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LOCAL AND IMPORT MATERIAL PROCUREMENT RISK ANALYSIS: HOUSE OF RISK METHOD
(Case Study at Bio-Manufacturing Company)

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ABSTRACT

Global challenges require companies to be able to manage their supply chain processes well. The procurement process is an important part of the supply chain because it can reduce total costs. Procurement strategies not only focus on reducing material prices but also controlling supply risks. To maintain competitiveness and create a stable supply of materials, PT. X sources materials locally or imports from abroad. This condition causes the potential for high risks to arise in the procurement process. At PT. X, risk analysis has not been conducted for either local or imported material procurement. Research is needed to map risks and mitigate them. A popular method used for risk identification and mitigation is the House of Risk (HOR). Many studies have been conducted on the HOR method, but no comparison has been made between its application in local and imported material procurement. Research is needed to map risks and mitigate them. A popular method used for risk identification and mitigation is the House of Risk (HOR). Many studies have been conducted on the HOR method, but no comparison has been made on the application of HOR to the procurement of local and imported materials. The procurement process is identified based on its sub-processes using the SCOR (Supply Chain Operation Reference) method. HOR phase 1 produces 25 risk events and risk agents for both local and imported materials. In HOR phase 2, the Aggregate Risk Potential (ARP) is calculated and ranked from the highest to the lowest value. Imported materials tend to have a high ARP value, meaning they have a higher risk than local materials. Using the Pareto principle, 5 priority risk agents are obtained that need to be mitigated. HOR phase 2 produces 10 preventive actions (PA) that can be used to mitigate risks. In HOR phase 2, calculations are carried out to obtain the Effectiveness to Difficulty (ETD) ratio and are ranked from the highest to the lowest value. Imported materials tend to have a high ETD value, meaning they have a high priority. From the risks of local materials and imported materials, risk mitigation using preventive actions is prioritized on risk agents with the highest to the lowest ETD values.

Keywords: Procurement, House of Risk, Agregate Risk Potential, Bio-Manufacturing Company

INTRODUCTION

The current global challenges require companies to be able to manage the production and sales process efficiently and effectively by being able to manage all processes from upstream to downstream well. The supply chain must be designed in such a way that it allows for ease and rapid transition from agile to efficient or vice versa depending on the volatility and business environment (Pujawan & Mahendrawathi, 2017). One reliable process is

procurement. Procurement is part of the supply chain process within a company and is crucial because companies focus on reducing total costs (Araujo et al., 2016). A company's procurement strategy needs depend on two factors: the importance and complexity of available supplies (Kraljic, 1983). Based on Kraljic's approach, procurement strategy focuses not only on generating profit but also on controlling risk. Operational risks can disrupt and delay material, information, and cash flows, which can ultimately harm sales, increase costs, or both (Chopra & Sodhi, 2004). The goal of supply chain risk management is to reduce the likelihood of risk events occurring and increase resilience, which is the ability to recover from disruptions (Norrman & Jansson, 2004).

One popular risk management method is the House of Risk (HOR). House of Risk is based on proactive supply chain risk management that should focus on preventative measures, namely reducing the likelihood of a risk agent occurring. Reducing a risk agent will usually prevent a risk event from occurring (Pujawan & Geraldin, 2009). HOR is based on the idea of supply chain risk management that focuses on preventative measures, reducing the likelihood of a risk agent occurring. Reducing the occurrence of a risk agent will usually prevent a risk event from occurring as well (Tampubolon et al., 2013). House of Risk can be used to mitigate the risks of supply chain processes, material procurement, production operations and project development. House of Risk research on procurement processes that have been carried out is on imported materials (Cahyani, et al. (2016), procurement of goods and services in port service companies (Trenggonowati & Pertiwi, 2017) and procurement of local materials in the textile industry (Oktalia, et al., 2020). From previous research, no House of Risk analysis has been conducted on the two procurement processes of local and imported materials. Factors such as reduced supply, globalization of the supply chain, shorter product cycles, and limited capacity of key components also increase supply chain risk (Norrman and Jansson, 2004). In the context of the supply chain, increased risk is caused by, among other things, network complexity due to companies outsourcing more of their activities to external parties (Pujawan & Geraldin, 2009).

