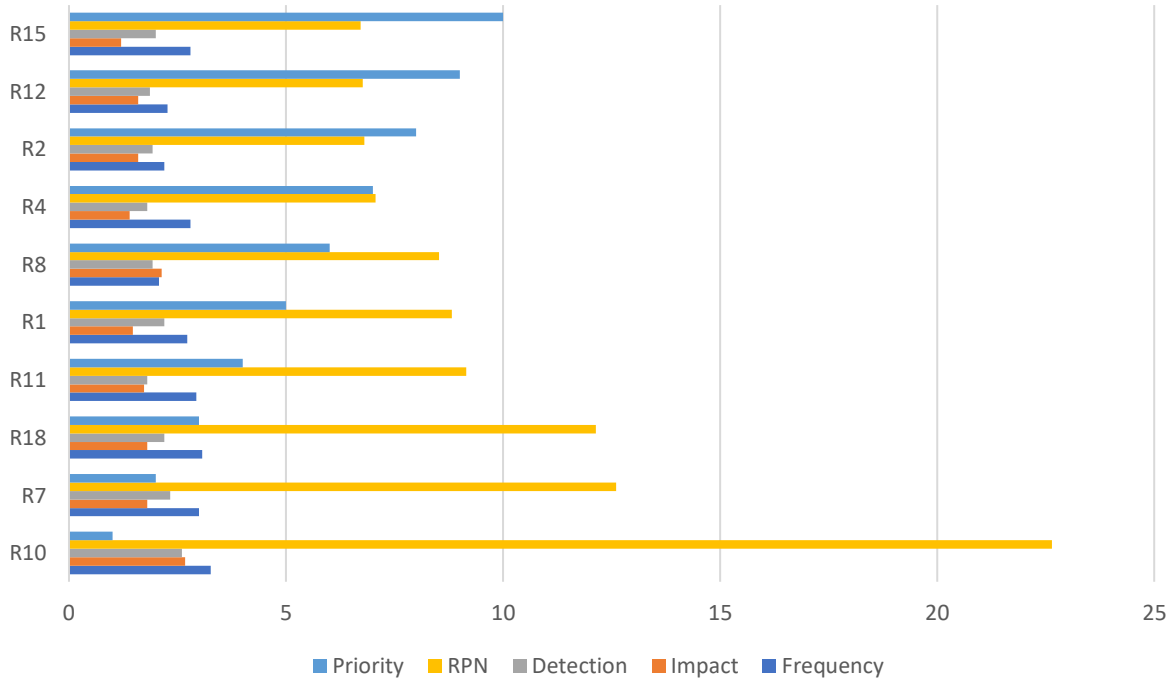

Figure 5. Risks with RPN above Critical Value

At the stage of determining the level of risk importance, identification is carried out regarding the frequency of occurrence of risks and the impact that may be caused if the risk occurs, so that the level of importance of each risk will be generated. Risk assessment basically refers to two factors, namely risk quantity and risk quality. The quantity of risk is related to how much value, or impact, is susceptible to risk while the quality of risk is related to the likelihood of a risk occurring. The purpose of risk assessment is to obtain a list of risks that have been assessed based on the level of impact and likelihood of occurrence. The results of the risk assessment are then mapped to determine the main risks that must be prioritized to be addressed.

To determine the level of risk importance, the equation below is used:

Risk importance value ax b = c.....(1)

Where the value of frequency = a (1-5), the value of impact = b (1-5) and the number of risk factors = z

The overall risk importance level is :

(Σci)/z.....(2)

To rank the risks, the results of the multiplication between the frequency and impact scales are arranged from the largest to the smallest. From the results of the above analysis, risks can be grouped based on their level of importance and obtain an interval that states the level of risk, high, medium, and low.

CIVED Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

Then in order to see the possibility of risk and the impact that may be caused if the risk occurs, so that the level of importance of each risk will be generated. The following table shows the results of the calculation of the level of importance of risks that have been sorted for the selection of providers in the procurement of construction work in five UKPBJs

