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Risk Mitigation Via Integrating House of Risk and Probability Impact Matrix in Halal Food Supply Chain

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ABSTRACT

One of the food industry challenges is how to identify sources of risk by considering the halal concept. This study aimed to identify risks and determine risk handling priorities in the supply chain strategy of halal food. This research offered integration of the house of risk and the probability impact matrix to manage risk mitigation in the halal food industry. A case study in the halal food industry was applied in Indonesia based on Supply Chain Operations Reference (SCOR). This study identified 27 risk events and 31 risk agents through 2 phases. Result research showed that employees who did not have special skills (A20) had the highest risk. Moreover, reward and punishment to employees (PA16) was the best proactive action for making effective improvements. The implication of this research is to provide recommendations to management in mitigating risks in the halal food industry.

1. Introduction

The food industry produces some product variety to fulfill consumer needs. In the national and international markets, there are many food industries to satisfy customer requirements. The food industry has several complex supply chain processes. Several studies declare that the supply chain strategy in the food industry has many problems in its business processes [1] [2]. One of the problems in the food industry supply chain is risk management. There are many risks in the food industry, such as experiences losses and non-optimal profit. Furthermore, several other risks in supply chain strategy are the inadequate identification of risk sources for suppliers, manufacturers, distributors, and consumers. Defective products are at risk in product quality, which cannot be sold on the market [3]. Other factors affect the risk, including problems with stopped production [4], unbalanced employee workloads [5], and improper supplier management [6]. In risk management, the ideal situation is when potential sources of risk in the supply chain are found. Then the management department immediately proposes priority mitigation strategies [7, 8].

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To anticipate risks in the food industry, the halal product certification process is the appropriate strategy for adoption. Some studies explain that halal certification aims to ensure product quality that consumers can consume safely [9-11]. Thus, an investigation into the concept of halal products is required in supply chain risk mitigation in the food industry. Inefficient supply chain management can be a source of industry risk if not properly managed. It might affect suppliers, manufacturers, distributors, and consumers. Halal supply chains require strict supervision to follow the standard operating procedures in each production process. It is objected to mitigate risks based on the possibility of loss and potential exposure to losses[12]. A study claims that the halal supply chain can cause losses and dangers from raw materials to finished products [13]. Risk can also be measured based on probability, severity, and impact[14]. Thus, many methods can be used in risk mitigation in supply chain strategies. For halal supply chains, risk mitigation requires grouping halal critical points that occur in every production process. Thus, an approach is needed to risk management in each production process based on the halal concept.

One of the popular models is Supply Chain Operations Reference (SCOR) to maps the supply chain. The SCOR model is a tool for mapping business processes in the supply chain [15, 16]. One approach in supply chain risk management is the House of Risk. This method is divided into two phases, including HOR phase 1, to determine the priority level of risk causes. HOR phase 2 is a priority in proactive actions considered effective [7]. This model focuses on preventive measures in reducing the possibility of risk agents occurring by identifying risk events. One risk agent can cause several risk events. The HOR can only assign probabilities to risk agents and the severity of the risk. Risk management in the halal supply chain requires accuracy and speed to reduce risk. In addition, the level of risk in the supply chain also needs to be assessed. Probability Impact Matrix (PIM) is one method to assess the level of risk that is easy to apply [17]. The risk assessment of this method is based on probabilities and consequences [18]. The management aims to assess the possibility of each risk and impact based on a predetermined rating scale. Thus, this method can assess risks that have a significant impact and require treatment [19].

Although several risk mitigation studies have been proposed, mitigation research for halal supply chains is very limited. This study proposes the integration of HOR and PIM to mitigate halal supply chain risk based on SCOR. In addition, PIM is offered to assess the level of halal supply chain risk based on SCOR. This study was intended to develop a risk mitigation procedure for the supply chain of halal products using HOR and PIM. The contribution of this research is to enrich knowledge in the field of risk mitigation in the supply chain of halal products by using HOR and PIM. In addition, this research contributes to companies' efforts to improve risk management in the supply chain of halal products.