This research was conducted at PT. X, a bio-manufacturing company. The complexity of PT. X's production necessitates import procurement due to the lack of local sources, making both local and imported procurement unavoidable. The rationale for procuring from other countries is that better value is perceived to be available from these sources than from domestic sources (Johnson et al., 2011). Some auxiliary materials may be available domestically but cannot meet certain requirements, such as food grade, so imports are necessary. For machine materials, the main suppliers are generally located overseas. Packaging materials are mostly supplied domestically, but certain packaging materials require purchasing from abroad. For laboratory materials, the majority are purchased from local distributors, but some materials must be imported. Based on these purchasing conditions, a strategy is needed to manage the risks that may arise from the local and import procurement processes.

LITERATURE REVIEWS

Procurement is the process of acquiring goods and services within a supply chain. The goal of procurement is to extract surplus value from the supply chain. Key steps in the procurement process include determining needs, describing needs, identifying supplies, selecting suppliers, placing purchase orders, shipping, receiving, inspecting, paying, and maintaining supplier relationships (Johnson et al., 2011). Most companies prefer to purchase from local sources. This policy is based on the fact that local sources can often offer more reliable service than those located far away. Benefits include faster delivery due to shorter

distances and reduced risk of transportation disruptions (Johnson et al., 2011). Initiating a global procurement strategy requires a higher level of country knowledge and analysis than domestic suppliers. There are 10 specific reasons why foreign suppliers are chosen as the preferred source: domestic unavailability, price and total cost, government pressure and trade regulations, quality, continuity of supply, better technical services, technology, marketing tools, linkages with foreign subsidiaries, and competitive influence (Johnson et al., 2011).

Despite the advantages offered by overseas supply sources, many potential problems arise from the procurement process. A procurement team must have good expertise and understanding, considering the total cost of ownership. Potential problems with overseas procurement include source location and evaluation, lead time and delivery, expediting, political, labor, and security problems, hidden costs, currency fluctuations, payment methods, quality, warranties and claims, tariffs and duties, administrative costs, legal issues, logistics and transportation, languages, communications, cultural and social customs, and ethics and social responsibility (Johnson et al., 2011).

House of Risk is a model to minimize the causes and risks by identifying risks and providing appropriate strategies in handling these risks (Pujawan & Geraldin, 2009). By conducting a House of Risk analysis, the company will have a set of risk agents that will be managed and then preventive actions can be prioritized. The house of risk method is used to identify risk events that will occur, what causes have the potential to arise in the company's business processes, and how to design mitigation strategies for these risks (Putri et al., 2017). House of Risk is a development of the Failure Modes and Effect Analysis (FMEA) and Quality Function Deployment (QFD) methods. The FMEA approach is used to quantify risks, while QFD prioritizes risk agents that need to be addressed first and selects the most effective actions to mitigate potential risks arising from risk agents. The House of Risk (HOR) assessment model provides an assessment of risk factors, a model that can be used to address risk causes or risk agents (Rakadhitya et al., 2019). The House of Risk focuses on preventative measures and risks that occur and helps reduce the likelihood of risk agents occurring. Therefore, reducing risk agents means reducing the occurrence of several risk events (Natalia et al., 2020).

HOR has two phases: first, risk identification, the output of which is a risk agent priority ranking. Second, risk management, the output of which is a risk agent prevention action plan (Cahyani et al., 2016). HOR phase 1 is used to identify potential risk events and risk agents, resulting in the grouping of risk agents into priority risk agents based on their Aggregate Risk Potential (Putri et al., 2017). In this stage, each risk event is weighted into severity levels and the weighting of the possibility of risk agents appearing in occurrence actions. HOR 1 functions to determine the ranking of each risk agent through the aggregate risk potential (ARP) value (Dvaipayana et al., 2024). The implementation of HOR phase 1 aims to determine the priority of risk agents to take proactive actions according to the significance of the risk (Rakadhitya et al., 2019). The advantage of the phase 1 HOR method is that it can rank risk causes through ARP based on the risk causes that most affect the company (Natalisa et al, 2020). HOR phase 2 is the stage of formulating preventive actions for risks that have been identified in HOR phase 1. The initial step in HOR phase 2 is formulating preventive actions (PA) which will be used as risk mitigation steps. After knowing the total effectiveness of the preventive measures, the level of difficulty in implementing each preventive measure will be calculated. This difficulty level value will be a divider for determining the priority of preventive actions.

