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OPERATIONAL RISK MANAGEMENT OF SURABAYA MAIN NAVAL BASE V REPAIR AND MAINTENANCE FACILITY BASED ON ISO 31000 FRAMEWORK

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ABSTRACT

Surabaya Main Naval Base V Repair and Maintenance Facility is one of the work units under the auspices of the Indonesian Navy that is tasked with carrying out the maintenance and repair of all major weapons systems of the Indonesian Navy. In carrying out their duties Surabaya Main Naval Base V Repair and Maintenance Facility has a big challenge and even there are various kinds of risks to prepare all the Indonesian Armed Forces defense equipment in accordance with the demands of need. Therefore, in this research, risk management will be carried out at the Surabaya Main Naval Base V Repair and Maintenance Facility Operational based on the ISO 31000: 2018 framework. Based on this framework, risk management will be carried out, namely how to carry out risk assessments in the form of risk identification, risk analysis, and risk evaluation for all risks in the operational field. Enterprise Risk Management (ERM) is also used to carry out in-depth risk management processes. One method used to solve existing problems is to use the House of Risk (HOR) method, which is divided into two stages. Stage 1 HOR focuses on ranking the Aggregate Risk Potential (ARP) value and with the help of the Pareto diagram the cumulative ARP value is obtained to determine the risk event (risk agent) selected, which then requires treatment on a priority scale. The results of this HOR phase 1 are then included in HOR phase 2 to rank the most effective prevention measures based on costs and resources. From the results of the HOR phase 2, further brainstorming was carried out with the Surabaya Main Naval Base V Repair and Maintenance Facility in accordance with the actions chosen for preventive actions that could be immediately carried out.

Keywords: *House of Risk, Enterprise Risk Management, SNI ISO 31000: 2018.*

1. INTRODUCTION.

Indonesian Navy Ships as one of the main elements of the Navy's integrated fleet weapons system is required to have combat readiness, so that efforts are needed to maintain and improve the condition of the Battle Ship so that it is always ready to carry out its tasks. Based on this, it is necessary to carry out maintenance and repairs of the Indonesian Navy Ships to maintain and maintain the technical condition of the ship in a condition ready for operation. To achieve this, the Indonesian Navy established a maintenance and repair work unit known as the Navy's Maintenance and Repair Facility. One of them is Surabaya Main Naval Base V Repair and Maintenance Facility, which has the main task of assisting the Commander of the Surabaya Main Naval Base V in carrying out repairs and maintenance in the field of machinery, shipping navigation equipment, weapons, electronics, magnetic security, dimming and fostering potential maritime services supporting the main tasks of the Surabaya Main Naval Base V.

The current condition in Surabaya Main Naval Base V Repair and Maintenance Facility, there are still a number of incidents that are related to the operation of the Surabaya Main Naval Base V Repair and Maintenance Facility, which is unexpected and detrimental to the Navy and Surabaya Main Naval Base V Repair and Maintenance Facility in particular. Some incidents include delays and inadequate availability of repair parts, work that is not completed on time, even at the stage of lack of coordination between Surabaya Main Naval Base V Repair and Maintenance Facility and third parties in carrying out repair operations. Research on risk management has been carried out in Surabaya Main Naval Base V Repair and Maintenance Facility, but only focused on improving the Indonesian Navy Ships. Therefore, in this study will examine risk management in the operational field which includes all operational Surabaya Main Naval Base V Repair and Maintenance Facility. Risk management is an inseparable part of management's responsibility in ensuring the achievement of organizational goals. Risk control can increase the effectiveness and efficiency of management, because all risks that can hinder the organization's processes have been identified and can be handled properly.

Implementation of Enterprise Risk Management (ERM) is a very important thing owned by a work unit, because the risks that occur can be managed and minimized to achieve the objectives of the work unit's organization. The approach used to carry out ERM in this study is the ISO 31000: 2018 framework. The process of risk

management, design goes through the stages of risk identification, risk analysis, risk evaluation, risk treatment, monitoring and review. In identifying and measuring potential risks, the focus is on the operations in Surabaya Main Naval Base V Repair and Maintenance Facility, because the risks faced can be seen in the operational section of Fasharkan.

In the many research that has been done on the risk management, design stage using a separate method for each stage. In risk identification using brainstorming, risk analysis uses a risk matrix, risk evaluation uses the FMEA (Failure Mode Effect of Analysis) method and the last step is to treat risk using manual recommendations. Therefore, in this study to identify, analyze, evaluate and treat risk using the House of Risk (HOR) model. This model is a framework developed by Pujawan and Geraldin (2011) by developing the FMEA method and the Quality Function Deployment (QFD) method. Broadly speaking, the advantages of this method are the stages in the framework that have been compiled to include one method that can be used to carry out risk management analysis.

