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Risk Mitigation Design Based on Halal Standards and Environmental Sustainability Aspects using SCOR DS Model and HOR Method

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ABSTRACT

This study aims to identify, analyze, and mitigate risks in the broiler chicken supply chain at PT. XYZ by considering halal standards and environmental sustainability. Risk mapping according to the supply chain process was carried out using the Supply Chain Operation Reference Digital Standard (SCOR DS) approach model; on the other hand, the House of Risk (HOR) method, stage 1 was used to determine the priority of risk agents and stage 2 was used to formulate effective mitigation strategies. The analysis results show 17 priority risk agents that significantly affect 80% of risk events, including the number of chickens slaughtered, poor administration, unpleasant odors, irregular working hours, delivery disruptions, and unhygienic equipment. The proposed mitigation strategies include scheduling, seasonal recruitment, warehouse management systems, waste management, routine sanitation, administrative digitization, loading and unloading supervision, weather monitoring, alternative delivery routes, and traceability implementation. The implementation of this strategy is expected to minimize the impact of risks, maintain halal integrity, support environmental sustainability, and increase the company's competitiveness.

1. INTRODUCTION

In order to discuss the quite rapid development of the halal industry, this can be observed from the global expenditure of Muslims as reported in the State of the Global Islamic Economy (SGIE) 2023/2024 (KNEKS, 2023). Halal certification serves as a primary factor for Muslim consumers in their engagement with and support for the development of industries related to food products (Adha et al., 2024). This is based on the growing trend of adopting a halal lifestyle, which has heightened public awareness and increased the consumption of halal products (Azizah et al., 2022). In this context, as the country with the largest Muslim population in the world, Indonesia holds significant potential to support the advancement of the halal industry (Sholehoddin et al., 2024).

Based on this phenomenon, processed chicken products in Indonesia represent a halal commodity with considerable potential. This is due to the human body's need for protein (Hidayatuloh et al., 2024). Based on these needs, processed chicken products can serve as halal commodities with considerable potential. The National Food Agency reported that in 2024, the level of chicken meat consumption in Indonesia reached 7.46 kg/capita/year, indicating a 4.3% increase compared to 2022 (BPN, 2023). Consequently, Chicken Slaughterhouses currently constitute an industry that plays a crucial role within the national food supply chain.

The complex processing involved in chicken meat production necessitates that the entire slaughter supply chain, from upstream to downstream, adheres to stringent standards of being halal, clean, safe, and high-quality, as chicken meat is classified as a critical raw material (Jumiono, 2022). The halal integrity of chicken slaughter can be evaluated based on several critical control points: the qualification of the slaughterer, the condition of the equipment used, the meat storage procedures, and the accurate labeling of the final product (Maryuliano & Andarwulan, 2024).

The halal aspect of the chicken slaughtering process can be identified through Halal Supply Chain Management (HSCM). The concept is not novel for contemporary companies. The complexity of diverse stakeholders within the supply chain structure and the multitude of uncertainties present significant challenges in supply chain management (Luin et al., 2020). Besides from religious aspect, HSCM also incorporates the aspect of environmental sustainability (Kurniawati & Cakravastia, 2023). As a meat provider, chicken slaughterhouses potentially harbor risks that pollute not only the environment but also affect humans and other living creatures (Maslina et al., 2022). These slaughterhouses' waste can generate impacts such as odor, water pollution, and public health disturbances (Hutagalung et al., 2024).

Based on this circumstances, the slaughterhouses, in addition to producing meat, it can also produce negative impacts on the environment and society, which certainly threatens sustainability if the problems are not addressed. In this context, sustainability has three main aspects: environmental, social, and economic (Putri, 2025). Environmental sustainability is crucial to consider as it relates to uncertainties in ecological, social, and economic conditions.

The Halal Supply Chain Management (HSCM), sustainability is an important concept to be researched (Ruslaini & Kusnanto, 2020). The complexity of supply chains requires an understanding of the mechanisms and practices of environmental and social responsibility. The integration of halal and environmental sustainability is a significantly influential element in supply chain management, as in the case of a chicken slaughterhouse (Misrochah et al., 2025).