The House of Risk method has become a popular method for risk identification and mitigation. This method has been applied to several business processes and industries, and has also been developed in combination with other methods. House of Risk analysis has been

conducted in several industries, such as the textile procurement process (Oktalia et al., 2020), automotive manufacturing (Mistissy et al., 2021), and transportation companies (Partiwi et al., 2023). The combination of House of Risk and SCOR was carried out in several industries such as steel pipe manufacturing (Tampubolon et al., 2013), shipyards (Cahyani et al., 2016), refined sugar companies (Ulfah et al., 2016), port services (Trenggonowati & Pertiwi, 2017), logistics companies (Putri et al., 2017), metal manufacturing (Irlandea, 2023) (Magdalena, 2019), furniture companies (Defriyanri & Ernawati, 2021), hospitals (Chaisani, 2021), machine manufacturing (Waluyo, 2021), food companies (Prasetyo et al., 2022), glass manufacturing (Maulana & Arvitrida, 2022), automotive (Ardyansyah & Nugroho, 2022), railway manufacturing (Liddin & Pulansari, 2024). The combination of HOR and Fuzzi logic in electronics manufacturing (Rakaditya et al., 2019). The combination of HOR, PESTLE, and CIMOSA in the power plant project (Muntoha & Sudiarno, 2019) and the combination of HOR and AHP in a construction company (Dvaipayana et al., 2023). Based on the development of research on the House of Risk, this study aims to apply it to the biomanufacturing industry. Furthermore, this study also conducts risk analysis in two procurement processes: local and imported materials.

3. Research Method

This study uses a qualitative approach, which is a research procedure that produces descriptive data in the form of words spoken or written by people or observed behavior (Moleong, 2016). The type of research is case study, in which researcher studies and carefully investigates a program, event, activity, process, or group of people. The main reason for chosing a case study is to make researcher able to describe in more depth about procurement risk analysis using House of Risk method.

The research process flow begins with the identification of procurement risks at PT. X. By understanding all procurement activities, the risk identification process will be easier. The procurement process is identified for each process detail using the Supply Chain Operation and Reference (SCOR) approach. SCOR is a process reference model developed as a diagnostic tool for supply chain management. The SCOR method includes five main processes: plan, source, make, deliver, and return (Waaly, 2018).

Risk identification is performed by dividing the procurement process into plan, source, make, deliver, and return. Based on the identification results using SCOR, risk identification is then carried out using the House of Risk phase 1. HOR phase 1 will generate risk agents and risk events for each procurement process activity. A single activity may have multiple risk events. The process of identifying risk events and risk agents is carried out through a Focus Group Discussion (FGD). For a single risk agent variable, more than one action can be taken to mitigate the potential risk (Maulana & Arvitrida, 2022).

The identified risks will be assessed for the level of risk probability (Occurrence) and risk impact (severity) by distributing questionnaires to the procurement team at PT. X. Severity or severity value indicates how big the impact is caused by the risk event. The assessment scale at the severity level uses a value of 1 - 10, where a value of 1 means no impact of damage and a value of 10 means it definitely has an impact of failure (Kosasih et al., 2020). Severity is the first step in analyzing risk, namely calculating how big the impact or intensity of the event affects the operational process. Occurrence is the possibility that the risk will occur and result in a form of failure during the operational process (Trenggonowati & Pertiwi, 2017). Respondents were employees of the procurement department and were selected based on the scope of work and the type of material purchased. Nine respondents were involved in the risk

agent and risk event assessments for local and imported materials, respectively. Respondents were equal for local and imported materials, as indicated by their average job rank and length of service, which were not nearly the same.