House of Risk is divided into two phases, namely the first phase, risk identification is the development of the QFD method. Then the second phase, risk treatment is the development of the FMEA method. The risk identification phase is the phase in which risk events and risk agents are identified, measured and prioritized. The risk management phase is the phase in which risk agents are selected based on the high priority level of the first phase HOR output. After that, identify relevant actions to prevent risk from arising and determine the relationship between each preventive action on each risk trigger. Then, calculate the level of effectiveness and measure the level of difficulty of each action used as a form of risk response or mitigation. The HOR model has been applied in one of the studies, namely Putri Amelia, Iwan Vanany, Indarso, Operational Risk Analysis in the Warship Division of PT. PAL Indonesia with the House of Risk Method. The purpose of this study is to identify, analyze and choose the sequence and risk mitigation strategies associated with using the House of Risk method.

With the research on the design of risk management framework, it is expected to be able to help Surabaya Main Naval Base V Surabaya in conducting risk management based on ISO 31000: 2018. So that it can meet the needs of Surabaya Main Naval Base V Repair and Maintenance Facility in finding operational risks and managing each risk appropriately.

2. MATERIAL AND METHODS.

This study uses the House of Risk (HOR) model which is a development of the FMEA (Failure Mode and Effects Analysis) and HOQ (House of Quality) methods. This model prioritizes which sources of risk are first chosen to be taken most effectively in a frame that reduces the potential risk from the source of risk. Knowing which causes of risk are priority will make it easier to determine mitigation or mitigation of risks. In FMEA, risks that can be calculated through the calculation of RPN (Potential Risk Numbers) obtained from three risk factors associated with, the risk of damage generated, and risk detection. However, in the estimation of HOR, the calculation of the value of the RPN is obtained from the source of the risk and the impact of damage related to that risk occurs.

2.1. Identification of Problems

The problem identification phase aims to find out and understand the main problem that will be the object of research, namely the design of operational risk management analysis at Surabaya Main Naval Base V Repair and Maintenance Facility. This description of the maintenance and repair process of the Surabaya Main Naval Base V Repair and Maintenance Facility is also needed so that it can be used as a basis for identifying risk agents and risk events.

2.2. Determination of Context

The purpose of this research is to analyze risk management in Surabaya Main Naval Base V Repair and Maintenance Facility. In identifying and measuring potential risks, the focus is on the operational in Surabaya Main Naval Base V Repair and Maintenance Facility, because the risks faced can be seen in the operational section of it. The operative part is in accordance with the maintenance and repair process of the Indonesian Navy Ships in Surabaya Main Naval Base V Repair and Maintenance Facility, starting from the maintenance planning process, the procurement of spare parts, the storage and distribution of spare parts, the production process of maintenance and repair, the monitoring process and the supporting processes (financial administration, management of work facilities, human resource management, and information technology management).

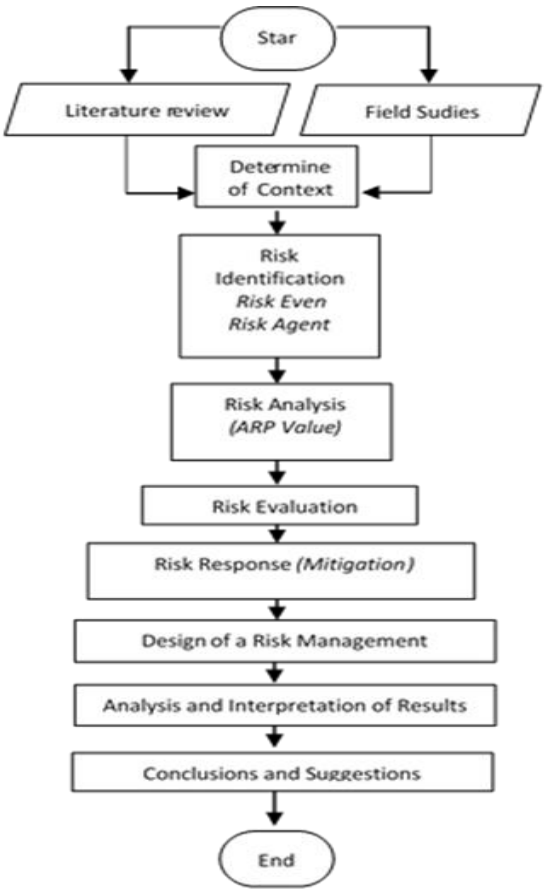
2.3. Literatur Review and Field Studies

The use of literature studies and field studies aims to provide a deeper understanding of the research concepts to be carried out. Literature study is more directed at providing study material to the object of research through literature in the form of books, journals, or previous research which includes the concept of operational risk management of the company, the use of the House of Risk (HOR) method in carrying out the stages of risk identification, risk analysis, risk evaluation, treatment risk and risk mitigation design on the company's operational risk. Then, the risk management concept literature is used to understand the steps in designing a risk management framework. In addition, the field study was conducted with the aim of providing a detailed

description of the maintenance and repair process of Surabaya Main Naval Base V Repair and Maintenance Facility, so that later on aspects of risk that could emerge as well as triggers for the risk could be identified.