The concept of halal refers to guarantees across the entire production process, while sustainability refers to operational effectiveness that also considers ecological impacts and, holistically, has relevance to human health (Herman et al., 2023). In addition to ensuring product compliance with halal standards, environmental sustainability practices in the halal supply chain also contribute to ecosystem health (Utami et al., 2023). This not only affects product image but also supports global goals in achieving sustainability and environmental protection (Dwi et al., 2024). Therefore, implementing environmental sustainability aspects in the halal supply chain is key to creating a production system that is not only ethical but also responsible, and it can enhance the competitiveness of halal products (Sakhi, 2024).

Seeing the risks of uncertain market demand for chicken meat, companies must be capable of managing and operating their supply chains to fulfill their customers' needs (Ulfah, 2022). While this company already possesses halal certification, it has not managed risks systematically; therefore, a systematic approach is required to identify and perform risk management.

This company distributes its products to processed chicken meat companies, retail stores, and restaurants. A significant risk encountered by the company is a mismatch between the condition of the chickens and the order data, leading to financial losses as consumers return products. Consequently, beyond adhering to halal standards, attention must also be paid to environmental aspects to maintain the quality and welfare of the broiler chickens. The key environmental aspects that require consideration include liquid, solid, and gaseous waste, as well as Hazardous and Toxic Materials (B3) (Harma & Dompak, 2020). This is based on the premise that waste generated by the company can result in environmental pollution and disrupt the activities of the surrounding community. The operational processes within a chicken slaughterhouse are not limited to slaughtering but also involve sanitation, cutting, washing, chilling and packaging.

Risk management that has been implemented along the supply chain utilizes the concept of supply chain risk management (Rozudin & Mahbubah, 2021). In relation to this, the present research will employ the Supply Chain Operation Reference Digital Standard (SCOR DS) approach to identify occurring risks and map each one. Furthermore, the House of Risk (HOR) method will be used to determine risk priorities and facilitate risk mapping, utilizing both HOR 1 and HOR 2 models.

Wahyuni et al. (2020) in their study focusing on a similar issue using the SCOR and HOR models, identified 19 activities (sub-processes), 28 risk events, and 28 risk sources. In another study employing the HOR method, Purwaningsih et al. (2021) found 26 risk events, 52 causes of risks, and 12 major risk sources, proposing 28 mitigation actions with 8 priority mitigations whose implementation difficulty had been considered. Furthermore, Rizqi et al. (2023), using a similar methodology, researched the Halal Supply Chain for 'otak-otak Bandeng' (a fish cake product). The study revealed that from 15 risk events and 12 risk sources, 4 major risks were identified, leading to the design of 8 proposed actions implemented in the production process.

Expanding on this perspective, Kurniawati & Cakravastia (2023) conducted research on the halal supply chain from a sustainability viewpoint. Their study uncovered three main issues in the relationship between the halal supply chain and sustainability: halal integrity, the implementation of the halal supply chain, and the limitations of halal and sustainability practices. On the other hand, Sugiantara & Basuki (2019) employ a different method for identifying and mitigating risks; in their study, they utilize the Failure Mode and Effect Analysis (FMEA). Their findings reveal nine activities within the scope of work in the Offshore CPP–Upper Compression Module that carry potential risks capable of generating problems due to workers' insufficient skills. In this regard, the recommended mitigation measure is to improve the Standard Operating Procedures, particularly in the Offshore Facilities area. Although this study differs in both mechanism and methodology, it nonetheless shares the same objective, namely, to identify preventive measures for risk mitigation

Based on the elaboration above, supply chain risk management incorporating halal standards and sustainability has been conducted through separate research streams. However, given the current developments in the halal industry, particularly in Chicken Slaughterhouses (RPA), it is insufficient to focus solely on risk management without considering sustainability implications. This ultimately raises critical questions regarding which risks have a direct impact on the halal supply chain and its sustainability. Furthermore, mitigation strategies constitute a crucial issue that must be highlighted, particularly in addressing potential risks effectively.

2. RESEARCH METHODS

This research was conducted at the Chicken Slaughterhouse (TPA) of PT. XYZ, a facility that already possesses halal certification. However, the company lacks a formal risk management mechanism. In response to this gap, the study analyzes potential risk values within its halal supply chain activities, integrating environmental aspects as a core element of sustainability.

