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ANALYSIS OF RAW MATERIALS DELAY AT PT. XYZ USING THE HOUSE OF RISK (HOR) METHOD

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Abstrak

PT. XYZ is one of the companies on Batam Island that fabricates steel constructions or modules for the oil and gas industry. However, one of the company's major potential issues is obtaining raw materials in time for fabrication. The purpose of this study is to identify factors causing raw material delays from the suppliers by determining risk events and risk agents using the House of Risk (HOR) method. The stages for identifying risks and evaluating the risk events and risk agents are performed by interviewing the relevant company staff using questionnaires. The research obtained as many as seven risk events and eleven risk causes, and the study is followed by conducting a correlation assessment process. Finally, producing them to determine the risk agents' ranking. Based on the Aggregate Risk Potential (ARP) of the HOR Model 1, there are three dominant risk agents described by the Pareto Diagram, namely, the Unavailability of the required raw materials (A1), the Changing of material delivery schedule (A2), and the Negligence of vendors (A5). After obtaining the priority order of eight strategies, four strategies resulted in an effectiveness of 80% of the total cumulative Effectiveness to Difficulty (ETD) ratio, namely, improving communication with vendors (PA1), increasing inspection and checking accuracy (PA2), conducting stricter vendor evaluations (PA3) and conducting efficient and economical budget planning and management (PA8).

INTRODUCTION

Inventory is the most important part of the company process. According to experts, the definition of inventory is generally defined as a stock of raw materials used to facilitate production or to satisfy consumer demand. Inventory is a central management function (R. Aswathy et al., 2025). It is a cornerstone of supply chain management and

logistics in the material management system (M. Baraka et al., 2022). From this explanation, it can be concluded that inventory is the systematic process of overseeing the flow of goods into and out of a company's inventory. It involves efficiently handling the ordering, storing, and usage of raw materials, work-in-progress, and finished products (Lilis et al., 2024).

PT. XYZ, which is engaged in the field of fabrication construction, is one of the companies in Batam Island, which fabricates steel constructions or modules, yet still having a major potential problem with raw material inventory (M. Ulfah et al., 2016). Inventory is one of the production factors that must be managed properly because it is an asset that greatly influences the production process (C. Vanessa Muñoz Macas et al., 2021). In addition, raw material inventory planning is one of the most important parts of a construction project. It was found that there were delays and lack of the required raw materials (D.A Kifta, 2021). So that production is hampered, then the estimated time needed for a solution to overcome the factor of material inventory delays is immense and it is mandatory of how to control raw material inventory at PT. XYZ (Wibowo and Ahyudanari, 2020). The author proposes that PT. XYZ use a method which can fix the problems. The House of Risk method (HOR) is one of the methods that has been developed from the Quality Function Deployment (QFD) and Failure Modes and Effect Analysis (FMEA) methods which function to design a framework for managing risk (I. Nyoman Pujawan & Laudine H. Geraldin, 2009). Based on the description above, it is necessary to conduct a study at PT. XYZ regarding the House of Risk method to minimize the inventory delay factor (K. Rani, et al., 2025), therefore, the author produces this article with the title of "Analysis of Raw Materials Delay at PT. XYZ Using the House of Risk (HOR) Method"

METHOD STUDY

The types of data used in this research are quantitative and qualitative data. Quantitative data is data in the form of numbers, or qualitative data is expressed in numbers, while qualitative data is data that is not in the form of numbers, usually expressed in the form of words, sentences and images (A. Enas et al., 2021). Data sources derive from primary and secondary data. Research variables are attributes or value properties of objects or activities that have certain variations determined by the researcher to be studied, so that information about them is obtained (Maharesi, 2021). In this study, the author used the House of Risk Method, these variables include: HOR Model 1 and HOR Model 2 (R. Riska et al., 2025).

House of Risk is a method that has been developed from the Quality Function Deployment (QFD) and Failure Modes and Effect Analysis (FMEA) methods which function to design a framework for managing risk (Cahyani et al, 2016). The purpose of the House of Risk (HOR) model is to minimize the causes of ongoing risks by identifying risks and providing appropriate strategies for handling and mitigating these risks (N. Ardiansyah et al., 2023).