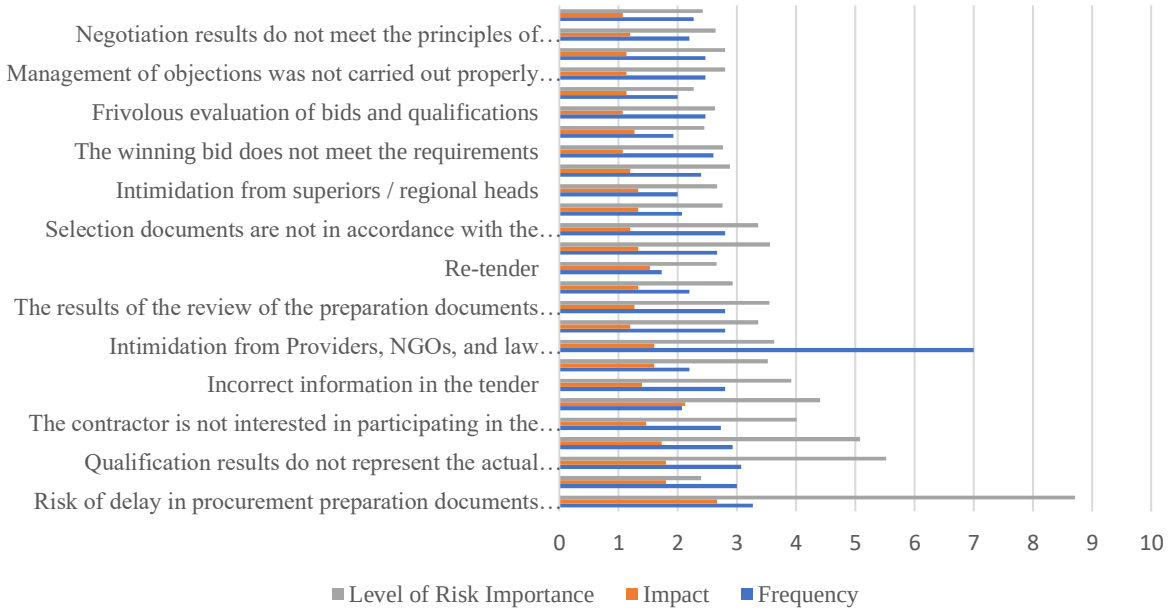

Figure 6. Value of Risk Importance Level

From the calculation of the risk importance table above, it can be seen that only two possible risks exist, namely medium and low as can be seen in table 5 below:

Table 5. Classification of Possible Risks

No.	*Risk Event*	Risk importance level value	Classification of Possible Risks		
			High (12-25)	Medium (8-12)	Low (1-8)
1	Risk of delay in procurement preparation documents from PPK SKPD	8,71		✓	
2	failed tender	5,40			✓
3	Qualification results do not represent the actual capabilities of the participants	5,52			✓
4	Lack of uploading tender documents	5,08			✓
5	Contractors are not interested in participating in the tender	4,01			✓
6	Protests/complaints from tenderers	4,41			✓
7	Misinformation in the tender	3,92			✓
8	HPS details known by tenderers	3,52			✓
9	Intimidation from providers, NGOs, and law enforcement officials	3,63			✓
10	Mistakes in selecting contractors	3,36			✓
11	The results of the review of the preparatory documents provide recommendations that are not in accordance with the provisions	3,55			✓

CIVED Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

No.	*Risk Event*	Risk importance level value	Classification of Possible Risks		
			High (12-25)	Medium (8-12)	Low (1-8)
	and/or rules for preparing procurement preparation documents				
12	There is a monopoly in the tender	2,93			✓
13	Re-tender	2,66			✓
14	The selection document prepared is biased / unclear	3,56			✓
15	Selection documents are not in accordance with the provisions, or characteristics of the work	3,36			✓
16	Inadequate number of bids submitted	2,76			✓
17	Intimidation from superiors / regional heads	2,67			✓
18	Explanation at the end of time / skipped	2,88			✓
19	Offer determined as winning did not meet requirements	2,77			✓
20	Failure to respond adequately to contractor queries	2,45			✓
21	Far-fetched evaluation of bids and qualifications	2,63			✓
22	Inadequate timeframe for submission of tender documents	2,27			✓
23	Protest management was not properly conducted in accordance with the provisions	2,80			✓
24	Selection of inappropriate procurement methods	2,80			✓
25	Negotiation results do not meet the principles of efficiency and effectiveness	2,64			✓
26	Collusion between procurement committee and contractor	2,42			✓

Based on the table above, it can be seen that of the 26 existing risks, only 1 risk has a moderate level of risk importance classification, namely the risk of delays in procurement preparation documents from PPK SKPD. While the other 25 risks are classified as low.
After being identified and analyzed for all existing risks, then risk control or mitigation proposals are made to minimize the impact that will occur. This risk mitigation is given to risks with RPN values above the critical value where in the results of this study there are 10 risks that need to be controlled / mitigated.