A correlation analysis of the risk agent for each risk event is performed due to the possibility that the risk agent can impact other risk events. The correlation level is usually classified as none (the given value is equivalent to 0), low (one), medium (three), and high (nine). Each requirement has a specific gap to be filled, and each response will require some type of resource and funding (Pujawan & Geraldin, 2009). The risk agent value, risk event, and correlation between the two are used to find the Aggregate Risk Potential (ARP) using equation 1.

$$ARP_j = O_j \sum S_i R_{ij} \quad (1)$$

The ARP value is ranked from highest to lowest to determine the risk agent's priority. Then, using the Pareto principle, the risk agent's priority is determined. The Pareto diagram shows that 80% of problems are caused by 20% of the causes. This diagram shows the effect of a problem on the Pareto diagram used to identify several opportunities to fix the problem. The Pareto diagram shows which problems should be resolved first (Nadhira et al., 2019). The risk agent with the highest ARP value from the Pareto analysis is formulated as a preventive action.

4. Results and Discussions

4.1. Results

The results of the procurement process identification are shown in Table 1.

Table 1: SCOR Procurement Process Identification

SCOR	Activities	Code
Plan	Requirements Planning	C1
	Purchase Planning	C2
Source	Supplier Sourcing	C3
	Tender Process	C4
Make	Procurement Process	C5
	Shipping Scheduling	C6
	Creating Purchase Orders/Contracts	C7
Deliver	Material Delivery	C8
	Quality Checking	C9
	Material Incoming Customs	C10
	Material Unloading	C11
Return	Product Returns	C12
	Material Outgoing Customs	C13

House of Risk (HOR) Phase 1

Each procurement activity is identified by a risk event or risk event that could potentially arise and the risk agent cause is formulated. For one risk agent variable, more than one action can be taken to mitigate the risk that will occur (Maulana & Arvitrida, 2022). From the identification results, there are two risk event results, namely local materials and imported material risk events. From these two risk events, two risk agents were obtained, namely the risk agent for local materials and the risk agent for imported materials. From the results of risk identification in the procurement process, 25 risk events were obtained for local and imported

materials, and 25 risk agents for local and imported materials. The risk events for local and import materials from all identification results are the same, but there are several differences for the risk agents. Table 2 and 3 below show the the average weight of questionnaire results for the risk event and risk agent for local and imported materials.

Tablel 2: Average weight of Questionnaire Results of Local Material

Risk Event	Value	Risk agent	Value
Production and demand increased significantly	7.22	Product sales increased significantly	7.44
Production and demand dropped significantly	5.78	Disruption in internal production processes	6.11
Supply quantity is insufficient	7.22	Supplier production capacity is limited	4.56
Only single supplier available	5.56	Certification standard requirements not met	4.22
There are few tender participants	5.44	There was a problem with the online tender	6.00
Tender Price Leak	5.00	Dishonesty of procurement employees (Leaking prices)	1.00
Procurement quantity error	6.11	Inaccuracy in material simulation	3.67
Price exceeds budget or management plan	6.11	Material prices rose significantly	6.11
Material price fluctuations	5.78	Changes in government regulations	4.89
Delivery lead time does not meet requirements	7.00	There is a shortage of shipping facilities (trucks, containers, etc.)	4.89
Error in creating PO	4.89	Not careful in making PO	2.67
Mistakes in making contract clauses	5.00	Contracts are not checked by Legal	2.33
Delivery late	7.44	Disruption in vendor production process	5.00
Shipment not fulfilled by vendor	5.56	Vendor commitment to delivery is less	5.78
Material does not meet standards	6.33	Damage or contamination of materials during the shipping process	5.00
Disassembly time is delayed	5.00	Vendor shipping documents are incomplete	5.89
Fines or penalties may arise from the relevant agencies	5.56	Customs administration errors	4.22
A safety violation or accident occurred	6.67	Safety standards are not met by the vendor	4.11
Material damage occurred	6.33	Unloading officers do not follow SOP	3.33
Goods receipt administration error	5.00	Carelessness of demolition officers	3.67
Loss of large quantities	5.56	Scattered materials or theft of materials	2.89