The stage for identifying risks to Risk Events and Risk Agents that can incur based on activities at PT. XYZ (Byrd & Dessai, 2025). Risk identification is carried out by interviewing the company's management (staff) divided into three categories from various job positions, i.e. category 1, category 2 and category 3, where each category comprises 10 personnel, which will then be used to assess the impacts related to Risk Events and Risk Agents using questionnaires distributed to the company's staff (Slamet,

2025). The following are respondents who helped in the study:

1. Respondent Category 1 (10 personnel)
   Job Positions: Project Coordinators and Assistant Project Coordinators.
2. Respondent Category 2 (10 personnel)
   Job Positions: Production Coordinators and Assistant Project Coordinators
3. Respondent Category 3 (10 personnel)
   Job Positions: Project Planners and Production Supervisors

Based on the questionnaires filled out by the respondents, there were ten risk events and twelve risk causes from production activities that were performed at PT. XYZ (H. Hally et al., 2024). The following are the results of interviews and filling out questionnaires related to Risk Events and Risk Agents at PT. XYZ:

Table 1: Risk Event and Risk Agent

Risk Event Code	Risk Event	Severity	Risk Agent Code	Risk Agent	Occurance
E1	Delay in procuring the materials	8	A1	Unavailability of the required materials	3
			A2	Changing materials delivery schedule	6
			A3	Inappropriate Transportation and Logistic	5
E2	Materials Lost	5	A4	Resources are not effective	3
E3	Materials received not as per Spec or Order (both Quality and Quantity)	8	A5	Negligence of the Vendors	9
E4	Materials rejected and returned to Vendors	6	A6	Incomplete Documents	3
			A7	Defective Materials	3
E5	Mistakes in Cost estimation	5	A8	Estimating Technique is not correct	4
			A9	Inequality in budgeting	6
E6	Products were made not as per the design drawings	6	A10	Ineffective Human Resources	5
E7	Delay in preparation or approval of design/ drawings	3	A11	Delay in Approval of design / drawing (from Purchasers)	4

The next stage is to assess the correlation, namely in this case is how to ensure whether there is a relationship between Risk Event and Risk Agent (A. Odi et al., 2024). If a Risk Agent causes a Risk Event, then there is a correlation. Correlation assessment is based on correlation values 1, 3, 9 (Sharma, 2025). After data collection is performed,

data processing is carried out using House of Risk Model 1 for Risk Identification. This stage is performed to determine the ranking of Risk Agents (Samuel & Jonathan, 2025).

RESULTS AND DISCUSSION

a) HOR Model 1

HOR Model 1 can be seen from the table below (Table 2).

Table 2: Calculation of Aggregate Risk Potential (ARP)

Risk Event	Risk Agent											Severity Of Risk
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	
E1	9	3	1									8
E2				1								5
E3					9							8
E4						1	1					6
E5								3	3			5
E6										3		6
E7											3	3
Occ Of Agent	3	6	5	3	9	3	3	4	6	5	4	
ARP	216	144	40	15	648	18	18	60	90	90	36	
Ranking	2	3	6	9	1	8	8	5	4	4	7	

The assessment results of severity, occurrence, and correlation are used to calculate the Aggregate Risk Potential (ARP) of Agent values obtained from the multiplication of the three factors (Kurniawan et al., 2021). The ARP value is obtained from the sum of the multiplication of severity by correlation multiplied by the occurrence value of risk cause (Osei et al., 2023). After obtaining the ARP value, a ranking is carried out (Ramadhan et al., 2025). This ranking is the basis for decision making to select the number of risks causes that will be minimized through proposed preventive actions (Khamis et al., 2019).

Based on the ARP value that can be seen in Table 2, the negligence of vendors (A5) ranks first, and ineffective human resources (A10) ranks last. Based on the ranking results, the ARP value for each risk cause is converted into a Pareto diagram (Winarso & Jufriyanto, 2020**)**. The ranking results are depicted in a Pareto diagram that has the principle of 80:20, taken from the value of 80% of the cumulative ARP (Q, Aini, et al., 2019).

