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Evaluation of Operational Risks on PT. Global Indo Pangan's Supply Chain Using House of Risk I Method

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Abstract

One of the challenges in managing supply chain is uncertainty. Uncertainty can cause risk which can interfere supply chain activity. In managing their supply chain, PT. Global Indo Pangan meets a lot of uncertainty that can cause risk such as demand uncertainty which makes the company can only rely on forecasting that can lead to miscalculating or even uncertainty from supplier like delivery time or quality of the product. Therefore, supply chain risk management is needed. One of the approaches to manage the risk is house of risk I (HOR I) method. This method will enable company to prioritize risk agents that cause risk events to be treated. Supply Chain Operation Reference (SCOR) model is used to define supply chain activity. First steps is identify risk by doing interview with divition which is related to supply chain. Next, risk is divided into low risk, medium risk, high risk, and very high-risk using risk maps. Risk assessment is performed by calculate aggregate risk potential (ARP) in a way assess severity of risk events, occurance of risk agents, and correlation between risk event and risk agent. The result of HOR 1 shows that there are 8 risk events which is cause by 13 risk agents. 7 risk agents is chosen by pareto analysis to make preventive action against it. There are 6 action plans that can be done to prevent risk agents as the result the severity of risk events can be reduced or even be removed.

Keywords: HOR I, Risk Management, SCOR, ARP, Supply Chain

1. Introduction

Uncertainty is one of the challenges for company in managing supply chain. Supply chain is relationship of companies who working in line on production activity . That companies is included supplier, factory, distributor, store or retail, also company which provides logistics service. Based on the sources, there are three main classifications of uncertainty, that are demand uncertainty, uncertainty from supplier, and uncertainty from internal company (Pujawan I. N., 2010).

PT. Global Indo Pangan is company which produces cocoa powder. There are various uncertainty in implementation of supply chain. One of the uncertainty that happen in company's supply chain is uncertainty from demand which cause company can only forecast the demand. Uncertainty from supplier is that the delivery time is not consistent, also the quantity and quality of material. Internal uncertainty can be formed the machine which the performance is not good or the operator. This uncertainty can cause risk which can disturb the implementation of company's supply chain.

Company needs to assess objectively the supply chain which is done by the company for knowing the risks that can be happened in implementation of supply chain to control the risk. With the assessment, company can identify risks that probably happened and find the cause of the risks.

Assessment of risks from the severity and how frequent the risks happens is done after risk is identified. It is intended to know which risks will become the priority to make proposed ideas for preventing the risks to reduce the severity of the risk or even the occurance of the risks. By doing the preventing action, company can keep the activity of supply chain from various risks that probably appear.

Supply chain's activity has uncertainty in various aspect. Because of that, risk can appear and disturb continuity of supply chain. One of the approaches used is house of risk method. This method using supply chain operation reference model to assess currenct supply chain's activity. By assessing current supply chain's activity, it allows company to know what risks which can probably happen and do preventing actions.

2. Literature

2.1. Supply Chain Management

Supply chain is a network companies which work together to create and deliver a product into the hand of end user (Pujawan I. N., 2010). Supply chain also known as logistic network in this relationship, there are several main cast who has the same importance, supplier, manufacturer, distribution, retail outlets and customers. Three main classification of uncertainty in supply chain are demand uncertainty, supplier uncertainty, dan internal uncertainty.

One of reference model of supply chain is supply chain operation reference which divided supply chain activity into five main process, plan, source, make, deliver, and return (Pujawan I. N., 2010). Chan & Qi quoted from Pujawan (2010) suggest what is called performance of activity (POA). POA is a model to measure activity which is part of supply chain. POA is measured in several dimention, cost, time, capacity, capability, productivity, utility, and outcome.

2.2 Risk Management

Risk management is a set of policy, a compelet procedure which is owned by organization, to manage, monitor, and control organization exposure to risk. Identiciation and assessment risk process continued by risk management which is a main operational activity from risk management. Systematic approach about risk management is divided into three main step (Mulyawan,2015), risk identification, evaluation and risk analysis, and respond or reaction to overcome the risk. To categorize the risk into low, medium, high, and very high, risk map is used. Risk maps that is arranged based on determination level of risk according to joint Australian/ new Zealand standar (2004) can be seen on Table 1.