Long disassembly time	4.56	Warehouse in full condition / damage to unloading facilities	4.44
Stock of materials is reduced and minimal	6.33	Material stock below safety stock	3.89
Disputes with suppliers	4.67	Poor communication with vendors	3.22
The return process is delayed	4.67	Return document requirements have not been met	4.33

Table 3. Average weight of Questionnaire Results of Import Material

Risk Event	**Nilai**	***Risk agent***	**Nilai**
Production and demand increased significantly	7.44	Product sales increased significantly	6.44
Production and demand dropped significantly	6.22	Disruption in internal production processes	5.89
Supply quantity is insufficient	8.11	Supplier production capacity is limited	5.00
Only single supplier available	6.44	Certification standard requirements not met	3.89
There are few tender participants	4.11	There was a problem with the online tender	3.00
Tender Price Leak	5.78	Dishonesty of procurement employees (Leaking prices)	1.22
Procurement quantity error	6.33	Inaccuracy in material simulation	2.67
Price exceeds budget or management plan	5.22	Material prices rose significantly	5.67
Material price fluctuations	6.11	Changes in government regulations	5.78
Delivery lead time does not meet requirements	7.89	There is a shortage of shipping facilities (trucks, containers, etc.)	6.11
Error in creating PO	5.56	Not careful in making PO	2.11
Mistakes in making contract clauses	6.11	Contracts are not checked by Legal	2.00
Delivery late	7.78	Disruption in vendor production process	5.78
Shipment not fulfilled by vendor	6.67	Vendor commitment to delivery is less	3.78
Material does not meet standards	7.00	Damage or contamination of materials during the shipping process	4.00
Disassembly time is delayed	5.89	The customs clearance process is wrong or late	2.00
Fines or penalties may arise from the relevant agencies	6.11	Customs administration errors	2.11
A safety violation or accident occurred	6.67	Safety standards are not met by the vendor	4.56

Material damage occurred	5.67	Unloading officers do not follow SOP	2.67
Goods receipt administration error	5.11	Carelessness of demolition officers	2.56
Loss of large quantities	5.89	Scattered materials or theft of materials	2.11
Long disassembly time	4.67	Warehouse in full condition / damage to unloading facilities	4.33
Stock of materials is reduced and minimal	6.33	Material stock below safety stock	4.11
Disputes with suppliers	4.56	Poor communication with vendors	3.00
The return process is delayed	4.00	Return document requirements have not been met	2.67

After obtaining the risk agent, risk event, and their correlation, the ARP value is then calculated. The calculation of the ARP value to determine the ranking and risk prioritization, namely determining the priority order of risk agents to be mitigated first by determining which rank has the highest priority that has been identified based on the magnitude of the risk agent ARP value (Tampubolon et al., 2013). ARP values are ranked from the highest to the lowest. Handling measurements are only performed for priority risks, while a Pareto diagram is used to determine priority risks (Paillin & Taupan, 2021). To determine risk agent priorities, a Pareto analysis is used based on the ARP values of each risk agent. The purpose of a Pareto diagram is to show the main dominant issues, state the comparison of each issue, show the level of improvement after corrective actions are taken, and show the comparison of each issue (Liddin & Pulansari, 2024). Not all risk agents will be addressed but will be selected based on priority or those that have a significant influence on the risk event. This must be done by considering the efficiency of human resource-related activities and the costs involved (Maulana & Arvitrida, 2022). For local materials, there are five priority risk agents: A1, A5, A3, A8, and A13. For imported materials, there are also five priority risk agents: A10, A1, A13, A9, and A3. The output of HOR phase 1 is a risk agent that has priority in handling compared to other risk agents. This is because the higher the ARP value of a risk agent, the greater the impact it will have on the company's business processes (Putri et al., 2017).

House of Risk (HOR) Phase 2

HOR 2 aims for mitigation strategy planning, which provides guidelines for companies on which risk agents should be mitigated first based on their level of effectiveness and ease of implementation based on the effectiveness to difficulty ratio value (Magdalena & Vannie, 2019). HOR 2 is used to determine which actions should be taken first by considering the differences in their effectiveness as well as the resources involved and the difficulty in carrying them out. (Pujawan & Geraldin, 2009). The results of the preventive formulation for priority risk agents on local materials are shown in table 4 and import materials in table 5.

