Minimization Risk Product Quality of Stolephorus Sp. Fish in Supply Chain Activities

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Abstract. In supply chain activities, there is always the potential for risk to arise, therefore risk management is needed for risk control. PT. Marinal Indorima Kapedi is a manufacturing company engaged in fisheries, which processes raw materials of Stolephorus Sp. fish where supply chain activities have the opportunity to pose risks that cause a decrease in product quality. The purpose of this study is to identify quality reduction risks and risk agents that occur in supply chain activities then design mitigation strategies that can be used to reduce the emergence of risk agents. The method used to determine priorities and mitigation strategies is House of Risk (HOR). From the results of the study 7 proposed mitigation strategies were proposed to reduce the possibility of the emergence of risk agents in the company's supply chain activities, namely conducting routine training for all workers, setting a standard time for each process on the production line, implementing production machinery instead of workers, oversee every tighter work activity, coordinate with suppliers, apply a system of violations to contract workers if the working mechanism is not in accordance with the SOP, and take Stolephorus Sp. fish only for trusted suppliers.

Keywords: Supply Chain, Risk Management, HOR (House of Risk), Mitigation, Risk Agents

1 Introduction

PT. Marinal Indorima Kapedi is a manufacturing company engaged in the fisheries sector, namely processing raw materials for Teri fish located in Sumenep Regency, East Java. The final products are almost entirely exported and marketed to foreign countries such as Japan, Singapore, China, Hong Kong, and Thailand. Problems faced by PT. Marinal Indorima Kapedi currently includes complaints from consumers about the quality of Stolephorus Sp. fish products because cases of refusing class fish are rejected, it is alleged that the case of rejection is not only caused by a production process error, but there are other factors outside the production process that increase the risk of rejection. In the production process the risk of process failure in the form of undercooked fish because the boiling temperature is not optimal, the fish is damaged due to excess production, the fish is damaged due to damage to the tools and machines, and the fish is damaged due to handling errors.

Risk can cause damage which may affect the company's goal [1]. The existence of some sort of risk needs to be identified to map the characteristics of the risks that will have an impact on the performance of Supply chain [2]. If a company does not have a risk management, then the risk can have an impact on the company's performance [3]. HOR (House of Risk) was chosen because it has a set of proactive which is considered effective in managing the risk of supply chain companies. A method HOR is a method that focuses on formulating the strategy of prevention, response and handling of risk factors potentially cause risk of more than one [4]. Model HOR used to prioritize which dealt first and to choose the most effective action to reduce the risk of potentially appear by agent risk. A method HOR had used to analyse risk on leather raw materials in a company [5] and to manage risk the quality of the frozen shrimp in the supply chain [6].

The Focus this study to identify and analyze risks in the supply chain then design appropriate mitigation strategies to deal with risks so that the company can minimize losses and achieve the purpose to identifying and measuring risks potential that exist in supply chain activities of PT. Marinal Indorima Kapedi can use the House of Risk model which is the development of Failure Modes and Effect Analysis (FMEA) and Quality Function Deployment (QFD) methods.

2 Literature Review

2.1 Risk Management

According to [7][8][9], risk management is the process of identifying, measuring, and ensuring risk and
developing strategies to manage those risks. The aim is to continue to make or add maximum value to all activities in an organization.

Fig. 1. Risk Management [10].

2.2 Supply Chain Risk Management

According to [11][12], Supply Chain Risk Management is a tool that might minimize possibility of things that can cause failure in one aspect of the supply chain so that the overall performance of the supply chain cannot function properly.

According to [13][14], Supply Chain Risk Management is a risk that occurs in the flow of products, information, ranging from raw materials to delivery of the final product. This risk threatens overall supply chain from suppliers to consumers.

2.3 House of Risk

Model House of Risk is one of framework by doing the development methods of Failure Modes and Effects Analysis and Quality function Deployment [15]. FMEA is a method used to identify the potential of a failure of a product or service as well as performing an act which aimed to eliminate or minimize the risk of failure [16][17][18].