2. Methods

2.1. Risk Mitigation Procedure in Halal Food Supply Chain

This study proposed eight stages in risk mitigation in the Halal Food Supply Chain. This study developed the model proposed by Nyoman Pujawan and Geraldin [7]. Details of the stages can be seen in Fig. 1. Stage 1 was the Identification of Critical Points in the Halal Food Supply Chain. At this stage, mapping activities of in halal food supply chain using the Supply Chain Operations Reference (SCOR) was exercised. The activity was organized into five business processes: plan, source, make, deliver, and return. Activity mapping had to pay attention to the halal concept in each activity. In the early stages,

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researchers needed an in-depth study of each activity. It could help in mapping the problems in each business process [20]. Data were obtained through observations, interviews, and questionnaires in each business process [21-23].

At the second stage, the identification of risk events and assessment of severity was conducted. In this section, the identification of risk events was collected in each business process. This risk identification process was carried out by experienced experts in their fields and was also verified by the company [24]. Furthermore, risk events were assessed as severity levels using a scale of 1 (no impact) to 10 (hazardous impact). Furthermore, stage 3 was the identification of risk agents and assessment of occurrence. At this stage, the identification of risk agents was collected for each activity. Furthermore, the risk agent rate of occurrence was assessed from a value of 1 (rarely) to 10 (surely).

Stage 4 determined the Aggregate Risk Potential (ARP) based on the HOR phase 1. At this stage, the experts assessed the correlation between the risk event and the risk agent. The proposed correlation value was on a scale of 0 (no correlation), 1 (low correlation), 3 (medium correlation), and 9 (high correlation). Furthermore, the results of this assessment were used to determine ARP. The ARP was calculated based on the formula presented in equation (1). Where ARPj showed the value of Aggregate Risk Potential at risk agent j. Oj was the occurrence value of the risk agent j, and Sj was the severity value of the risk event j. The correlation value between the risk agent and the risk event was denoted as R_{ij}. The ranking of the ARP was based on the largest value.

$$ARP_j = O_j \sum_i S_j + R_{ij} \quad (1)$$

Stage 5 was to determine the potential risk agent using Pareto. At this stage, the results of the ARPj calculation were sorted from the largest value to the smallest value. Stage 6 was to assess the level of risk agent using the PIM procedure. Determination of risk agent priority was based on the occurrence and severity assessment of the risk agent. Occurrence assessment was in stage 3, while severity was assessed using a scale of 1 (no impact) to 10 (hazardous impact). Furthermore, these values were converted to the PIM scale in Table 1. The conversion results were utilized in the risk mapping presented in Fig. 2.

Stage 7 was the determination of proactive action/mitigation based on HOR phase 2. At this stage, proactive action was done based on the results of discussions with experts. Furthermore, the experts assessed the degree of relationship between proactive action and risk agent values. The results of this assessment were denoted as Eij. In assessing the relationship, this study implemented a scale of 0 (no relationship), 1 (low relationship), 3 (with relationship), and 9 (high relationship). Furthermore, experts evaluated the degree of difficulty (Dk). In this study, the Dk assessment was based on a scale of 3 (easy to apply), 4 (somewhat easy to apply), and 5 (difficult to apply). The results of this assessment were then used to calculate the Total Effectiveness of proactive actions (TEk) and the Effectiveness to Difficulty ratio of actions ($ETDk$). These calculations are presented in equations (2) and (3), respectively. The last stage was to reassess the risk agent when proactive action was applied. This stage was shown to determine the level of effectiveness of proactive action against risk agents. Severity and occurrence values of risk agents were reassessed based on proactive action.

$$TE_k = \sum_j ARP_j + E_{ij} \quad (2)$$

$$ETD_k = TE_k / D_k \quad (3)$$

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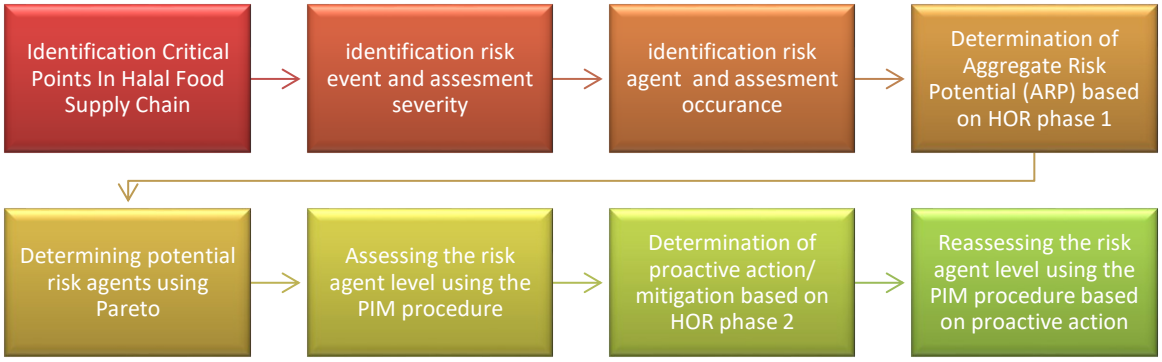