2.4. Research Flow Chart

The research flow diagram can be seen in Figure1., As follows:



2.5. Risk Identification, Analysis and Evaluation

At this step the data collection process will be carried out to facilitate the analysis process in the study. This stage consists of the risk identification stage as outlined in the form of a risk event and the risk agent.

2.5.1. Identification of Risk Agent and Risk Event

In this step, what will be identified as risk events and risk agents in Surabaya Main Naval Base V Repair and Maintenance Facility operational activities. The identification of risk aversion is carried out in business processes and the risk events that may occur in each business process are obtained. The results of the identification of risk agents and risk events are also supported from literature studies, previous research that discusses operational risks and observations in field studies. The risks that have been identified are then verified by conducting interviews from various expert fields from each related business process unit.

2.5.2 Risk Analysis

This step is the stage of data collection and operational risk recapitulation which includes risk agents and also risk events that are contained in the operational activities of Surabaya Main Naval Base V Repair and Maintenance Facility. The risk variables used in the study were obtained from the results of verification through interviews with several people who have specific experience and expertise in the fields in accordance with the topic of discussion. Then, a Focus Group Discussion (FGD) was conducted with several expert fields from each related unit to determine the magnitude of the risk probability (occurrence), the impact of the risk (severity).

2.5.3. Risk Evaluation

The purpose of the risk evaluation is to determine the risk agent that will be selected from a high priority level based on the output of HOR phase 1 that will enter HOR phase 2. Then generate a priority sequence of risks to be addressed further (risk protection / mitigation plan). Severity and correlation between risk events and their risk agents, and the likelihood of these occurrences combined to determine the level / rating of risk.

This risk analysis process is carried out by calculating the Aggregate Risk Potential (ARP) value using the HOR1 Model. ARP value is obtained from the sum of the results of the multiplication of severity with the level of occurrence. The result is a risk priority which is then used as a reference for preparing a risk management plan.

2.6. Risk Mitigation Design

The preparation of a risk mitigation design serves to provide alternative solutions in preventing operational risks with optimum costs. In this research, the risk mitigation design is shown in the House of Risk phase 2. At this stage, it focuses on determining what steps are most appropriate to do first by considering the effectiveness of the resources used and the level of performance of related objects.

2.7. Making a Risk Management Framework in Surabaya Main Naval Base V Repair and Maintenance Facility

This stage will design a risk management framework for Surabaya Main Naval Base V Repair and Maintenance Facility by implementing Enterprise Risk Management (ERM). The implementation of ERM is a very important thing owned by the company, because the risks that occur can be managed and minimized to achieve company goals. The approach used to implement Enterprise Risk Management (ERM) in this study is SNI ISO 31000: 2018. The framework of risk management, design goes through several components, including risk identification, risk analysis, risk evaluation, risk treatment, monitoring

and review. In this study at the stage of risk identification, risk analysis, risk evaluation and risk treatment using the House of Risk (HOR) method.

Then, the next stage of monitoring and review needs to be done because the development and implementation of each stage of risk management need to be monitored to ensure the optimization of risk management. This activity also aims to ensure that the implementation of risk management remains in line with company policy. It also needs to be understood that risk is something that can change at any time (dynamic not static). In essence, monitoring activities will ensure the effectiveness and efficiency of risk management implementation so that it runs optimally.

2.8. Analysis and Interpretation of Results

This stage is carried out after going through the process of collecting, recording, and processing data. The results of data processing in the study are then analyzed and interpreted in more depth so that a conclusion can be drawn that can answer the purpose of conducting research on the design of operational risk management analysis in Surabaya Main Naval Base V Repair and Maintenance Facility.

2.9. Conclusions and Suggestions

After all phases which include identification, collection, recording, processing, analysis and interpretation of data are carried out, then conclusions can be drawn relating to the allocation and design of risk mitigation forms that can be carried out in the operational activities of Surabaya Main Naval Base V Repair and Maintenance Facility. In addition to drawing conclusions, at this stage there are also providing suggestions or recommendations for future studies in order to provide better results for the design process of operational risk management analysis at Surabaya Main Naval Base V Repair and Maintenance Facility.

3. RESULTS AND DISCUSSION

3.1. Business process of Surabaya Main Naval Base V Repair and Maintenance Facility

The business process at Surabaya Main Naval Base V Repair and Maintenance Facility can be described as follows:

Fig 2. Organizational Level Surabaya Main Naval Base V Repair and Maintenance Facility

The main business level is the Main Naval Base V Commander in Surabaya and all staff, while the business level unit is one of the work units, namely Maintenance and Repair Facilities that provide maintenance, repairs and maintain the readiness of the technical conditions of the Idonesian Navy Ships elements. Furthermore, the level of business processes is all workshops under Repair and Maintenance Facility and at the level of activity that is all kinds of work activities carried out for the maintenance and repair of Indonesian Navy Ships in each workshop fasharkan a case of welding, repair of pumps, electric motors, generators, main enggine etc.