While the QFD is a process set the customer's wishes (what is "desirable" customers) and translates it into "how" attribute so that each functional area can understand and execute it[19][20].

3 Methods

The method of completion in this study using the House of Risk method which is a development of the Quality Function Deployment method and Failure Modes and Effect Analysis.

3.1 House of risk.

The following are the stages of House Of Risk (HOR)

3.1.1 House of Risk phase 1

From each risk event and risk agent, then it is followed by mapping Aggregate Risk Potential (ARP) value with phase 1 HOR matrix. This matrix maps the correlation of risk events with each risk agent. a scale of 0, 1, 3, 9 where 0 indicates no correlation and 1, 3, 9 shows successively low, medium and high correlation.

\[ ARP_j = O_j \sum S_i R_{ij} \]  

3.1.2 Make Pareto diagram

Make a Pareto (Aj) diagram for priority selection. Pareto diagram is used making rank of data indication based on the percentage order. left for lowest value of ARP Aggregate Risk Potential in HOR and right for highest value. The biggest percentage will be improved by conducting phase 2 HOR, which is looking for strategies for the proposed risk mitigation steps

\[ TE_k = \sum ARP_j E_{jk} \]  

ARPj= Aggregate Risk Potential from risk agents  
Ejk= Correlation between mitigation strategies and risk agents

The ETDk value is calculated by the formula:

\[ ETD_k = TE_k / D_k \]  

TEk = Total effectiveness  
Dk = Degree of Difficulty

3.1.3 House of Risk phase 2

In phase 2 HOR or risk handling phase which aims to determine the priority of actions with TEk calculation (total effectiveness) and ETDk (Ratio between Total effectiveness and level of difficulty).

4 Result

4.1 Risk Evaluation

The purpose of risk evaluation is to make which risk decisions are categorized as critical and need to be addressed. A tool that can be used to decide which risks need handling first, including Pareto chart.

4.1.1 House of Risk phase 1

The following results from House of Risk phase 1:

<table>
<thead>
<tr>
<th>Code</th>
<th>Risk / Risk agent</th>
<th>ARP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Sudden demand from consumers</td>
<td>102</td>
</tr>
<tr>
<td>A2</td>
<td>Delay in information from consumers</td>
<td>14</td>
</tr>
<tr>
<td>A3</td>
<td>Request forecast error</td>
<td>65</td>
</tr>
<tr>
<td>A4</td>
<td>Anchovy capacity from fluent suppliers</td>
<td>200</td>
</tr>
<tr>
<td>A5</td>
<td>Misinformation between marketing and purchasing</td>
<td>27</td>
</tr>
<tr>
<td>A6</td>
<td>Less careful in writing contract agreements</td>
<td>72</td>
</tr>
</tbody>
</table>
A7 Lack of communication between companies and suppliers 18
A8 Less careful in writing order specifications 95
A9 The occurrence of transportation accidents 36
A10 Packing the wrong anchovy 147
A11 Lack of ice cubes 486
A12 Nonstandard shipping handling (heat/rain protection) 54
A13 Management of post-caching anchovy is not standard 144
A14 Misinformation between suppliers and the procurement department 30
A15 The temperature in cold storage is not according to the standard 128
A16 Waiting time in the process is too long 504
A17 The amount of anchovy capacity exceeds production capacity 96
A18 The material storage mechanism is not standard 92
A19 Material overload warehouse 81
A20 Work equipment is not supportive 75
A21 Operators work outside the SOP 402
A22 The process storage temperature is not standard 138
A23 The capacity of anchovy in boiling vessels exceeds the limit 45
A24 Boiling process is too long 432
A25 Error checking water content by the operator 42
A26 Natural factors (rain, cloudy) 288
A27 The drying process is not long enough 144
A28 Lighting in the room 25
A29 Damage to tool/sizing machine 225
A30 Operators cannot operate machines 29
A31 There is no maintenance/calibration of the scale 8
A32 Sealing equipment needs repairs 24
A33 Operators are less careful about marking labels 108
A34 The storage mechanism in cold storage is not standard 168
A35 Storage lead time is too long 40
A36 Storage overload 216

From the Pareto diagram in Figure 3, it can be seen that there are four selected risk agents that will carry out mitigation actions, namely A16 (Prolonged waiting time in process), A11 (Lack of ice cubes), A24 (Boiling process too long) and A21 (Operator works outside the SOP). The four risk agents were chosen because they had the most influence on the decline in product quality which would have an effect on the company's income.