This research utilizing the Supply Chain Operation Reference Digital Standard (SCOR DS) model. This

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framework encompasses the processes of Orchestrate, Plan, Order, Source, Transform, Fulfill, and Return, and will be used to structure the variables of risk events, risk sources, and risk mitigation. Subsequently, the risks identified through this model will form the basis for developing mitigation strategies using the House of Risk (HOR) method.

Furthermore, this research uses three variables, namely Risk Event, Risk Agent, and Preventive Action.

a) Risk Event
A risk event refers to an occurrence that disrupts activities within the halal supply chain. The SCOR DS model is employed to identify and map these risks based on observational data and literature review. Each risk is assigned a severity value ranging from the lowest to the highest impact, measured on a scale of 1 to 10, where 10 signifies the most severe consequence.
b) Risk Agent (Source of Risk)
Risk agent denotes the root cause that triggers a risk event. These agents are evaluated based on their frequency of occurrence (O), also measured on a scale where 10 indicates that the risk event happens consistently.
c) Preventive Action (Mitigation)
This strategy is implemented to prevent or reduce the likelihood of risk materialization within the company. The feasibility of implementing these actions is assessed on a difficulty scale: a score of 3 denotes easy implementation, 4 indicates moderate difficulty, and 5 represents a high level of implementation complexity.

2.1. Supply Chain Operation Reference Digital Standard (SCOR DS)

This measurement model was developed by the Supply Chain Council (SCC) (Ryandy, 2024). The measurement framework within this model is employed to evaluate supply chain performance, which can be meticulously delineated through indicators, attributes, and metrics, thereby enabling the enhancement of the corporate supply chain (Sriwana et al., 2021).In this context, the SCOR DS comprises four main components as follows:

a. Performance
This encompasses performance attributes, standard metrics, and processes for depicting the performance of supply chain measurement and evaluation processes.
b. Processes
The supply chain process is structured hierarchically across levels 1 to 4. Within the SCOR DS framework, the core Level 1 processes are: Orchestrate, Plan, Order, Source, Transform, Fulfill, and Return. Level 2 process categories define the specific capabilities required to execute the broader Level 1 processes. Level 3 processes consist of detailed, sequentially ordered steps necessary for planning supply chain activities. Companies may further develop standardized process descriptions for activities within Level 3, which are then classified as Level 4 processes.
c. Practice
It is a way of configuring processes, including automation, specific skills, sequence, and distribution methods
d. People
The skills needed to perform tasks and manage processes, namely experience, training, and competency level.

2.2. House of Risk

The House of Risk analysis is conducted in two stages, namely HOR 1 and HOR 2. HOR 1 is used to identify risk events and risk sources by determining the priority of risk sources for mitigation actions. The steps in HOR 1 analysis are as follows:

1. Identify potential risk events (E_i) that occur and cause disruptions within each supply chain process. These risk events can be identified based on each supply chain activity within the SCOR DS framework (Orchestrate, Plan, Order, Source, Transform, Fulfill, and Return)
2. Determine severity level (S_i) for each identified risk event. This severity level quantifies the magnitude of disruption caused by each risk event to the supply chain. The scale used to determine the risk severity level ranges from 1 to 10, where a score of 10 indicates the most severe or greatest adverse impact.
3. Identify sources of risk (A_j), which are factors that could cause identified risk events to occur.
4. Assess the probability/occurrence level (O_j) of each risk source on a scale of 1-10, where 1 means almost never occurs and 10 means the assessed risk source occurs frequently.
5. Measuring the correlation (R_{ij}) between a risk event and a risk source. This correlation indicates the risk sources that can cause a risk event to occur. The correlation scale ranges from (0, 1, 3, 9), where a value of 0 (or no value) indicates no correlation, a value of 1 indicates a small correlation, a value of 3 indicates a moderate correlation, and a value of 9 indicates a high correlation (Trenggonowati *et al.*, 2022).
6. The ARP_j value calculation is determined as the result of the probability of a risk source occurring and the set of causal impacts of each risk event caused by a risk source, as shown in the following equation:

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

where ARP_j = risk priority index value; O_j = occurrence; S_i= severity; R_{ij} = correlation value between risk event and risk agent; I = risk event value; and j = risk agent value.
7. Sorting risk sources based on high ARP values to determine the priority of risk sources to be selected.
8. Using Pareto chart to select priority risk sources based on ARP rankings.