3.2 Design of Risk Management in Surabaya Main Naval Base V Repair and Maintenance Facility

The creation of a risk management framework that will be carried out in this study through several stages, including determining the context, identifying risks, analyzing risks, evaluating risks, treating risks, monitoring and reviewing, and communicating and consulting. The House of Risk (HOR) method will be used at the risk identification, risk analysis, risk evaluation and risk treatment stages.

3.2.1 Determination of Context

By focusing this research on the operational of Surabaya Main Naval Base V Repair and Maintenance Facility, namely by looking at the risks seen in the operational process. The matters relating to this operational process are starting from the process starting from the planning process, the process of procuring spare parts, the process of storing and distributing parts, the production process of maintenance and repair, the quality management process and the supporting process (financial administration, work facility management, management human resources, and information technology management).

3.2.2 Risk Identification

The process of risk identification carried out in this research is to use the House of Risk (HOR) method. All risks that occur will be identified based on the form of risk events (risk events) and also the causative factors that trigger (risk agents) the risk.

a. Respondent Data Recap

Selected respondents are people who are experts or experts in each stage of the business process at Surabaya Main Naval Base V Repair and Maintenance Facility. Respondent data used in this study are the Leaders namely Kafasharkan, Head of Planning, Head of Production, Head of each Workshop, Kataud and Kaakun (financial section).

b. Identification of Risk Events

In the identification of these risk events, a table will be made containing the results of the identification of risk events that may occur in Surabaya Main Naval Base V Repair and Maintenance Facility in accordance with each of the

existing fields in the business processes carried out. From the results of the identification of risk events that were carried out, as many as 19 risk events were obtained, which can be seen in Table1.

Table 1. Risk Events

Risk Event Code	Risk Event
Risk Planning Process (Planning Unit)	
K1	Limited funds for the implementation of harkan
K2	Procurement of spare parts is not timely
K3	The planned time is not in accordance with the implementation
K4	Additional work that is not according to plan
K5	User delays in following the work schedule as planned
K6	Spare parts procurement error
K7	Mismatch between the number of parts that come with the planned (contract)
K8	The process of storing spare parts by a third party is not according to standard
K9	Service process for spare parts by third parties is not smooth
Activity Risk (Workshop Unit)	
K10	There are additional hours worked
K11	Work accident
K12	Engine failure during production
K13	Implementation of work by third parties is not on schedule
K14	Limited performance and speed of work by parties
K15	The number of jobs tends to increase
Risk Oversight Process (Production Unit)	
K16	Installation of inappropriate components
K17	Timing of work that is not on schedule
K18	The volume of work that is not appropriate
K19	Delay work that was not completed on time

c. Identification of Risk Agent

Risk events that have been described previously, will be identified by compiling the impact that might result from each of these risk events as in Table 2 below:

Table 2 Risk Event Potential Impact Caused

Kode Risiko	*Risk Event*	Potential Impact Caused
Risk Planning Process (Planning Unit)		
K1	Limited funds for the implementation of harkan	- Can not Fulfill the cost of repair and procurement of spare parts
K2	Procurement of spare parts is not timely	- The repair process will not be completed on time - Maintenance and recovery is not carried out with safety standards
K3	The planned time is not in accordance with the implementation	- Will lead to a delay in the repair process - The occurrence of additional costs due to the addition of time.
K4	Additional work that is not according to plan	- Increasing the cost of repairs due to an increase in the volume of work outside the planned volume - The execution time will increase due to an increase in volume
K5	User delays in following the work schedule as planned	- The planned repair planning process will change and affect other repair schedules.
K6	Spare parts procurement error	- Cost losses due to unused spare parts - Repairs carried out are not in accordance with the standard because the spare parts do not match.
K7	Mismatch between the number of parts that come with the planned (contract)	- Cost losses due to unused parts because the amount exceeds the needs - Repairs carried out can be hampered because of the lack of spare parts
K8	The process of storing spare parts by a third party is not according to standard	- Spare parts can get damaged because they are stored in a place that is not up to standard - The execution time will increase due to an increase in volume
K9	Service process for spare parts by third parties is not smooth	- The work process is hampered because of having to wait for spare parts - The execution time will increase due to an increase in volume
Activity Risk (Workshop Unit)		
K10	There are additional hours worked	- There are additional costs due to the increased number of

		hours worked.
K11	Work accident	- Experienced material losses and personnel losses
K12	Engine failure during production	- The work process can be stopped either in a short period of time, or in a long period of time.
K13	Implementation of work by third parties is not on schedule	- Work will be completed in a timely manner - Can disrupt the schedule.
K14	Limited performance and speed of work by parties	- The work will not be on target both in terms of time and in terms of quality.
K15	The number of jobs tends to increase	- Will increase the need for resources to be able to accommodate all existing work.
Risk Oversight Process (Production Unit)		
K16	Installation of inappropriate components	- Relating to the quality of work and its compliance with existing standards - The results of the work will not meet safety standards
K17	Timing of work that is not on schedule	- Delays in work that will add to operational costs - There will be changes in work schedules that will affect other work schedules.
K18	The volume of work that is not appropriate	- Increasing the volume of work adds to operational costs - Increasing the volume of work will increase the time of work.
K19	Delay work that was not completed on time	- Additional costs due to increased processing time (for example a ship above the dock)

d. Risk Agent Identifikation

In the process of identifying the risk agent, the identified risk events are then carried out further identification of what triggers them. The aim is to find out exactly what triggers a risk event that occurs. This will facilitate the risk management process to determine what mitigation measures need to be taken. Risk agent identification can be seen in Table 3. below:

Tabel 3. Risk Agent

Risk Agent Code	***Risk Agent***
Risk Planning Process (Planning Unit)	
P1	Incompatible budget design with realtime conditions (badly damaged facilities)
P2	Some of the spare parts needed are hard to find in the market
P3	An auction failed in the procurement of parts
P4	The technical specifications given to third parties lack detail
P5	Error in choosing Supplier in this case a third party
P6	Suppliers do not understand when given an explanation of the technical specification of spare parts
P7	Lack of accuracy in the process of checking what damage needs to be addressed
P8	Users do not provide detailed information about the damage
P9	High user operational demands
P10	Operational schedule that has not synchronized with the repair schedule
P11	The supplier does not fully understand the type of spare parts to be held
P12	There is a change in the serial number on the spare parts on the market
P13	The technical specifications of the spare parts received by the supplier lack detail
P14	Supplier cannot provide spare parts in fast time because the order process takes a long time
P15	The selection of suppliers is not right
P16	Suppliers only borrow Fasharkan's warehouse as a storage area
P17	Administrative process is still long in the distribution of spare parts
P18	There is still an administration that requires an original signature and a wet stamp for administrative completeness
P19	Unavailability of spare parts directly because they have to go through the ordering process.
Activity Risk (Workshop Unit)	
P20	HR works less effectively
P21	There is no standardization of special working hours or additional working hours
P22	Workers who work do not comply with SOP
P23	Operators who are less competent

	according to their fields
P24	Some operators who work in the field are already quite old
P25	It does not carry out regular checks on production machinery
P26	Third party spare parts delays
P27	Third parties have not been able to fulfill the time according to the agreement
P28	Some operators in the production sector are old
P29	The amount of damage at the user level is increasing
Risk Oversight Process (Production Unit)	
P30	The unavailability of parts in the market that are in accordance with the specifications required
P31	Negligence from third parties
P32	The addition of work that is not included in the volume that is urgent and must be done
P33	Overloaded production target

e. Questionnaire Data

At this stage, a questionnaire is carried out to find the scale of the impact (severity) and the criteria for the probability scale of the event (occurance). The questionnaire is arranged based on the identification of risk events and identification of triggers that have been obtained previously. The questionnaire will be filled by Kafasharkan, Kebag, and the Workshop Heads in accordance with the data fields we need. The questionnaire will be made based on the criteria for weighting the impact value according to the table below:

Tabel 4. Severity of Risk

LEVEL	SEVERITY	DESCRIPTION
1	Not significant	The impact is very small or not important or really needs attention or doesn't need attention
2	Small	Not too important or valuable, not too serious, not causing problems or damage
3	medium	Big enough or have an interest to get attention
4	Big	Very bad, serious, or unwanted damage
5	Significant	Impacts that thwart the success of the target

Tabel 5. Kriteria Skala Probabilitas kejadian (*Occurence*)

SCORE	Occurance	Description	Frequency
5	Almost certainly / often happens	Incident already expected to occur	Freq >5x/year
4	Most likely / ever happened before	This incident is possible occur	Freq 3-5x/year
3	Maybe / can happen	This incident is possible happened at a time	Freq 1-2x/year
2	Rarely	Can happen but not expected	Freq <1x/2year
1	Very rarely	Occur only in certain situation	Freq <1x/5year

3.3 House of Risk (HOR)

At this stage of the HOR, it will be divided into two stages, namely stage one as risk identification and stage two is the stage of preparing risk response or mitigation.

3.3.1 HOR Step 1

In this Phase 1 HOR the determination of which risk source will be chosen, is based on the value of the Aggregate Risk Potential (ARP). Where the ARP value consists of three factors, namely occurance, severity and interrelationship. From the results of interviews and discussions with Kafasharkan, Section Heads, and Workshop Heads obtained 19 risk events and 33 risk agents. Next as a first step by providing an assessment of severity scale (risk impact) with a value of 1-5 in the risk event and an assessment of the scale of occorrance (probability of occurrence) with a scale of 1-5 in the risk agent. The assessment of severity scale and occurance scale is based on Table 4 and Table.5.

