

Risk and Mitigation Analysis of Supply Chain with House of Risk Approach for a Business in Free Trade Era.

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Risk and Mitigation Analysis of Supply Chain with House of Risk Approach for a Business in Free Trade Era.

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ABSTRAK

Economic uncertainty, business competition in the free trade era, the increase and variety of demand becoming a challenge for businesses. Robust Supply chain system considered as strategic decision for a company, since SCM give a meaningful contribution for a company in building competitive advantage. However the Supply Chain process cannot be separated from risks.

This research conduct an assessment of the relationship between the risk to the cause of the risk, and evaluate the risk prioritization for designing risk mitigation strategies in Coffee Industry. This research using house of risk in identify risk and causes of risk. Result of this research identify 66 causes of risk and 10 mitigation activities. The priority of risks being mitigated are the increase of barcode system, information sharing system, information about availability of stock to consumer, Scheduling system, regular information to vendors, consumer and supplier coordination to flexible production process. Training and Refressing, creating with Quality standart for instant coffee. Regular maintenance system and synchronize between production and material being use. Result of this research useful for companies that implement supply chain management to a broad geographical area

Keywords: Risk Management, Mitigation, House of Risk

Background

Supply chain management is f one the way for the enterprise to make a competitive advantage. But the complexity of supply chain give a new challenge for business process of an organization. The configuration of the supply chain complexity can raise some risks. This research trying to find the way to cope with the risks by identifying, assessing and determining the strategy to mitigate the risks with the House of Risk (HOR) method. The first step of the research identifying the risk potential of the supply chain process. Secondly, identifying the impact of the risk and third identify the cause of the risk in the supply chain process. Finally, assessing the relationship of risk and the cause of the risks, moreover this research evaluate the effort to mitigate the impact of the risks. The research conducted in the coffee industry which is has a complex supply chain in order to reach the national and international market.

Conceptual Background

16
Supply Chain Management is a set of method in collaborating the parts of business (suppliers, manufacture, warehouse, retail and customer) in order to produce and distribute the product in the right quantity, at the right time and also the right quality as need by customers. Another importance concern of supply chain management is about the cost efficiency and the quality of service (Simchi levi et al, 2009). SCOR (Supply chain Operations Reference) is a model that deviding the supply chain process into five core processes, ie plan, source, make, deliver and return. Risk is the probability of an event that resulted losses when the incident took place during a certain period (Bowden et. Al, 2001). Risk management can

be applied to many level in the organization from the strategic level, tactical level and operational level. Risk management can also be applied in a special project to assist the decision-making specifically related to the management of risiko. Supply Chain Risk Management. According Waters.D (2004) Supply Chain Risk Management is a systematic process for identifying, analyzing and dealing with risks in the supply chain. One method of analyzing risk is to modify the model Failure Mode and Effects Analysis (FMEA) for the measurement of risk quantification and House of Quality (HOQ) to prioritize which risks should be addressed first and to choose the measures most effective mitigation to reduce the risk posed potential.

Mitigation strategy in Supply chain management

Tang (2010) describes in mitigating the risks, there are four approaches, namely Supply Management, Product Management, Demand Management, Information Management.

Table-1 : Strategic plan and tactical risk management in supply chain

	Supply Management	Demand Management	Product Management	Information Management
Strategic Plan	Supply Network Design	Product Rollovers and Product pricing	Product Variety	Supply chain Variability
Tactical Plans	Supplier Selection, Supplier Order Allocation, and Supply Contracts	Shift Demand Across Time Markets, and Products	Postponement, and Process Sequencing	Information Sharing, Vendor manage Inventory, and Collaborative Planning, Forecasting and Replenishment

Research Method

This is a exploratory research, finding the way to mitigate the impact of supply chain risk by identifying causes of risk, impact of risk in the supply chain process and assessing the relationship between risk and the cause of the risk. Moreover, evaluating the priorities as an effort in designing a strategy to mitigate the risks. The data collection is done with interviews, group discussions. The population in this study is the operations manager at the business process of supply chain and several departments are involved, such as marketing, research and development, purchasing, production planning and inventory control, production, engineering, Quality control and Quality assurance, distribution / export-import, Finance and accounting etc. Another informant is the raw material suppliers (which supply more than 200 tons / month) and customer (which have regular order more than 50 tons / month). The study was conducted on a supply chain system of instant coffee industry for domestic and international shipments.