HOR 2 is used to select the most effective mitigation strategies to reduce the impact of risk sources. The steps in HOR 2 analysis are as follows:

1. Select risk sources based on the highest to lowest ARP values from the HOR 1 analysis using a Pareto chart. Risk sources with high priority will be used as input for the HOR 2 analysis.
2. Identify relevant risk mitigation measures for

Table 1. Performance attribute

Performance Attribute		Description
Resilience	Reliability (RL)	Timeliness, quantity, and quality in completing products,
	Responsive (RS)	Supply chain speed in completing products
	Agility (AG)	Respons pengaruh eksternal dan perubahan pasar
Economic	Costs (CO)	Operational costs for each process
	Profit (PR)	Financial benefits obtained from the process
	Assets (AM)	Utilizing assets efficiently
Sustainability	Environmental (EV)	Minimizing enviromental impact
	Social (SC)	Socially responsible supply chain (ASCM, 2022)

preventing risk sources. Risk mitigation measures can be applied to one or more risk sources.

3. Assessing the correlation between risk sources and risk mitigation measures on a scale (0, 1, 3, 9) indicating no correlation, low correlation, moderate correlation, and high correlation (Trenggonowati *et al.,* 2022).
4. Assessing the level of difficulty that reflects the costs and other resources needed to take proactive measures. The difficulty level assessment is carried out by assigning a value from a scale of 3, 4, and 5, where 3 indicates that the mitigation action is not too difficult to implement and the costs incurred are considered quite affordable, 4 indicates that the mitigation is quite difficult to implement and the costs incurred are considered quite high, and 5 indicates that the mitigation action is difficult to implement and the costs incurred are considered high (Pujawan & Geraldin, 2009).
5. Calculate the total effectiveness of mitigation actions (TE) using this equation:

$$TE_k = \sum_j ARP_j \, E_{jk} \quad (2)$$

Where TE_k = total mitigation effectiveness; ARP_j = potential aggregate risk; E_{jk} = correlation between mitigation strategy and risk; j = *risk agent* value; k = mitigation strategy value.

6. Calculate the total effectiveness of mitigation actions (ETD) using this equation:

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

Where ETD_k = the total of effectiveness ratio of mitigation strategy difficulty; TE_k = the total of effectiveness mitigation strategy; and D_k = difficulty level of mitigation strategies

7. Rank each strategy in order of priority based on the highest ETD_k value.

2.3. Pareto Diagram

Pareto analysis is employed to determine which risks occur most frequently (ASQ, 2025). Priority selection utilizes the 80/20 principle, meaning that a subset of events is selected based on the concept that 80% of effects originate from 20% of causes. This principle posits that in many phenomena, a minority of invested risks—represented by 20%—are responsible for 80% of problems (Abyad, 2021). The following are the analytical steps to be used:

a. Focus on the the left-hand side bars, which represent the most frequently occurring problems or those yielding the most significant impact.
b. Utilize the cumulative percentage line extending from left to right, and observe the point where this line intersects the vertical axis at approximately 80%.
c. Identify the highest-priority risks; the categories of bars located under the cumulative line up to the 80% threshold represent the most critical causes.
d. Mitigation strategies can be designed after identifying these primary causes to effectively prioritize and address the most consequential risks (DataPARC, 2025).

3. RESULTS AND DISCUSSION

3.1. Overview of the Company's Production Process

PT. XYZ is a chicken slaughterhouse facility with a production capacity exceeding 20 tons. The company features a complex production process flow consisting of material flow, financial flow, and information flow. The material flow refers to the physical movement of raw materials from suppliers to end consumers. Conversely, the financial flow occurs from consumers (downstream) to suppliers (upstream). Between these two flows, there is a process of data and information exchange, often referred to as the information flow (Fig. 1).

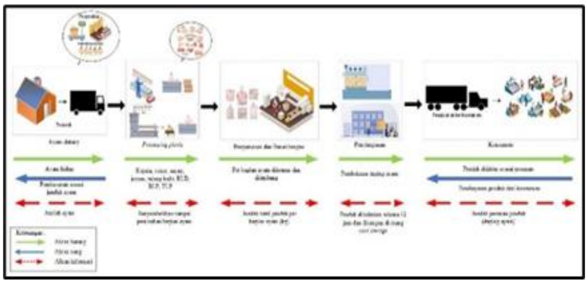

Fig. 1. Landfill supply chain at PT. XYZ

The company's production supply chain consists of several stages. The initial stage of the production process begins with the arrival of chickens from the supplier. This process involves a material flow in the form of live chickens, a financial flow in the form of payment corresponding to the number of chickens, and an information flow comprising the quantity of chickens shipped and received. The new arrived chickens are rested briefly to prevent stress, followed by an inspection process conducted in several steps: re-weighing, counting, and separating any dead chickens to be returned to the supplier.