Fig. 1. The stage of risk mitigation

Table 1. Convert of severity and occurrence value to risk level

Level	Impact (Severity)	Probability (occurance)	Scale
1 - Very Low	1-4	1-4	0-20%
2 - Low	5	5	20-40%
3 - Moderate	6	6	40-60%
4 - High	7-8	7-8	60-80%
4 - Very High	9-10	9-10	80-100%

Probability Rating (Occurrence)	Impact Rating (Severity)				
	1-Very Low	2 - Low	3 - Moderate	4 - High	5 - Very High
5 - Very High					
4 - High					
3 - Moderate					
2 - Low					
1 - Very Low					

Fig. 2. Level of risk based on Probability Impact Matrix

2.2 Case Study

This research was designed as a case study on a food company that produces bakeries in Indonesia. Data were collected based on observations, interviews, and questionnaires. Five expert respondents involved in this study consisted of marketing, production, sales, logistics, and human resources experts. The experts were directly involved in 8 stages of research which are presented in Fig. 1. The results of identification and assessment at each stage were considered the result of in-depth discussion among the experts.

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3. Results and Discussion

Risk management needs to be carried out in a supply chain strategy to obtain the suitable raw materials to produce finished goods, which are then sent to meet consumer needs. Several studies have explained that risk mitigation involves several processes, methods, and techniques that can help management maximize the consequences of positive events and minimize the consequences of opposite events [25, 26]. Therefore, risk analysis needs to be considered in the management of the food industry. Other studies state that a prevention strategy against risks that are still weak can bring disaster to the industry [27], and giving excessive warnings to avoid risks make various opportunities lost [28]. To overcome these challenges, the management needs to involve an accurate assessment of risk to maximize profits for the industry.

The initial stage was mapping the supply chain strategy by considering the halal concept in the process business. Table 2 shows a review of several studies for determining the critical halal point using the SCOR model framework. The next step was SCOR mapping which involved five aspects (Plan, Source, Make, Deliver, Return). Some of the business units involved in this case can be seen in Fig. 3.

Table 3 describes the events' risk and severity level in business process activities. In this research, there were 31 risk agents in the company. The risk agents and occurrence level can be found in Table 4. Furthermore, the Result of House of Risk (HOR) Phase 1 is displayed in Table 4. Fig. 3 explains the result of the aggregate risk potential compiled using the Pareto Diagram. These results indicated that the risk agent A20 had the largest value, whereas the risk agent A6 produced the smallest value. Therefore, based on the Pareto principle, 16 risk agent priority was selected. To determine the level of risk in each risk agent, this study used the PIM procedure. The results of the risk level assessment for each risk agent are presented in Table 6.

Fig. 4 presents the mapping of risk levels using PIM on risk agents. The results showed that 16 risk agents were categorized as high and medium-high risk. On the other hand, two (2) risk agents (A1 and A2) were classified as moderate. For example, risk agent A20 had an occurrence value of (8) and a severity rating of (6).