The following are the results of severity and occorrance scale assessments obtained from questionnaires and interviews with Kafasharkan, Division Heads, and Workshop Heads as shown in the following Table 6 :

Table 6. Assessment Results on Severity Scale

Risk Event Code	Kejadian Risiko (*Risk Event*)	*Severity*
Risk Planning Process (Planning Unit)		
K1	Limited funds for the implementation of harkan	2
K2	Procurement of spare parts is not timely	3
K3	The planned time is not in accordance with the	3

	implementation	
K4	Additional work that is not according to plan	1
K5	User delays in following the work schedule as planned	1
K6	Spare parts procurement error	1
K7	Mismatch between the number of parts that come with the planned (contract)	3
K8	The process of storing spare parts by a third party is not according to standard	4
K9	Service process for spare parts by third parties is not smooth	3
Activity Risk (Workshop Unit)		
K10	There are additional hours worked	2
K11	Work accident	2
K12	Engine failure during production	3
K13	Implementation of work by third parties is not on schedule	4
K14	Limited performance and speed of work by parties	5
K15	The number of jobs tends to increase	1
Risk Oversight Process (Production Unit)		
K16	Installation of inappropriate components	3
K17	Timing of work that is not on schedule	3
K18	The volume of work that is not appropriate	1
K19	Delay work that was not completed on time	3

Table 7. Assessment Results of Occurrance Scale

Risk Agent Code	Risk Agent	Occurance
Risk Planning Process (Planning Unit)		
P1	Incompatible budget design with realtime conditions (badly damaged facilities)	1
P2	Some of the spare parts needed are hard to find in the market	3
P3	An auction failed in the procurement of parts	1
P4	The technical specifications given to third parties lack detail	3
P5	Error in choosing Supplier in this case a third party	4
P6	Suppliers do not understand when given an explanation of the technical specification of spare parts	3
P7	Lack of accuracy in the process of checking what damage needs to be addressed	2
P8	Users do not provide detailed information about the damage	1
P9	High user operational demands	1
P10	Operational schedule that has not synchronized with the repair schedule	2
P11	The supplier does not fully understand the type of spare parts to be held	3
P12	There is a change in the serial number on the spare parts on the market	2
P13	The technical specifications of the spare parts received by the supplier lack detail	1
P14	Supplier cannot provide spare parts in fast time because the order process takes a long time	3
P15	The selection of suppliers is not right	4
P16	Suppliers only borrow Fasharkan's warehouse as a storage area	1
P17	Administrative process is still long in the distribution of spare parts	4
P18	There is still an administration that requires an original signature and a wet stamp for administrative completeness	2
P19	Unavailability of spare parts directly because they have to go through the ordering process.	5
Activity Risk (Workshop Unit)		
P20	HR works less effectively	1
P21	There is no standardization of special working hours or additional working hours	1
P22	Workers who work do not comply with SOP	3
P23	Operators who are less competent according to their fields	1
P24	Some operators who work in the field are already quite old	2
P25	It does not carry out regular checks on production machinery	1
P26	Third party spare parts delays	3
P27	Third parties have not been able to fulfill the time according to the agreement	3
P28	Some operators in the production sector are old	1
P29	The amount of damage at the user level is increasing	1
Risk Oversight Process (Production Unit)		

P30	The unavailability of parts in the market that are in accordance with the specifications required	3
P31	Negligence from third parties	3
P32	The addition of work that is not included in the volume that is urgent and must be done	2
P33	Overloaded production target	1

From the results of the Severity scale and Occorrance scale that has been obtained, then the correlation between risk agents and risk events will be identified. The correlation assessment is based on the rules of 9 (nine), 3 (three), and 1 (one) values based on the role of the risk agent in generating risk events, which are large, medium or weak. The results are as in Table 8 below:

Table 8. Correlation between Risk Event and Risk Agent

RE Code	Risk Event	RA Kode	Risk Agent	Correlation
Risk Planning Process (Planning Unit)				
K1	Limited funds for the implementation of harkan	P1	Design mismatch budget with real conditions time (facilities badly damaged)	1
K2	Procurement of spare parts is not timely	P2	Some spare parts are it is difficult to find in the market	3
		P3	An auction failed inprocurement of spare parts	1
K3	The planned time is not in accordance with the implementation	P4	The technical specifications given to third parties lack detail	1
		P5	Error in choosing Supplier in this case a third party	3
		P6	Supplier does not understand When given an explanation of the technical specification of spare parts	1
K4	Additional work that is not according to plan	P7	Lack of accuracy in the process of checking what damage needs to be addressed	1
		P8	Users do not provide detailed information about the damage	1
K5	User delays in following the work schedule as planned	P9	High user operational demands	1
		P10	Operational schedule that has not synchronized with the repair chedule	1
K6	Spare parts procurement error	P11	The supplier does not fully understand the type of spare parts to be held	3
		P12	There is a change in the serial number on the spare parts on the market	1
		P13	The technical specifications of the spare parts received by the supplier lack detail	1
K7	Mismatch between the number of parts that come with the planned (contract)	P14	Supplier cannot provide spare parts in fast time because the order process takes a long time	9
		P	The selection of suppliers is	3