Chickens that pass the inspection stage proceed to the processing plant. This stage includes the information flow of the slaughtering process, which

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begins by hanging the chickens on an overhead conveyor. This allows the blood from the slaughtered chickens to drain before they enter the scalding tank, followed by the defeathering process. The subsequent process involves the material flow of portioning, where the chickens are separated into parts including the head, feet, wings, and offal, resulting in products such as Boneless Dada (BLD), Boneless Paha (BLP), and Tulang Paha (TLP).

The material flow continues with the packaging process, where the chicken parts are packed into plastic bags weighing 2 kg. Before entering the freezing room, the packaged chicken is arranged into boxes and re-weighed per box, which constitutes an information flow process to determine the quantity of each product. The material flow at this stage involves transferring the packaged chicken into a blast freezer for a 12-hour freezing process. Subsequently, the information flow entails storing the products in a cool storage room, packaged in sacks weighing 24 kg (equivalent to 12 plastic bags). The Products were stored in cool storage are shipped according to consumer demand using a first-in, first-out (FIFO) method to maintain chicken quality; this shipment represents the material flow.

Products are delivered using dedicated logistics to prevent mixing with other goods. Payment from consumers for the products constitutes the financial flow, while the customer order quantity represents the information flow necessary to fulfill the order accurately. The final stage of this process occurs when the product reaches the end-user. The customer receives the chicken products, and the financial transaction is settled. The financial flow at this stage is the product payment from the consumer, which represents the revenue realization point, thereby closing the financial cycle of the supply chain. The customer order quantity, as part of the information flow, is crucial for ensuring order fulfillment accuracy.

3.2. Identification of Halal Supply Chain Risks at Chicken Slaughterhouses (TPA)

Risk identification was conducted by mapping risks across the entire halal supply chain within the company. The mapping was performed using the SCOR DS (Supply Chain Operations Reference Digital Standard) framework, which encompasses the orchestrate, plan, order, source, transform, fulfill, and return processes. The identified processes include risk events and risk agents, obtained from literature studies and direct field observations. The identified and mapped risk events and risk agents are presented in Table 2 and Table 3.

The company has 32 risk events, consisting of: 2 risk events in the orchestrate activity with the integration attribute; 3 risks in the planning activity with the three attributes of responsiveness, agility, and costs; 2 risks in the order activity with the reliability attribute; 2 risks in the procurement activity with the reliability and agility attributes; 15 risks in the production activity with the reliability, environmental, and social attributes; 4 risks in the delivery activity with the responsiveness and agility attributes; and 4 risks in the return activity with the agility and environmental attributes. The subsequent identification, namely the risk agents that influence the occurrence of risk events, revealed 49 risk agents that have been identified based on the company's supply chain. Within the orchestrate process, two risk events are identified: difficulties in coordination (E1) and an unwillingness to share data between departments (E2). Each of these risk events is caused by a single risk agent: E1 is attributed to a fragmented organizational structure, and E2 is caused by a low level of inter-departmental trust.

Subsequently, in the planning stage, there are three risk events, each caused by their respective risk agents. Production plans not aligning with operational reality (E3) are caused by a planning system that is not updated with current machine or labor conditions (A3). The occurrence of low commitment from business partners (E4) is attributed to two sources: lack of support from adequate administration (A4) and supplier fraud (A5). The final event, unexpected fluctuations in raw material prices (E5), stems from two sources: weather effects and government regulations (A6, A7).

In the third sequence, the order process is documented to have two events (E6, E7). Stock inaccuracies (E6) are caused by data input errors (A8) and fluctuating orders (A9). Non-conforming raw materials (E7) are also caused by two sources (A10, A11): changes in chicken quality (incorrect weight) and frequent miscalculations in chicken quantity.