Table 1: Risk Maps

Likelihood	Impact				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Critical 5
Almost Certain 5	Medium	High	High	Very High	Very High
Likely 4	Medium	Medium	High	High	Very High
Possible 3	Low	Medium	High	High	High
Unlikely 2	Low	Low	Medium	Medium	High
Rare 1	Low	Low	Medium	Medium	High

2.3 House of Risk

House of Risk (HOR) is an FMEA modification and House of Quality (HOQ) Model to prioritize which source of risk is first selected to take the most effective action in order to reduce risk potential from source of risk. Here's the steps in House of Risk I model:

1. Identify risk event that can happened in every business process. It can be done by mapping supply chain (plan, source, make, deliver, and return) and then identify what is lacking in every process.
2. Estimate the severity of the risk event. In this case using 1-10 scale where 10 shows the extreme effects. Severity level of risk event is placed on right column of the table and declared as S_i.
3. Identify the source of risk and assess the probability event for every source of risk. In this case scale 1-10 is set where 1 means that almost never happen. Source of risk (Risk agent) is placed on upper row table and connected with lower row event with O_j.

4. Develop the relationship matrix. Correlation between every source of risk and risk event, $R_{ij}(0,1,3,9)$ where 0 shows that there is no correlation and 1,3,9 consecutive shows low, medium and high correlation.
5. Calculate set of potential risk (Aggregate risk potential of agent j = ARP_j) which is determined as the result from probability event of source of risk j and set of severity from every risk event that caused by source of risk j.
6. Make source of risk ranking based on set of potential risk in descending order.

3. Research Methodology

Research methodology are steps which is done for conducting research to achieve its purpose. Here is the steps of research methodology in Fig. 1.

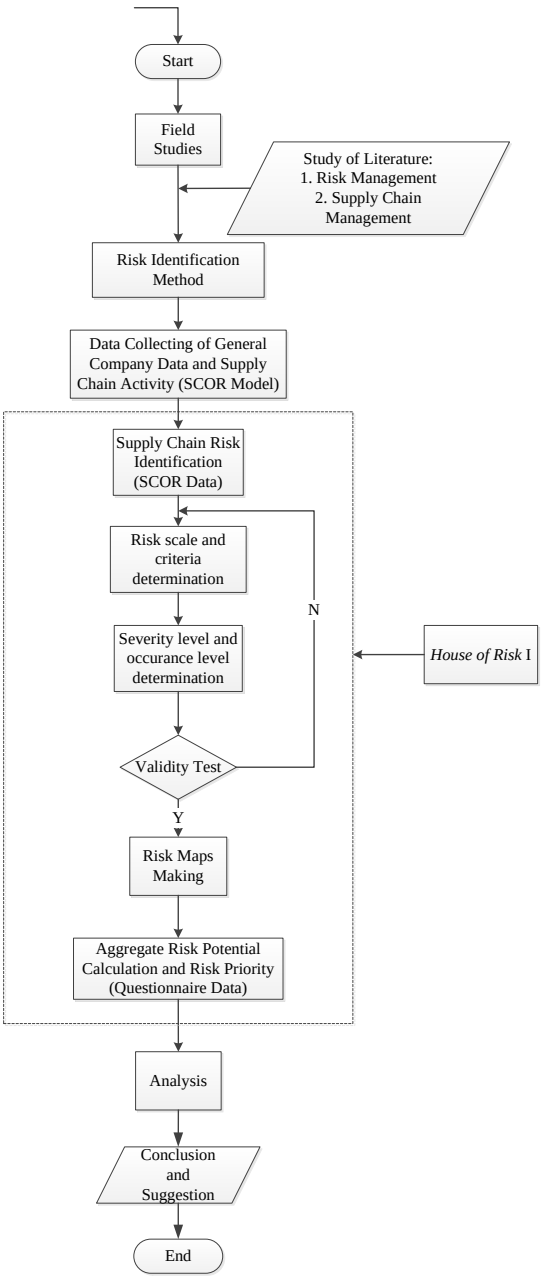

Fig. 1 : Research Methodology

4. Supply Chain Risk Management

4.1 Supply Chain Activity

First steps to identify risks is defining supply chain activity on company used supply chain operation reference (SCOR) model. Supply chain activity on the company can be seen on Table 2.

Table 2: Supply Chain Activity

Business Process	Sub Process	Detail Activity
Plan	Demand Forecasting	Forecast the quantity of demand
	Production Planning	Planning the quantity of raw material
		Planning the quantity of operator
		Planning the quantity of machine
	Inventorty Examine	Quantity of raw material examination
		Quantity of finished good examination
	Production Schedulling	Schedulling for 1 Shift
Source	Comminucate with supplier	Raw material ordering process
	Supplier election	Evaluate Supplier performance
	Procurement Process	Supplier deliver raw material
		Raw material examination
Make	Production Controll	Production capacity in one month
		Maintenance
		Production Layout
	Production Activity	Conducting Production Process
	Quality Examination	Finished Good Quality Filtering
	Packing Process	Packing Finished Goods
Deliver	Determination of modes of transportation	Determination of transportation type
	Order management	Delivering finished good to consumer
		Send bill to consumer
Return	Return of inappropriate product	Return of raw material to supplier
		Handling of product which is returned by consumer