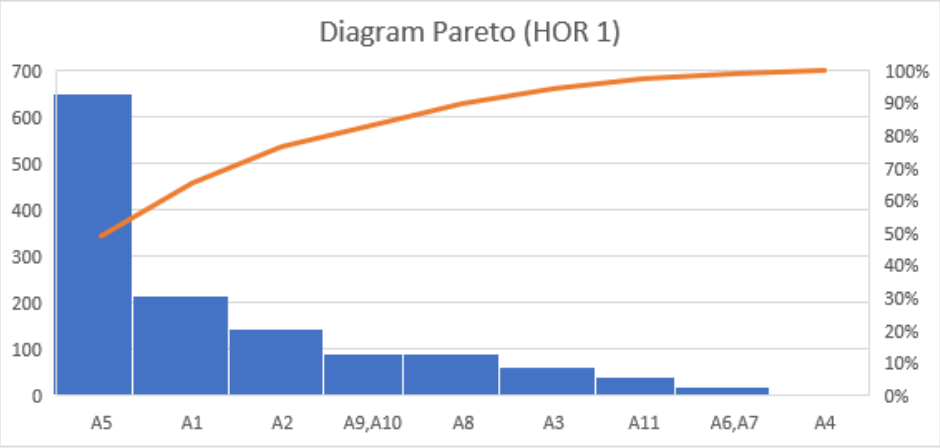

Fig. 1. Pareto Diagram HOR Model 1

Based on Figure 1 above, there are several most dominant risk agents that can be handled. There are three dominant risk agents based on the Pareto diagram above that can be resolved by designing a risk strategy according to the risk agent (H. Aman et al., 2017). Based on the Pareto concept, 75% of the main risk agents are expected to reduce 25% of other risk agents (Islamiah et al., 2020). The three dominant risk agents are A1, A2, and A5.

b) HOR Model 2

In HOR Model 2, preventive actions against the risk causes identified in the HOR Model I will be discussed. House of Risk Model 2 is used to determine preventive actions taken by looking at the involvement of sources and the level of difficulty in taking preventive actions (Liansari et al., 2020).

Table 3: Correlation between Risk Causes and Strategy

No.	Risk Causes	Strategy	Strategy Code	Correlation
1	Vendors mistakes	Improve communication with vendors	PA1	3
		Increase inspection and checking accuracy	PA2	3
		Conducting stricter vendors evaluation	PA3	9
2	Availability of materials	Improve open communication and perform flexible planning	PA4	3
		Improve and evaluate inventory management	PA5	3
		Perform real time monitoring	PA6	3
3	Shipment Schedule uncertainty	Provisional of temporary storage	PA7	1
		Conducting efficient and economical budget planning and management	PA8	9

Table 4: Level of Difficulties

No.	Actions Description	Level of Difficulties
PA1	Improve communication with vendors	3
PA2	Increase inspection and checking accuracy	3
PA3	Conducting stricter vendors evaluation	4
PA4	Improve open communication and perform flexible planning	3
PA5	Improve and evaluate inventory management	4
PA6	Perform real time monitoring	4
PA7	Provisional of temporary storage	3
PA8	Conducting efficient and economical budget planning and management	5

From the above table we can see that conducting efficient and economical budget planning and management (PA8) becomes more difficult action to be performed while improving communication, increase inspection and checking accuracy, flexible planning and provisional of temporary storage are less difficult.