Then, entering the source stage, two risk events are identified: E8 with four sources and E9 with two sources. Chicken mortality prior to the slaughter process (E8) originates from sick chickens (A12), chickens experiencing stress (A13), poor crate arrangement (A14), and exceeding crate capacity (A15). Meanwhile, E9, the lack of live chicken stock information from farmers, stems from the absence of integrated information technology from the farm to the central slaughterhouse (A16) and stock shortages (A17).

Within the transform process, there are three attributes. The first attribute comprises four risk events (E10 to E13). The failure of the slaughterer to recite the basmallah (E10) is sourced from the high volume of chickens being slaughtered (A18). The event of arteries not being cut according to religious guidelines (E11) has three sources: blunted cutting tools (A19), excessive blood loss (A20), and chickens not being deceased before the scalding process (A21). Furthermore, the slaughterer not facing the Qibla (E12) is attributed to a room layout that is not supportive (A22), and chicken feathers not being plucked thoroughly (E13) is caused by unhygienic/poorly maintained production equipment (A23) and unstable water scalding temperature (A24).

The second attribute consists of five risk events. Water pooling in the production area (E14) is caused by excessive water usage (A25). Soil contamination (E15) originates from wastewater from chicken processing being absorbed into the ground before undergoing treatment (A26). Air pollution (dust and unpleasant odors) (E16) is sourced from chickens waiting too long before entering the blast chilling room (A27) and confined spaces (A28). Next, the accumulation of solid waste (blood, feathers, bones, etc.) (E17) is attributed to buyers being late in collecting the waste (A29). Finally, damage to environmental aesthetics (E18) is

Table 2. Risk event

Process	Attribute	Risk Event	Code	Reference
Orchestrate	Social	Difficulties in coordination between departments	E1	(Perdana et al., 2019)
		Unwillingness to share data between departments	E2	
Plan	Responsive	Production plans do not match operational realities	E3	(Pangestuti et al., 2022)
	Agility	Low commitment to business partners	E4	(Munizu, 2017)
	Costs	Unexpected fluctuations in raw material prices	E5	(Fathoni, 2020)
Order	Reliability	Incorrect stock	E6	(Puji & Satriardi, 2024)
		Raw materials are not suitable.	E7	(Enru et al., 2020)
Source	Reliability	Chicken died before slaughtering	E8	(Saputro et al., 2024)
	Agility	There is no information about live chicken stocks from farmers	E9	(Sembiring et al., 2024)
Transform	Reliability	The slaughterer did not recite Bismillah	E10	(Windyarti et al., 2025)
		The artery was not cut according to Sharia law	E11	(Kuncorosidi & Sanjaya, 2021)
		The animal's position is not facing the qibla	E12	(Hakim, 2021)
		The chicken feathers are not completely removed	E13	
	Environmental	Water accumulation occurred in the production area	E14	(Kusumawati et al., 2025)
		Soil Contamination	E15	
		Air pollution (dust and unpleasant odors)	E16	
		Accumulation of solid waste (blood, fur, bones, etc.)	E17	
		Damaging the aesthetics of the environment	E18	
	Social	High work tension	E19	(Jeman & Tandean, 2024)
		Society complain	E20	(Wenas et al., 2023)
		The staff cannot operate the digital system	E21	(Nazara & Pratiwi, 2025)
		There is inconsistency in tracing data within systems	E22	(Vikaliana et al., 2024)
		Lack of integration in halal standards and environmental sustainability in business strategies	E23	(Riadi et al., 2025)
		Dependence on suppliers that are not halal certified or environmentally sustainable	E24	(Farida et al., 2023)
Fulfill	Responsive	Delays in order completion	E25	(Tiya et al., 2021)
		Delays in delivery to customers	E26	(Selajati & Syaichu, 2024)
		Damage to product packaging during shipping	E27	(Kurniawan, 2020)
	Agility	No tracking information found	E28	(Yusriana & Jaya, 2022)
Return	Agility	The product delivered were not suitable	E29	(Trimaryono & Sulistiyowati, 2024)
		Return items did not match with the system record	E30	(Revaldiwansyah & Ernawati, 2021)
	Environmental	The handling of defective products did not fulfill with the halal and enviromental standard	E31	(Yuwana & Wahyuni, 2024)
		non-organic waste was ineffective	E32	(Nattassha et al., 2020)