4.2 Risks Identification and Analysis

Risks identification is done based on supply chain activity which is already define before. Risk event severity and the cause of risk event that is risk agent occurance assessment is done by questionnaire. Here are the risks that is possibly to happened and the result of questionnire can be seen on Table 3 and Table 4

Table 3: Severity of Risk Events

Code	Risk Event	Severity
E1	Determination of quantity of demand is less precies	2,2
E2	Raw material come late	2
E3	Raw material which is delivered is not appropriate	3
E4	Sack for packing finished good is damaged	2,2
E5	Finished good does not meet specification	1,6
E6	Finished good become waste	3,4

E7	Changes in production schedule	2,6
E8	Finished good delivery is late	2

Table 4: Occurance of Risk Agents

Kode	Risk Agent	Occurance
A1	There is an error while calculating demand	3,2
A2	There is high demand changing	1,6
A3	There is sudden demand from consumer	2,8
A4	There is problem on distribution path	2,6
A5	Expired of raw material is near	1,8
A6	There is damaged in main raw material packaging	1,4
A7	There is damaged on sack	2,4
A8	There is a mistake from operator while holding sack	3,2
A9	Sack is torn hit by sharp object	1,8
A10	There is a mistake from operator while calculating time in production	1,4
A11	Machine is broken while production	3,6
A12	There is a power outage	3,8
A13	There is re-mixing finished good	2,4

The result of questionnaire is used for making risk maps. The purpose of this maps is to categorize risks into low, medium, high, and very high based on severity/impact and occurance/likelihood. Risk maps can be seen on Table 5.

Table 5: Risk Maps

Likelihood	Impact				
	Insignificant 1	**Minor 2**	**Moderate 3**	**Major 4**	**Critical 5**
Almost Certain 5					
Likely 4					
Possible 3	(E5,A12) (E5,A11)	(E7,A12) (E7.A11) (E1,A1) (E4,A8)	(E6,A12) (E6,A11)		
Unlikely 2		(E1,A3) (E4,A7) (E7,A13) (E2,A4) (E8,A4)	(E3,A7)		
Rare 1	(E5,A10)	(E4,A9) (E1,A2)	(E3,A5) (E3,A6)		

Next is calculating aggregate risk potential (ARP) to sort risk from highest to lowest based on ARP value. ARP calculation is done on House of Risk I method. The calculation of ARP value on House of Risk I method can be seen on Table 6.

Table 6: House of Risk I

		Risk Agent (Aj)													
Business Process	Risk Event (Ei)	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	Severity of Risk Event i (Si)
Plan	E1	9	3	1											2,2
Source	E2				9										2
	E3					9	1	9							3
Make	E4							9	3	9					2,2
	E5										9	3	3		1,6
	E6											1	1		3,4
	E7											3	3	9	2,6
Deliver	E8				3										2
Occurance of agent j		3,2	1,6	2,8	2,6	1,8	1,4	2,4	3,2	1,8	1,4	3,6	3,8	2,4	
Aggregate Risk Potential j		63,36	10,56	6,16	62,4	48,6	4,2	112,3	21,12	35,64	20,16	57,6	60,8	56,16	
Priority rank of agent		4	12	13	1	5	14	2	10	11	8	6	3	7	

Pareto analysis is done after calculating the value of ARP to prioritize risk agent. Then action plan is made to prevent risk is done based on the risk which become priority. The risk priority can be seen on Table 7.

Table 7: Risk Priority

Code	Risk Agent	ARP	Action Plan
A7	There is damaged on sack	112,32	Flexible supply base Coordination
A1	There is an error while calculating demand	63,36	Coordination
A4	There is problem on distribution path	62,4	Mutliple Routes
A12	There is a power outage	60,8	Additional genset and uninterruptible power supply (UPS)
A11	Machine is broken while production	57,6	Schedulling maintenance Additional genset and uninterruptible power supply (UPS)
A13	There is re-mixing finished good	56,16	Schedulling maintenance Additional genset and uninterruptible power supply (UPS)
A5	Expired of raw material is near	48,6	Flexible supply base Coordination

5. Conclusion

Based on the result of this research on PT. Global Indo Pangan's Supply Chain then the following conclusion are obtained:

- There are 8 risk events based on supply chain operation reference model.
- There are 13 risk agents that cause 8 risk events.
- 7 risk agents is choosen from 13 risk agents as risk priority.
- There are 6 action plan to prevent risk priority.

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