Below is the calculation of Effectiveness to Difficulty (ETD) ratio:

Table 5: ETD Ratio

Risk Agent	Strategi								ARP
	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	
A5	3	3	9						648
A1				3	3	3			216
A2							1	9	144
TEK	1944	1944	5832	648	648	648	144	1296	
Dk	3	3	4	3	4	4	3	5	
ETD	648	648	1458	216	162	162	48	259,2	
Priority	2	2	1	4	5	5	6	3	

In Table 5 of HOR Model 2 above, the strategy sequence is obtained based on the highest ETD ratio. The following is a table of the strategy priority order from the HOR Model 2 calculation:

Table 6: Strategy Priority Order

Code	Strategy	Priority
PA3	Improve vendors evaluation	1
PA1	Improve communication with vendors	2
PA2	Improve inspection and checking system	2
PA8	Improve budgeting plan	3
PA4	Improve open communication and perform flexible planning	4
PA5	Improve and evaluate inventory management	5
PA6	Perform real time monitoring	5
PA7	Provisional of temporary storage	6

After obtaining the priority order of eight strategies based on Table 6 above, the next step is to determine the strategy that will be the main priority were based on the ETD

ratio or effectiveness ratio of the strategy, the higher the ETD ratio, the more effective the strategy action is to be implemented (J. Beinschróth, 2022). The following is the ETD ratio value expressed in the form of a Pareto diagram:

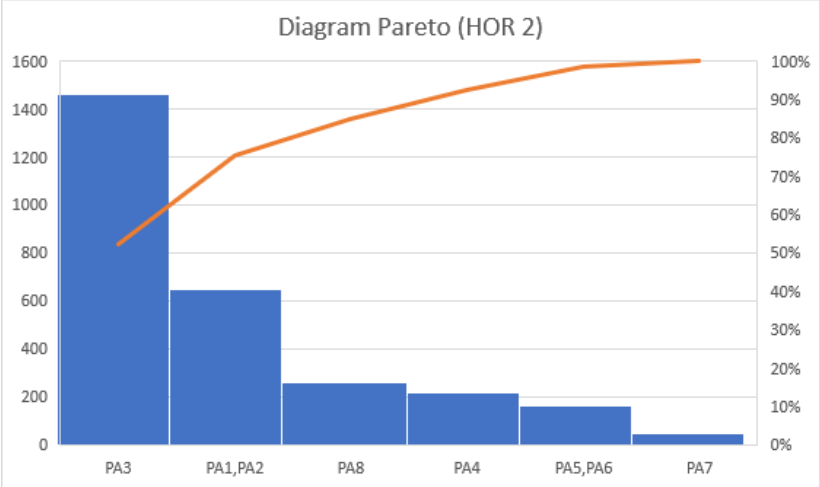

Fig. 2. Pareto Diagram HOR Model 2

Based on Figure 2 above, and considering the effectiveness of the strategy in implementation, the main strategies taken are four strategies which produce an effectiveness of 80% of the total cumulative ETD ratio. So that the four main strategies that can be implemented are as follows:

1. The first strategy with an ETD ratio value of 1458 is to conduct stricter vendors evaluation (PA3) because it is to stimulate vendors' better performance.
2. The second strategy with an ETD ratio value of 648 is to improve communication with vendors (PA1) because it is to keep the coordination of each part for running smoothly, because coordination errors can hamper the process.
3. The third strategy with an ETD ratio value of 648 is to increase inspection and checking accuracy (PA2) because it will minimize errors made by vendors.
4. The fourth strategy with an ETD ratio value of 259.2 is to conduct efficient and economical budget planning and management (PA8) because it will increase efficiency and savings in production operations.

CONCLUSION

Based on the results of the analysis and data processing carried out, the following conclusions were obtained. The risks that have been identified in the delay in material supplies at PT. XYZ are seven risk events and eleven risk agents that may occur. Of the eleven risk agents there are three dominant risk agents. The three dominant risk agents are unavailability of the required material (A1), changing material delivery schedule (A2) and negligence of the vendors (A5). The risk strategy that can be applied by PT. XYZ based on the three dominant risk agents is eight strategic actions. From the eight strategic actions in considering the effectiveness of the strategic actions in their implementation, four main strategic actions were obtained, namely, increasing communication with

vendors (PA1), improve accuracy in inspection and checking (PA2), conducting stricter vendor evaluations (PA3) and improve budget planning and financial management that is economical and efficient (PA8).

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