		15	not right	
K8	Proses penyimpanan suku cadang oleh supplier tidak sesuai standar	P 16	Suppliers only borrow Fasharkan's warehouse as a storage area	1
		P 17	Administrative process is still long in the distribution of spare parts	1
K9	Service process for spare parts by third parties is not smooth	P 18	There is still an administration that requires an original signature and a wet stamp for administrative completeness	1
		P 19	Unavailability of spare parts directly because they have to go through the ordering process.	3
Activity Risk (Workshop Unit)				
K 10	There are additional hours worked	P 20	HR works less effectively	1
		P 21	There is no standardizatio n of special working hours or additional working hours	1
K 11	Work accident	P 22	Workers who work do not comply with SOP	3
K 12	Engine failure during production	P 23	Operators who are less competent according to their fields	1
		P 24	Some operators who work in the field are already quite old	1
		P 25	It does not carry out regular checks on production machinery	3
K 13	Implementatio n of work by third parties is not on schedule	P 26	Third party spare parts delays	9
		P7	Third parties have not been able to fulfill the time according to the agreement	3
K4	Work performance and speed are decreasing	P8	Some operators in the production sector are old	1
K5	The number of jobs tends to increase	P9	The amount of damage at the user level is increasing	1
Risk Oversight Process (Production Unit)				
K6	Installation of inappropriate components	P0	The unavailability of parts in the market that are in accordance with the specifications required	3
K7	Timing of work that is not on schedule	P1	Negligence from third parties	9
K8	The volume of work that is not appropriate	P2	The addition of work that is not included in the volume that is urgent and must be done	1
K9	Delay work that was not completed on time	P3	Overloaded production target	1

The next step is to calculate the Aggregate Risk Potential (ARP) obtained from the

multiplication of the probability of the risk source and the impact related to that risk. Then the results of the ARP values are made in one table, sorted from the highest ARP value to the lowest value. The results can be seen in the following Table 9:

Table 9. ARP values based on Ranking

RA Code	Risk Agent	Rank	RP Values
P26	Third party spare parts delays	1	108
P31	Negligence from third parties	2	81
P14	Supplier cannot provide spare parts in fast time because the order process takes a long time	3	81
P19	Unavailability of spare parts directly because they have to go through the ordering process.	4	45
P5	Error in choosing Supplier in this case a third party	5	36
P15	Third parties have not been able to fulfill the time according to the agreement	6	36
P27	The selection of suppliers is not right	7	36
P30	The unavailability of parts in the market that are in accordance with the specifications required	8	27
P22	Workers who work do not comply with SOP	9	18
P17	Administration process is still long in the distribution of spare parts	10	16
P2	Suppliers do not understand when given an explanation of the technical specification of spare parts	11	9
P3	The technical specifications given to third parties lack detail	12	9
P4	An auction failed in the procurement of parts	13	9
P6	It does not carry out regular checks on production machinery	14	9
P11	Some of the spare parts needed are hard to find in the market	15	9
P25	The supplier does not fully understand the type of spare parts to be held	16	9
P18	Some operators who work in the field are already quite old	17	6
P24	There is still an administration that requires an original signature and a wet stamp for administrative completeness	18	6
P28	Some operators in the production sector are old	19	5
P16	Suppliers only borrow Fasharkan's warehouse as a storage area	20	4
P23	Overloaded production target	21	3
P33	Operators who are less competent according to their fields	22	3
P1	Lack of accuracy in the process of checking what damage needs to be addressed	23	2
P7	The addition of work that is not included in the volume that is urgent and must be done	24	2
P10	There is no standardization of special working hours or additional working hours	25	2
P12	HR works less effectively	26	2
P20	There is a change in the serial number on the spare parts on the market	27	2
P21	Operational schedule that has not synchronized with the repair schedule	28	2
P32	Incompatibility between the draft budget and the real time conditions (facilities badly damaged)	29	2
P8	High user operational demands	30	1
P9	Users do not provide detailed information about the damage	31	1
P13	The amount of damage at the user level is increasing	32	1

P29	The technical specifications of the spare parts received by the supplier lack detail	33	1

Table 10. ARP Cumulative Value

RA Code	ARP VELUE	ARP Cumulative Value (%)
P26	108	19%
P31	81	32%
P14	81	46%
P19	45	54%
P5	36	60%
P15	36	66%
P27	36	73%
P30	27	77%
P22	18	80%
P17	16	83%
P2	9	85%
P3	9	86%
P4	9	88%
P6	9	89%
P11	9	91%
P25	9	92%
P18	6	93%
P24	6	94%
P28	5	95%
P16	4	96%
P23	3	96%
P33	3	97%
P1	2	97%
P7	2	98%
P10	2	98%
P12	2	98%
P20	2	99%
P21	2	99%
P32	2	99%
P8	1	99%
P9	1	100%
P13	1	100%
P29	1	100%