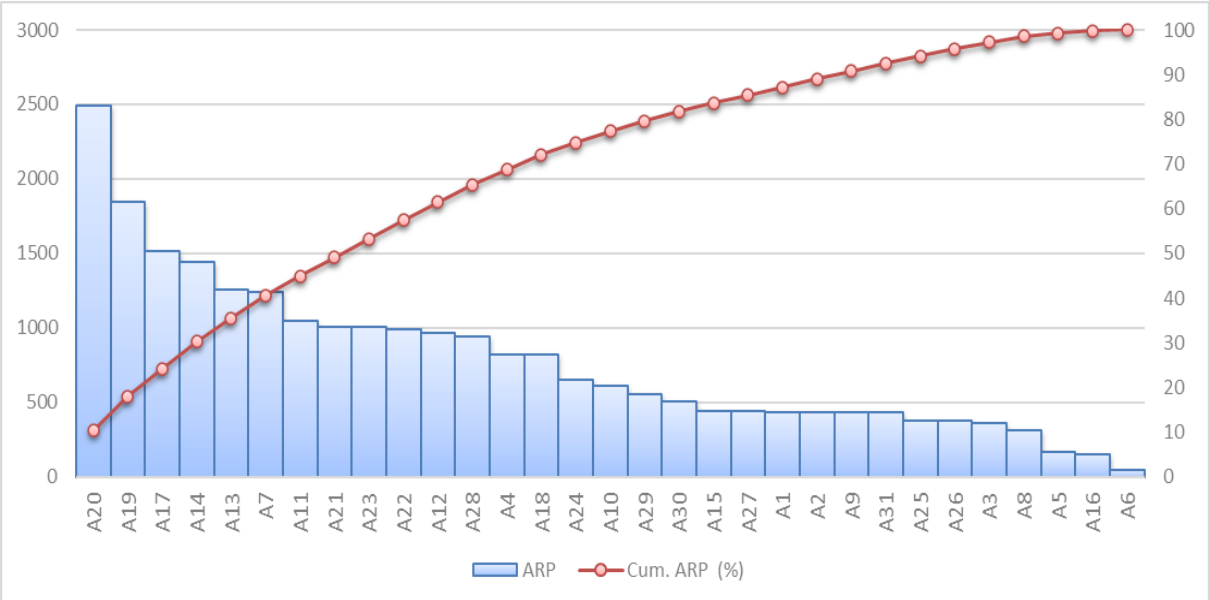

Fig. 3. Aggregate Risk Potential (ARP)

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Based on its PIM and Pareto, proactive action was proposed to mitigate risk. Proactive action and degree of difficulty (Dk) are presented in Table 7. Furthermore, phase 2 of HOR can be seen in Table 8. These results suggested that the greatest value of proactive action was obtained at PA16, and the smallest value was PA8. Based on the proposed proactive action, an assessment of the estimated risk level of the risk agent was also carried out. The risk agent assessment based on proactive action is shown in Table 9. The results of the risk level assessment of 16 risk agents based on proactive action are shown in Fig. 5. These results indicated that the overall risk agents had decreased risk levels compared to before proactive action.

Table 2. Supply chain strategies for critical halal points based on the SCOR Model

SCOR	Activity	A	B	C	D	E	F
Plan	Planning of the raw material procurement	√			√	√	√
	Production planning	√	√		√	√	√
	Distribution planning	√				√	
	Planning of machine maintenance			√		√	
Source	Supplier selection	√					√
	Selection of halal raw materials and according to standards	√			√	√	
	The process of procuring raw materials	√			√		
Make	Production execution according to plan	√	√				
	Checking the halalness of the finished product	√		√		√	
	Checking the quality of the finished product	√	√		√		
	Storage of finished products	√	√			√	
Deliver	Delivery of goods	√				√	
	Ensure that goods are not contaminated which is not halal	√			√	√	√
	Product availability data information		√				
	Selection of logistic providers	√					√
Return	Return the product to the supplier		√			√	
	Handling of returned products by customers		√			√	

Note : A = research by Nukeriana [29]; B = research by Neio Demirci, et al. [30]; C = research by Lau, et al. [31]; D = research by Faridah [32]; E = research by Jannah [33]; F= research by Atma, et al. [34].

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Table 3. Risk Event and Severity Level