Table 4. Preventive Action of Risk Agent Local Material

RA	Risk Agent (Local)	PA	Preventive Action (PA) Local Material
A1	Product sales increased significantly	PA1	Designing a scheduled production planning system
		PA2	Increasing raw material warehouse capacity

A5	There was a problem with the online tender	PA3	Creating Standard Online Tender Tutorial Materials
		PA4	Socialization of online tender procedures to employees and vendors
A3	Supplier supply capacity is limited	PA5	Adding new suppliers
		PA6	Looking for Sources of Material Substitution
A8	Material prices have increased significantly	PA7	Proactively conduct studies on global conditions
		PA8	Building supplier relationships or strategic contracts
A13	Disruption in vendor production process	PA9	Create a supplier selection system
		PA10	Conduct regular supplier evaluations

Tablel 5. Preventive Action of Risk Agent Import Material

RA	Risk Agent (Import)	PA	Preventive Action (PA) Import Material
A10	There is a shortage of shipping facilities (trucks, containers, etc.)	PA1	Create a supplier pool for shipping service companies
		PA2	Creating alternative material delivery scenarios
A1	Product sales increased significantly	PA3	Designing a scheduled production planning system
		PA4	Increasing raw material warehouse capacity
A13	Disruption of shipping process using sea vessels	PA5	Make purchases using air freight
		PA6	Adding special safety stock for imported materials
A9	Changes in political conditions or import-export regulations	PA7	Create a communication system with related legal and government authorities
		PA8	Multi source from several countries
A3	Import quota limitations	PA9	Applying for additional import quota
		PA10	Optimizing the absorption of quotas that have been provided by the government

4.2 Discussions

The risk events for local and imported materials are the same, but there are some differences between the risk agents. In planning activities, the risk agent for local materials is limited production from suppliers, while for imported materials, it's limited import quotas. Overdemand for local materials is often encountered, or demand exceeds supply. When PT. X's demand is high, the supplier cannot meet the material. Some imported materials require special import permits. Price fluctuations are a risk in the procurement process. For local materials, this can be caused by changes in government regulations, such as import regulations impacting local supplier production, transportation regulations, port regulations, and tax regulations. For imported materials, price fluctuations are generally driven by global political conditions and import-export regulations.

Differences were also found in material delivery and customs activities. Local material deliveries were affected by vendor disruptions in the production process. Meanwhile, for imported materials, delivery delays were influenced by weather or unloading queues. In general, in supply chain management, risks can arise in various forms from each incident.

Uncertainty stemming from suppliers can also pose risks, including uncertainty about raw material delivery lead times and the quality of the materials shipped (Tampubolon et al., 2013).

Another difference lies in delayed unloading times. For local materials, this is due to incomplete documentation, while for imported materials, delays in unloading are caused by delayed customs processing or errors. For imported materials, customs clearance occurs before the ship arrives at the port. Delays in customs clearance mean the material cannot be unloaded, incurring additional costs such as storage and demurrage. Table 6 below decribes the difference between local and import material.

Table 6. Difference Risk Agent on Local and Import Material

SCOR	Activities	RISK EVENT		RISK AGENT	
		Description	Code	LOCAL	IMPORT
Plan	Purchase planning	Supply quantity is insufficient	RE3	Supplier production capacity is limited	Import quota limitations
Make	Procurement Process	Material price fluctuations	RE9	Changes in government regulations	Changes in political conditions or import-export regulations
Deliver	Material Delivery	Delivery late	RE13	Disruption of vendor production processes	Disruption of shipping process using sea vessels
	Customs entry of materials	Disassembly time is delayed	RE16	Vendor shipping documents are incomplete	The customs clearance process is wrong or late