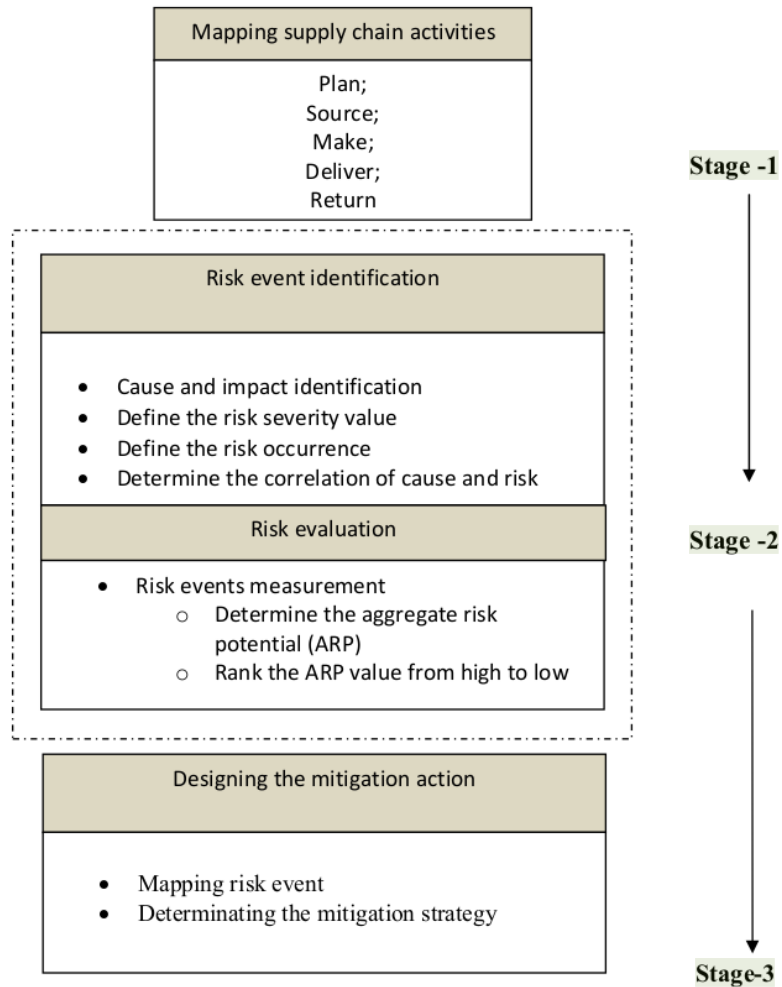
The research instrumen are questioner and semi structured interview and also observation in the field. The triangulation done in credibility testing. Research is conducted in Aneka Coffee Inc. located in east Java Indonesia which produce instant coffee. Primary data is collected by delivering the questionnaire and interviewing the informans and verifying with the manager of Aneka Cofee Inc.

Data Analysis

The data is processed and analyzed using the methods HOR (House of Risk). The latest method to analyze risk by developing a modified model of Failure Mode and Effects Analysis (FMEA) for the measurement of risk quantification. Model House of Quality (HOQ) agents is used to prioritize which risks should be addressed first and to choose the most effective actions to reduce potential risks posed by

the risk agencies. With two deployment models, called the ¹¹ House of Risk (HOR), is a modification of HOQ (Pujawan and Geraldine, 2009):

1. HOR.1 ⁶ used to determine the priority level of risk that the agent should be administered as a preventive measure.
2. HOR.2 are priorities in mitigation actions that are considered effective.



¹⁰ **Figure-1. The research stage**

Analysis and Result

Stage- 1. Mapping supply chain activities

At this stage, identification of the core business process mapping data is obtained from the distribution of a questionnaire which is based on the internal data flow process instant coffee. The informant was the head part on each department. Mapping supply chain activity based on Supply chain operation reference components, resulting such activities as seen in the table-2 below:

Table-2. Detail activity and sub process of Aneka Cofee Inc. based on SCOR

Business Process	Sub Processes	Detail activities
Plan	<i>Forecasting demand</i>	Customer forecasting demand of finish good
	<i>Production Plan</i>	Preparation of sample product of customer demand
		Determining of the specification standard of every single product (raw material, additional material and finish product)
		Inventory planning of raw material, additional material and finish product
		Production planning of finish product
		Distribution planning of finish product
		Product return planning of finish product
<i>Inventory inspection</i>	Controlling raw material stock level, additional material and finish product	
Source	<i>Communication with supplier</i>	Purchase order
		Vendor selection
		Offering demand
		Negosiaation
	<i>Procurement process</i>	Opening offer
		Ordering
		Delivering
		Verification
		Receiving product in warehouse
		Evaluation (procurement process and vendor)
Make	<i>Installation preparation and manufacturing</i>	Production process (Roasting, Extraction, Evaporation, Spray)
		Packing process
	<i>Inspection and maintenance</i>	Inspection of raw material, additional material and finish good
		Storage products in the warehouse
Delivery	<i>Determining the transportation mode</i>	Selection of transportation mode
		Delivering product to consumer
Return	<i>Returns nonconforming product</i>	Returning nonconforming raw material/additional material to vendor
		Maintaining return product from customer

Mapping the activity of the company is based on SCOR conducted by distributing questionnaires resulting 9 subprocesses with 27 activities detailed in the company's business processes.