SCOR	Activity	Risk Event	Code	Severity (Si)
Plan	Planning of the raw material procurement	Late arrival of raw materials	E1	6
	Production planning	The change in production plans suddenly	E2	6
		Errors in planning production quantities	E3	7
	Distribution planning	Delay in providing finished products	E4	7
	Planning of machine maintenance	Machine maintenance planning schedule errors	E5	7
Source	Supplier selection and contract	Miss communication with suppliers	E6	8
	Selection of halal raw materials and according to standards	The difficulty in getting raw materials according to standards	E7	7
		The low ability of suppliers to meet demand in quality	E8	7
	The process of procuring raw materials	Late arrival of raw materials	E9	7
		The supplier cannot meet the total raw material requirements	E10	6
		Logistics error in raw material inspection	E11	7
Make	Production execution according to plan	The insufficient stock of raw materials	E12	7
		The insufficient stock of supporting materials	E13	7
		The delay in the production process	E14	7
		The demand from consumers suddenly	E15	6
		Production defect	E16	7
	Checking the halalness of the finished product	Ensure that there are no contaminated materials and tools that are haram	E17	6
	Checking the quality of finished product	Less thorough quality inspection	E18	7
	Storage of finished products	The damaged product in storage	E19	6
Deliver	Selection of logistic providers	Unilateral cancellation from logistic provider	E20	8
	Delivery of goods	Late arrival of raw materials	E21	8
		Product damaged in transit	E22	7
	Ensure that goods are not contaminated which is not halal	Check the halalness of the raw material storage area periodically	E23	6
	Product availability data information	An error occurred with the product availability number	E24	7
Return	Return the finished product from the consumers	Delay in returning products to consumers	E25	8
		There is an additional fee	E26	7
	Return the product to the supplier	Late replacement of raw materials to suppliers	E27	8

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Table 4. Risk Agent and Level of Occurrence

SCOR	Risk Agent	Code	Occurrence(O_j)
Plan	The uncertainty of delivery time by expedition	A1	6
	The stock of goods is empty	A2	6
	Lack of supply of raw materials in warehouses	A3	5
	The uncertainty of the number of orders from consumers	A4	7
	Supplier's inability to provide raw materials in a quantity	A5	7
	Poor warehouse management	A6	7
	Human error	A7	6
	Machine maintenance planning errors	A8	5
Source	Less strong agreements/contracts with suppliers	A9	6
	Raw materials below standard quality	A10	7
	Incompatibility of price with the quality of raw materials	A11	7
	Natural factors	A12	7
	Inadequate conditions of transportation	A13	7
	Scarcity of raw materials	A14	8
	Quality inspection errors during the loading process	A15	7
	Not in accordance with the SOP	A16	7
Make	Poor warehouse management	A17	8
	The delay of the production process	A18	7
	Workers do not focus, and they are not conscientious	A19	8
	Workers do not have special skills	A20	8
Deliver	The void of raw material	A21	7
	Bad weather	A22	6
	The difficulty for getting raw materials	A23	7
	Road conditions are not good	A24	7
	The product packaging is not good	A25	6
	There is no special team to check the halal of the area	A26	7
	Data are not updated	A27	7
Return	The damaged means of transportation	A28	7
	Bad weather	A29	6
	The delay in handling incoming material	A30	7
	Weaknesses in the memorandum of agreement with suppliers	A31	6

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Table 5. HOR Phase 1

Code	Risk Events (E)																											ARP $_j$	Rank
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
A1	9	3																										432	18
A2	9	3																										432	18
A3	9	3																										360	20
A4		9	9																									819	12
A5	3	1																										168	22
A6	1																											42	24
A7		3	9	9	9																							1242	6
A8					9																							315	21
A9						9																						432	18
A10							3	9																				609	14
A11						3	9	9																				1050	7
A12							3		9	9																		966	10
A13							9		9	9																		1260	5
A14							9	9		9																		1440	4
A15											9																	441	17
A16											3																	147	23
A17												9	9	9														1512	3
A18														9	9		3											945	11
A19												9	3	3		9	9	9										2280	2
A20												1	1	9	9	9	9	9	9									2920	1
A21																				9	9							1008	8
A22																				9	9	3						990	9
A23																				9	9							1008	8
A24																					9	3						651	13
A25																						9						378	19
A26																							9					378	19
A27																								9				441	17
A28																									9	9		945	11
A29																									9	3		558	15
A30																											9	504	16
A31																											9	432	18

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Table 6. Risk Agent Priority

SCOR	Risk Agent	Code	(Oj)	(Sj)
Plan	The uncertainty of delivery time by expedition	A1	6	6
	The stock of goods is empty	A2	6	6
	The uncertainty of the number of orders from consumers	A4	7	6
	Human error	A7	6	7
Source	Incompatibility of price with the quality of raw materials	A11	7	7
	Natural factors	A12	7	7
	Inadequate conditions of transportation	A13	7	7
	Scarcity of raw materials	A14	8	6
Make	Workers do not focus, and they are not conscientious	A19	8	7
	Workers do not have special skills	A20	8	6
Deliver	The void of raw material	A21	7	8
	Bad weather	A22	6	8
	The difficulty for getting raw materials	A23	7	7
	Road conditions are not good	A24	7	8
Return	The damaged means of transportation	A28	7	8
	Bad weather	A29	6	7