This control method is obtained based on interviews that have been conducted with Pokja-Pokja in the relevant UKPBJ and mitigation proposals that the author provides, then summarized the handling or mitigation that can be done for the ten risks with RPN above the critical value presented in table 6.

CIVED Journal of Civil Engineering and Vocational Education
EISSN: 2622-6774
Vol 11 No.2 June 2024
http://cived.ppj.unp.ac.id/index.php/CIVED

Table 6. Risk Mitigation with RPN above Crisis Value

No.	Procurement Stage	*Risk Event*	Mitigation Measures
1.	Provider Selection Stage	Risk of delay in procurement preparation documents from PPK SKPD	• PPK can be assisted by PBJ Functional as a support team to help prepare procurement preparation documents. • Make regional head instructions so that SKPD makes planning documents, especially construction work, not during the current year but in the previous year • SKPD to divide tasks with an adequate number of PPK so that they do not accumulate in one particular PPK • Periodically, at least once a month, a coordination meeting to accelerate the PBJ process should be held, led by the mayor or regent • SKPD and the PBJ section periodically provide socialisation and guidance to PPK for a more comprehensive understanding of PBJ so that the acceleration of the PBJ process can be improved.
2.		Failed Tenders	• SKPD PPKs should not require qualification and technical requirements that are likely to be difficult for providers to fulfil. • PPK and UKPBJ provide sufficient time for providers to submit bid documents. • The PUPR Office as the jakon coach to provide guidance to providers on how to understand procurement documents and the correct bid-making mechanism. • In the aanwizing process, PPK and UKPBJ should explain the details of the bid documents to be submitted and the procedure for UKPBJ to evaluate them.
3.		Qualification results are not the actual capabilities of the participants	• Administrative proof of qualifications in the field is carried out, such as administrative evidence explaining that the provider has rented the equipment listed • PPK and SKPD to be orderly in conducting performance assessment of providers • Conduct a study so that the provider's performance assessment can be an indicator in the process of selecting

			goods and services, especially in the procurement of construction work. • Provide guidance to associations to selectively accept their members according to their material and non-material capabilities. • Provide guidance to providers so that they do not force themselves if they do not have the ability so that they are forced to rent personnel and equipment.
4.		Lack of uploading tender documents	• Checking the completeness of documents before uploading both normatively and substantively.
5.		Contractors are not interested in participating in the tender	• Allow providers from other regions to take part in the auction
6.		There are objections / complaints from tenderers	• Carry out direct evaluation and clarification with the provider by requesting the necessary supporting evidence
7.		Information errors in the tender	• Maximise Aanwijzing / Explanation of work and Addendum to the Procurement Document
8.		HPS details are known by bidders	• The total value of the HPS is announced in the tender announcement. • Maintain confidentiality of HPS details
9.		Intimidation from Providers, NGOs, and law enforcement officials	• Carry out the procurement process in accordance with applicable rules • The existence of supervision from the Internal Supervisory Apparatus / Regional Inspectorate • Good and smooth communication with all parties
10.		Mistakes in selecting contractors	• In conducting evaluations, the selection working group must be careful and careful so that providers who do not meet the required qualifications do not pass the bidding stage.

CONCLUSION

Risk Event selection of providers in the procurement of construction work obtained 26 risk events identified by means of literature studies and pilot surveys conducted on several selection working groups. Of the 26 risk events that have been identified and analyzed using the FMEA method, 10 risk events are obtained that have an RPN value above the critical value, namely:

1. Delay in procurement preparation documents from PPK SKPD
2. The tender failed
3. Qualification results are not the actual ability of the participants
4. Lack of uploading tender documents
5. The contractor is not interested in participating in the tender
6. The existence of objections/complaints from tenderers

7. Misinformation in the tender
8. HPS details are known by tenderers
9. Intimidation from Providers, NGOs, and law enforcement officials
10. Mistakes in selecting contractors

As for the value of the level of risk importance, of the 26 risk events, only 1 risk event has a moderate level of risk probability classification, namely the risk of delays in procurement preparation documents from PPK SKPD. Then after being identified and analyzed, a mitigation action plan is carried out for each risk event that has an RPN value above the critical value to minimize the existing impact.

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