Stage-2 Risk event identification process

In this stage, will identify the inherent risks in the company's business processes. The results of the identification of risk events were conducted on business processes at Aneka Coffee Inc. Overall there are 47 events in detail the risks based on SCOR activities element of risk there are 14 events on the Plan stage, then the 22 risk events on Source stage, and 7 risk events on Make stage, as well as two risk events on Delivery stage, two risk events on the Return stage. The second step in HOR-1 method is an assessment of the impact level (*severity*) of the risks event identified and assessment of the level of appearance (*occurrence*) of the causes of the risks identified. The assessment was conducted by distributing questionnaires to the operational managers as decision makers. The result of observing, interviewing and delivering the questioner about risk identification can see in the table-3 below:

Table-3. Potential risk event in business process activities of Aneka Coffee Industry Inc.

Business Process	Code	Risk event	Severity
Plan	E1	Forecast error from marketing	9
	E2	The difference occur in montly stock opname	8
	E3	The difference between physical stock and the stock card	8
	E4	The arrival of goods from supplier are late	7
	E5	Supplier cannot fulfill the product needed	8
	E6	Miscalculation of raw materials and finished goods	9
	E7	Sudden changes in production, due to meet the sudden demand	2
	E8	Miscalculation in determining energy capacity	10
	E9	Miscalculation of production capacity	7
	E10	Quantity differentiation between production planning and realization	10
	E11	The completion time of the production process is behind schedule (late)	4
	E12	Error of delivery, both the quantity and type of goods	9
	E13	Delays in delivery of finished goods to consumers	9
	E14	Existing refund system incriminate the company	3
Source	E15	Double calculation for the same item	2
	E16	Late	6
	E17	Old product	3
	E18	New vendor	6
	E19	The respon of old vendor is too long	5
	E20	The marketing of vendor is difficult to contact	5
	E21	Rising the price	10
	E22	Delivery time (lead time) is too long	9
	E23	No comparison	4
	E24	Purchase order revision	5
	E25	The completeness of purchase order document	10
	E26	Delivery of raw materials is behind schedule	9
	E27	The arrival of the truck as the operating hours of the warehouse is closed	8
	E28	Not attaching chemical identity on the packaging	8
	E29	The items are not in accordance with PO	8

	E30	Quality goods from the supplier does not comply with quality standards	10
	E31	Miscalculation weigh listing / qty order exceeds the tolerance	10
	E32	No purchase order	8
	E33	Missing invoice	10
	E34	Do not attach a tax invoice	10
	E35	Non local vendor	2
	E36	no positive change for the existing vendor performance even declining	9
Make	E37	Damage to the machine caused delays in the production process	9
	E38	Downtime machine from electricity	9
	E39	Loss of production / product failures	9
	E40	Damage to the final product. Defects in products	9
	E41	Error standard parameter / measuring instrument is not calibrated	8
	E42	Employees work not in accordance with procedures	9
	E43	Placement is not in accordance with the layout / placement cause product damage	10
Delivery	E44	Errors delivery of products to consumers	10
	E45	Delays in delivery to the consumer / customer complaints	10
Return	E46	Slow response from suppliers	7
	E47	Material are not in good condition to manufacture	5

E = Risk event

Based on the risk assessment has been carried out, a score severity in the event of a particularly serious impact risk for companies without warnings represented by the number 10 by 11 the risk event. , The incident risks that affect the company, but does not harm consumers represented by the numbers 2 lowest score as many as three events risk. Whereas that often appear, 9 is a serious risk events affecting as many as 12 events with a warning of risk. Furthermore, ARP (Aggregare Risk Potential) value is determined based on the severity, causes, correlation, and opportunities emerging from each event risk by using methods HOR 1. Based on ARP calculations, with Pareto analysis are obtained 10 major causes of risks include:

Table-4. Identified the important cause of risk

Code	Cause of Risk event	ARP
A10	Lack of coordination among departement	5747
A13	Administration system is weak	3722
A4	No forecast or information about customer	3368
A1	Instability demand	3276
A2	The competition of low grade and low price product	3086
A38	The maintenance system is weak	3077
A46	Employee not follow the procedure	2852
A37	Management vendor system	1996
A41	There is a deviation of production setting	1812
A44	Using the alternative material	1776