Table 7. Proactive Action and Degree of Difficulty (Dk)

SCOR	Code	Proactive action	Dk
Plan	PA1	Looking for alternative routes of material delivery	3
	PA2	Conducting additional stock	4
	PA3	The user and logistics must coordinate	3
	PA4	The suppliers and logistics must coordinate	3
	PA5	Determine the inventory management policies following company conditions	3
	PA6	Forecasting sales	3
	PA7	Do regular training for employees	4
	PA8	Create a structured machine maintenance schedule	3
	PA9	Add the number of engineers to check machines	5
Source	PA10	Looking for suppliers from outside the region or abroad	3
	PA11	Add the number of raw material orders	3
	PA12	Do service and regularly check on transportation equipment	3
	PA13	Looking for substitutes that resemble raw materials	4
Make	PA14	Carry out the training regularly	4
	PA15	Create check sheets in each work area	5
	PA16	Apply rewards and punishments to workers	4
Deliver	PA17	Strengthen the memorandum of agreement with the supplier	5
	PA18	Looking for other alternatives that resemble raw materials	4
	PA19	Provide suitable transportation	4
	PA20	Create the long-term proudction plan (MRP)	5
Return	PA21	Ensure the feasibility of the means of transportation to be used	4
	PA22	Maintenance of transportation equipment regularly	4
	PA23	Do packaging on the product neatly and strongly	5

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Table 8. HOR Phase 2

Code	A1	A2	A4	A7	A11	A12	A13	A14	A19	A20	A21	A22	A23	A24	A28	A29	ETD_k	Rank
PA 1	9																1296	19
PA 2	9	9	9														3787	9
PA 3		9	9														3753	11
PA 4	3	9	9														4185	7
PA 5		9	9														3753	11
PA 6		3	9														2889	14
PA 7				9													2795	15
PA 8				1													414	22
PA 9				3													745	21
PA10					9			3									4590	5
PA11						9		9									7218	3
PA12							9										3780	10
PA13					3			9									4028	8
PA14									9	3							6024	4
PA15									9	9							7805	2
PA16									9	9							9756	1
PA17											9						1814	18
PA18											9		9				4536	6
PA19												9		9			3692	12
PA20											3		9				2419	17
PA21															9	9	3382	13
PA22															9	3	2545	16
PA23																9	1004	20

Table 9. Risk Agent Assessment Based on the Proactive Action

SCOR	Rank	Risk Agent Code	Oj	Si	Proactive Action Code
Plan	1	A7	5	4	PA7
					PA8
					PA9
	2	A4	6	6	PA6
	3	A1	2	2	PA1
					PA2
	4	A2	3	2	PA3
					PA4
					PA5
Source	1	A14	5	2	PA13
	2	A13	6	5	PA12
	3	A11	5	3	PA10
	4	A12	6	3	PA11
Make	1	A20	2	3	PA16
	2	A19	4	5	PA14
					PA15
Deliver	1	A21	2	3	PA17
	2	A23	5	3	PA18
	3	A22	3	5	PA19
	4	A24	5	2	PA20
Return	1	A28	2	3	PA21
	2	A29	3	4	PA22
					PA23

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Probability Rating (Occurrence)	Impact Rating (Severity)				
	1-Very Low	2 - Low	3 - Moderate	4 - High	5 - Very High
5 - Very High					
4 - High			A4, A14, A20	A13, A11, A12, A21, A23, A24, A28	
3 - Moderate			A1, A2	A7, A18, A22, A29	
2 - Low					
1 - Very Low					