From the results of the ARP value, the risk agent's priority classification of the overall risks that will be taken as a treatment action in an effort to minimize the occurrence of risk using the Pareto 80:20 diagram can be seen in Figure 3. below:

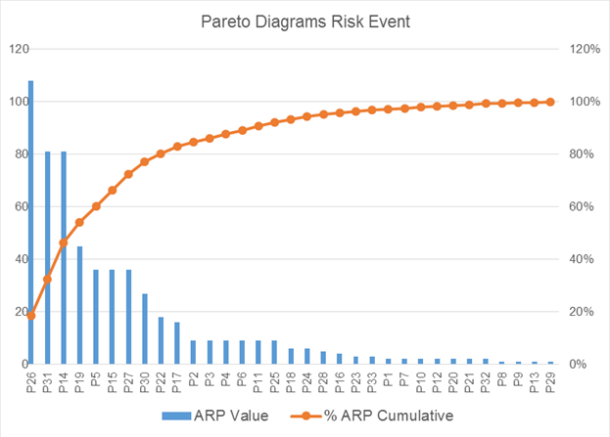


Fig 3. Risk Agent Pareto Diagram

After pareto diagram application, it is obtained from the cumulative percentage of ARP that there is 1 selected risk agent, namely the delay of spare parts by third parties (P 26). However, based on branstring with Surabaya Main Naval Base V Repair and Maintenace Facility, risk agents that will become priority risk agents for preventive actions are the top four risk agents. Because according to the Repair and Maintenace Facility the risk agent, is considered to be able to hamper the achievement of organizational goals.

The next step, the results of selected risk agents will be processed using the House of Risk Phase 2 Model to determine mitigation actions.

3.3.2 HOR Step 2

For the next step of HOR 2 , the preparation of precautionary measures against risk triggers will be carried out where the results of the HOR phase 1 are used. Based on the output of the HOR 1 calculation, there are only four risk agents that trigger operational risk at PT in Fasharkan which requires handling on a priority scale. House of Risk phase 2 focuses on determining the actions to be taken first by considering the level of effectiveness and the level of difficulty of each of the preventive actions (PA) to be carried out. Following are the results of the identification of preventive actions (PA) which are used to control or prevent and minimize a risk agent. The results can be seen in the following table 11 below:

Tabel 11. Prevent and minimize a risk agent.

Risk Agent Code	Risk Agent	Prev. Act. Code (PA)	Preventive Action
P26	Third party spare parts delays	PA1	Providing conditions to third parties for ready stock of spare parts at a certain time before the start of work.

		PA2	Give emphasis to third parties to carry out the procurement of spare parts on time
P31	Negligence from third parties	PA3	Provide administrative sanctions, in the form of penalties
		PA4	Giving moral sanctions is temporarily rested
P14	Supplier cannot provide spare parts in fast time because the order process takes a long time	PA5	Conduct a market survey in advance for the type of spare parts needed
P19	Unavailability of spare parts directly because they have to go through the ordering process.	PA6	Look for other alternatives in the parts procurement process.
		PA7	Carry out a review in the work planning process

Preventive action in Table 11 will then be used in the preparation of HOR stage 2. As with HOR stage 1, then in this HOR phase 2 will be determined the relationship or correlation with each risk agent that is a priority in HOR output phase 1, where the relationship of each - each preventive action and risk agent is measured using a scale of {0, 1, 3, 9}. This figure shows the relationship between preventive action and risk event, which means that preventive action plays a major role in minimizing risk agent.

4. CONCLUSIONS.

Based on the results of the risk identification obtained 19 risk events. Where 9 risk events in the Planning Unit, 6 risk events in the Workshop Unit, and 4 risk events in the Production Unit. As for the risk triggers, 33 things are obtained that trigger the risk.

Based on the ARP calculation results on HOR stage 1, the results obtained are 1 risk that needs to be handled, namely P26 (spare parts delay by third parties). But from the results of the brainstorming with Fasharkan, there were 4 risk triggers that needed to be followed up in accordance with Fasharkan's requirements and needs. The triggers for this risk are P26 (Delay of spare parts by third parties), P31 (Negligence of third parties), P14 (Supplier cannot provide spare parts in fast time due to the ordering process that takes a long time), and P19 (Unavailability of spare parts directly because they have to go through the order process).

Furthermore, in HOR phase 2, seven preventive measures were made as mitigation actions and follow-up actions to address these risks. The seven actions are PA1 (Provide conditions to third parties for ready stock of spare parts at a certain time before the start of work), PA2 (Give emphasis to third parties to carry out spare parts procurement on time), PA3 (Provide administrative sanctions, in the form of penalties), PA4 (Providing moral sanctions ie resting temporarily), PA5 (Conducting a market survey in advance for the type of spare parts needed), PA6 (Looking for other alternatives in the process of procuring parts), and PA7 (Carrying out a review in the work planning process).

Suggestions for further research that is necessary to be more effective by involving experts in the field of the project being carried out or officials in companies that are competent with the project implementation.

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