A=risk agents

Stage-3 Designing the mitigation action

Based on 10 causes of these risks will be determined coping activities (action) that allow to eliminate or decrease the emergence of the cause of such risks. At this stage it will be evaluated mitigation actions are adjusted based on a risk agent that has a high value of ARP and the correlation between the cause and the risk mitigation plan. The process for making the proposed mitigation activities carried out by distributing questionnaires to level managers as decision makers and standard setters. In stage 2 at the House Of Risk specify the actions that must be done first. Causes and risk mitigation as well as the varying effectiveness of the resources involved with different difficulty levels. Companies should ideally choose a set of actions that are not difficult to do but effective and can reduce the likelihood of agents.

The questionnaire contains the relevant proposal suggested as a follow up of the priority risks to be addressed first, along with Level difficulty in doing any mitigation measures are classified into three categories: low, the medium, and a high. Here are the details of mitigation strategies based on the results of questionnaires and discussions with relevant managers as decision makers in the company's operations:

**Tabel-5. Mitigation action
eliminating risk event in Aneka Coffee Inc.**

Code	Mitigation action
PA1	Implementing more integrated sharing information system
PA2	Increasing barcode system
PA3	Informing about the stock on hand
PA4	Coordination with consumer, supplier to flexible production
PA5	Creating low product with SNI (Indonesian National Standard) coffee standard.
PA6	Better scheduling system
PA7	Training and Refreshment
PA8	Updating information to vendor periodically
PA9	Better Regular Maintenance system
PA10	Synchronize production and material used

PA = Preventive action (Mitigation action)

Based on the level of effectiveness, difficulty, and effectiveness of the difficulty level, the mitigation action sequences obtained sequentially, start with PA2 (Increasing barcode system); PA1 (Implementing more integrated sharing information system); PA3 (Informing about the stock on hand); PA6 (Better Scheduling system); PA8 (Up dating information to vendor periodically); PA4 (Coordination with consumer, supplier to flexible production); PA7 (Training and Refreshment); PA5 (Creating low product with SNI (Indonesian Nasional Standard) coffee standard.); PA9 (Better Regular Maintenance system); PA10 (Synchronize production and material used). Selection of mitigation action plan is based on the level of effectiveness of the company. It can be seen from the costs and resources. As well as the level of difficulty of the application of these mitigation actions.

Conclusion

Based on analysis of the above data and answer the purpose of research, it can be concluded that:

1. The identification of the risk of supply chain at Aneka Coffee Inc. using models House Of Risk phase 1 of 27 activity detail by elements of SCOR obtained 14 risk events on the stage of the Plan, then 22 risk

events on stage Source, and 7 risk events on the stage of the Make, and two risk events on stage Delivery, two risk events on Return stage.

2. The identification of the impact and cause a risk of 47 risk events found 53 impact risk. With varying levels of severity among others in the event of a particularly serious impact risk for companies without warning number 10 is represented by as many as 11 events risks, while frequently appearing at number 9 is a serious risk events affecting as many as 12 events with a warning of risk.

3. The identification result of impact and cause a risk of 47 risk events obtained 66 risk agent with difference occurrence. Based on identification obtained 66 causes of risk obtained 10 agents of risk that have a highest value ARP, among others: Lack of coordination between departments, administrative system less tersistem, No its forecast / info from consumers, Demand consumers unstable, Competition imported goods low grade and price by the consumer, less maintenance system, employees did not follow procedures, working system / vendor management, deviation current production settings, use of alternative materials.

4. Based on House Of Risk phase 2 obtained 10 draft mitigation actions that can minimize the risk of Aneka Coffee Inc. sorted by score highest priorities include improving the barcode system (PA2); Applying a more integrated system of sharing information (PA1); Info advance of the availability of stocks in the consumer (PA3); More systematic Scheduling system (PA6), periodic information on the development of vendor (PA8); Coordination with customers, suppliers for production flexibility (PA4); Training and Refreshment (PA7); Creating a product with low product ISO standard Instant coffee (PA5); Maintenance system more regularly (PA9); More sikron between production and material to be used (PA10).

House of risk assessment methods is a risk assessment tools that are applicable that can be applied by anyone, anytime and anywhere. This method is able to evaluate the risks that potentially arise, the cause of the risk, as well as the severity of risk with a variety of viewpoints. This method can help decision makers in a short time with information complete.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9