No	Risk Agent	Code	Risk Impact		Risk Probability		Rank	Level risk
1	Workers do not have special skills	A20	M		H		1	
2	Workers do not focus, and they are not conscientious	A19	H		H		2	
3	Scarcity of raw materials	A14	M		H		3	
4	Inadequate conditions of transportation	A13	H		H		4	
5	Human error	A7	H		M		5	
6	Incompatibility of price with the quality of raw materials	A11	H		H		6	
7	The void of raw material	A21	H		H		7	
8	Difficulty for getting raw materials	A23	H		H		8	
9	Bad weather	A22	H		M		9	
10	Natural factors	A12	H		H		10	
11	The damaged means of transportation	A28	H		H		11	
12	The uncertainty of the number of orders from consumers	A4	M		H		12	
13	Road conditions are not good	A24	H		H		13	
14	Bad weather	A29	H		M		14	
15	The uncertainty of delivery time by expedition	A1	M		M		15	
16	The stock of good is empty	A2	M		M		16	

Fig. 4. Risk Level for Risk Agent Based on the PIM

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Probability Rating (Occurrence)	Impact Rating (Severity)				
	1-Very Low	2 - Low	3 - Moderate	4 - High	5 - Very High
5 - Very High					
4 - High					
3 - Moderate	A11	A1, A2, A13	A4		
2 - Low	A7, A12, A14, A22, A23, A24				
1 - Very Low	A20, A21, A28, A29	A19			

No	Risk Factors	Code	Risk Impact		Risk Probability		Rank	Level risk
1	Workers do not have special skills	A20	VL		VL		1	
2	Workers do not focus, and they are not conscientious	A19	L		VL		2	
3	Scarcity of raw materials	A14	VL		L		3	
4	Inadequate conditions of transportation	A13	L		M		4	
5	Human error	A7	VL		L		5	
6	Incompatibility of price with the quality of raw materials	A11	VL		M		6	
7	The void of raw material	A21	VL		VL		7	
8	Difficulty for getting raw materials	A23	VL		L		8	
9	Bad weather	A22	VL		L		9	
10	Natural factors	A12	VL		L		10	
11	The damaged means of transportation	A28	VL		VL		11	
12	The uncertainty of the number of orders from consumers	A4	M		M		12	
13	Road conditions are not good	A24	VL		L		13	
14	Bad weather	A29	VL		VL		14	
15	The uncertainty of delivery time by expedition	A1	L		M		15	
16	The stock of good is empty	A2	L		M		16	

Fig. 5. Probability Impact Matrix for Risk Agent Priority Based on the Proactive Action

This study implied that integrating the house of risk method and the probability impact matrix can solve the appointed problem. Halal supply chain requires risk mitigation to ensure halal quality standards in Indonesian produce products. Previous

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research has implemented a house of risk in the halal supply chain in a small-medium enterprise [35] [36]. The results of the research found risk agents and proactive actions to mitigate risk. However, this research was still limited in grouping risk levels to speed up the risk mitigation process. Then, this case study integrated the probability impact matrix to measure the level of probability and impact on risk. The probability impact matrix method is widely used for project management cases in accelerating project work [37]. Therefore, modifying the probability impact matrix in the house of risk can provide accuracy and speed for halal products in mitigating risks to improve service to consumers.

4. Conclusion

This study indicated that the mapping of supply chain strategies in halal food based on the SCOR model had provided an overview of the business processes of suppliers, manufacturers, logistics, and consumers. This study identified 27 risk events and 31 risk agents. HOR Phase 1 concluded that the highest risk occurred to the employees who did not have special skills to carry out their work. Then, phase 2 concluded that the best proposal for making effective improvements by business managers was to apply a reward and punishment system to employees. Then, each phase of the HOR was integrated with the probability impact matrix to determine risk priorities in risk mitigation. The implication of this research is in the form of a recommendation to the food industry management in mitigating the sources of risk in each business process. In addition, further study is suggested to adjust the risks that have been found with halal certification regulations in Indonesia.

Data Availability

All data generated or analyzed during this study are included in this article.

Declarations

Author contribution: Fitra Lestari contributes to conceptualization, methodology, data collection, validation, formal analysis, writing (original draft preparation, review, and editing), and funding acquisition. Ahmad Mas'ari contributes to conceptualization, validation, and investigation. Silfia Meilani contributes to methodology, data collection, software, writing (original draft preparation), and project administration. Irsan Nuari Riandika contributes to validation, investigation, writing (review and editing). Abu Bakar Abdul Hamid contributes to conceptualization, writing (review and editing), and validation. All authors read and approved the final paper.
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