4.2 Mitigation of Risk

The next stage carried out in the risk management process after the risk evaluation is the risk mitigation stage. Where at this stage the chosen risk agents will be included in phase 2 HOR for develop mitigation actions. The mitigation action in question is an action to reduce the impact of a risk agent that appears in future. Mitigation actions are measuring from normalization of the company. The following is a mitigation action that is obtained in accordance with the objectives of the company.

<table>
<thead>
<tr>
<th>Mitigation Action</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish the standard time for each process on the production line</td>
<td>PA1</td>
</tr>
<tr>
<td>Applying a production machine as a substitute for workers</td>
<td>PA2</td>
</tr>
<tr>
<td>Take anchovy only to trusted suppliers</td>
<td>PA3</td>
</tr>
<tr>
<td>Coordination with suppliers</td>
<td>PA4</td>
</tr>
</tbody>
</table>
Establish the standard time for each process on the production line  PA1
Supervise in every work activity more strictly  PA5
Conduct routine training for all workers  PA6
Supervise in every work activity more strictly  PA5
Applying a system of violations to contract workers when contract violations occur or work mechanisms that do not comply with the SOP  PA7

4.3 2<sup>nd</sup> phase House of Risk

In phase 2 HOR or risk handling phase which aims to determine the priority of actions with TEk calculation (total effectiveness) and ETDk (Ratio between Total effectiveness and level of difficulty)

**Table 3.** ETD (Ratio between Total effectiveness and level of difficulty).

<table>
<thead>
<tr>
<th>Code</th>
<th>Mitigation Action</th>
<th>ETD</th>
<th>Priority Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA6</td>
<td>Conduct routine training for all workers</td>
<td>1809</td>
<td>1</td>
</tr>
<tr>
<td>PA1</td>
<td>Establish the standard time for each process on the production line</td>
<td>1404</td>
<td>2</td>
</tr>
<tr>
<td>PA2</td>
<td>Applying a production machine as a substitute for workers</td>
<td>907</td>
<td>3</td>
</tr>
<tr>
<td>PA5</td>
<td>Supervise in every work activity more strictly</td>
<td>834</td>
<td>4</td>
</tr>
<tr>
<td>PA4</td>
<td>Coordination with suppliers</td>
<td>729</td>
<td>5</td>
</tr>
<tr>
<td>PA7</td>
<td>Applying a system of violations to contract workers when contract violations occur or work mechanisms that do not comply with the SOP</td>
<td>603</td>
<td>6</td>
</tr>
<tr>
<td>PA3</td>
<td>Take anchovy only to trusted suppliers</td>
<td>486</td>
<td>7</td>
</tr>
</tbody>
</table>

5 Conclusion

Based on the Pareto diagram analysis obtained four priority risk agents that need mitigation actions, namely A16 (the waiting time in the process is too long with the Aggregate Risk Potential (ARP) value of 504, A11 (Lack of ice cubes) with an ARP value of 486, A24 (process boiling too long) with ARP values of 432 and A21 (Operators working outside SOP) with ARP values of 402 of the 4 selected risk agents, 7 strategies were proposed to the company, the seven strategies were ranked by calculating the value of ETD (Effectiveness to Difficulty).

Authors would like to thank DIPA FT UTM 2020, because this article accessing this foundary. For further research can take note of any failure of any business processes to make it easier to do risk management. In addition, the identification of the risk starts from means of transport from suppliers because it can also cause a high risk on loss of quality.

**References**