The correlation analysis of risk events and risk agents for local and imported materials is largely the same, with differences in correlation only occurring for some risk agents. Risk agent A3 has no correlation for local materials because vendor production capacity limitations do not impact the existence of a single supplier. For imported materials, import quota limitations can lead to the existence of a single supplier. Risk agent A9 has a correlation with risk event E9 for both local and imported materials, but with different values. Risk agent A10 correlates with several risk agents, but there are differences in values for local and imported materials. For example, the scarcity of shipping facilities for local materials correlates highly with delivery delays, while for imported materials, the correlation is moderate. This is because local materials have a direct impact on stock if there is a shortage of trucks. Another difference in correlation also occurs for risk agents A13 and A17, where the correlation value for imported materials is higher than for local materials. This difference is due to the impact of imported materials on risk events that can be fatal.

Several preventive actions can be formulated for each risk agent. However, to focus on preventive actions that can be effectively used for mitigation, each risk agent is limited to a maximum of two preventive actions. Mitigation strategy design is carried out by designing relevant mitigation actions. Risk agents can be prevented by one or more mitigation actions (Liddin & Pulansari, 2023). Prioritized risk agents based on the results of the HOR phase 1 have shown differences between local and imported materials, thus preventing actions for local

and imported materials also differ. In the formulation of preventive actions, there is no uniformity between local and imported materials.

At the correlation stage between preventive action and risk agent, differences were found in the conditions of local and imported materials. For local materials, seven (7) preventive actions were found to have correlations with several risk agents, namely preventive actions PA1, PA5, PA6, PA7, PA8, PA9, and PA10. The most correlation was found in PA6, looking for material substitution sources, which correlated with three risk agents, namely Risk agent A1: product sales increase significantly, A3: supplier supply capacity is limited, and A13: disruptions in the vendor's production process. For imported materials, five (5) preventive actions were found to have correlations with several risk agents, namely preventive actions PA3, PA4, PA5, PA6, and PA8. The most correlation was found in two preventive actions, namely PA4: increasing raw material warehouse capacity and PA6: increasing safety stock specifically for imported materials. Preventive actions PA4 and PA6 can be carried out to mitigate risk agents A10: shortage of shipping facilities, A1: product sales increase significantly, A13: disruptions in the shipping process by ships, and A9: changes in political conditions or import-export regulations. Table 7 and 8 show the ranking of the preventive action of local and import material

Table 7. Preventive Action Rank of Local Material

PA	Preventive Action (PA)	Rank
PA3	Creating Standard Online Tender Tutorial Materials	1
PA1	Designing a scheduled production planning system	2
PA9	Create a supplier selection system	3
PA7	Proactively conduct studies on global conditions	4
PA2	Increasing raw material warehouse capacity	5
PA4	Socialization of online tender procedures to employees and vendors	6
PA5	Adding new suppliers	7
PA10	Conduct regular supplier evaluations	8
PA8	Building supplier relationships or strategic contracts	9
PA6	Looking for Sources of Material Substitution	10

Table 8. Preventive Action Rank of Import Material

PA	*Preventive Action (PA)*	Rank
PA6	Adding special safety stock for imported materials	1
PA1	Create a supplier pool for shipping service companies	2
PA4	Increasing raw material warehouse capacity	3
PA3	Designing a scheduled production planning system	4
PA8	Multi source from several countries	5
PA7	Create a communication system with Legal and Government	6
PA9	Applying for additional import quota	7
PA5	Make purchases using air freight	8
PA2	Creating alternative material delivery scenarios	9
PA10	Optimizing the absorption of quotas that have been provided by the government	10

5. Conclusion

The purpose of this study is to analyse the local and import material procurement risk by using house of risk method. The results of the procurement process identification using the SCOR (Supply Chain Operation Reference) approach show similarities in the risk events in the local and imported material procurement processes. Risk identification using HOR Phase 1 yielded 25 risk events and 25 risk agents for both local and imported materials. There are differences in the risk agents between local and imported materials due to the longer processing time for imported materials. The HOR phase 1 method can be used to determine the priority of risks that need to be mitigated. By using the HOR phase 2 method, 7 preventive actions for local material and 5 preventive actions for import material have correlation with risk agents.

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