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Table 3. Risk agent

Risk Agent	Code
Fragmented structural organization	A1
Lack of trust level within department	A2
The planning system did not update the condition of machinery or labor	A3
Lacks of good administrative support	A4
Fraud by the suppliers	A5
Weather effect	A6
Government Laws	A7
Data entry error	A8
Fluctuative order	A9
The quality of the chicken has changed (the weight of the chicken is not appropriate)	A10
Frequent miscalculations of the number of chickens	A11
Sick Chicken	A12
The Chicken was stressed	A13
Poor basket arrangement	A14
Chickens exceed one basket capacity	A15
There is no information technology integration between chicken cage and the center of slaughterhouse	A16
Lack of stock	A17
The number of chickens slaughtered	A18
The cutting tool becoming dull	A19
More blood is coming out	A20
The chicken wasn't dead when it was boiled	A21
Unsupportive room layout	A22
Unhygienic equipment and poorly maintained tools	A23
The water temperature is unstable	A24
Excessive water consumption	A25
Water left over from chicken processing is absorbed into the ground before undergoing treatment	A26
The chicken spent too long in the queue to enter the blast chamber	A27
Cramped space	A28
The buyer is late picking up the waste	A29
Growth of insects and rodents in the surrounding area	A30
Demand exceeds human resource capacity	A31
Unorganized working hours	A32
Unpleasant odors affecting the environment	A33
Lack of technology-related training	A34
There is no integration between production, warehouse, and shipping systems.	A35
Halal and the environment are not considered as core values	A36
Lack of comprehensive verification of upstream supply chains	A37
The chicken hanging chain was broken	A38
Disruptions (accidents, transportation, demonstrations) during delivery	A39
The employees were not carefully during the loading and unloading process	A40
Packaging cannot prevent cross-contamination	A41
There is no tracking system	A42
High water content in products	A43
The cutting was not suitable	A44
There is a strange object in the package	A45
The failure of manual input when return	A46
Non-integrated waste operational standards	A47
Packaging waste piles up	A48
The garbage collector does not collect garbage according to schedule.	A49

caused by the proliferation of insects and rodents in the surrounding area (A30).

The third attribute encompasses six risk events with seven risk agents. Each risk event is sourced from one risk agent, except for E19 (high workload), which is attributed to demand exceeding human resource capacity (A31) and irregular working hours (A32). The other five events each have a single source: community complaints (E20) stem from unpleasant odors affecting the environment (A33); human resources being unable to operate the digital system (E21) is due to insufficient technology-related training (A34); the occurrence of data tracing inconsistency between systems (E22) is sourced from a lack of integration between production, warehouse, and delivery systems (A35); event E23, the lack of integration of halal and environmental sustainability standards into business strategy, is because halal and environment are not considered core values (A36); and E24, dependence on suppliers without halal certification or environmental sustain-ability, originates from insufficient comprehensive verification of the upstream supply chain (A37).

In the fulfill process, there are four risk events: delays in order completion (E25), delays in delivery to customers (E26), damage to product packaging during shipment (E27), and missing tracking information (E28). Risk event E25 is caused by breaks in the chicken hanging chain (A38). The source of E26 is disruptions (accidents, transportation issues, demonstrations) during delivery (A39). Furthermore, E27 has two sources: employees being insufficiently careful during loading/unloading processes (A40) and packaging being unable to prevent cross-contamination (A41). Lastly, E28 is sourced from the absence of a tracking system (A42).

Finally, in the return stage, four risk events are identified: delivered product not matching the order (E29), returned goods not matching system records (E30), handling of defective products not conforming to halal and environmental standards (E31), and ineffective management of non-organic waste (E32). Risk event E29 is caused by high product moisture content (A43), non-conforming meat cuts (A44), and the presence of foreign objects in the packaging (A45). Risk events E30 and E31 each have a single source: manual input failure during returns (A46) and a non-integrated waste Standard Operating Procedure (SOP) (A47). Meanwhile, E32 has two sources: accumulation of leftover packaging waste (A48) and waste collectors not adhering to the pickup schedule (A49).

3.3. HOR 1 Analysis

Following the identification and mapping of risk events and risk agents, the subsequent step involves the development of a validated HOR 1 (House of Risk 1) questionnaire. This instrument is designed to be disseminated to and completed by individuals with a thorough comprehension of all supply chain activities and their associated risk levels within the company under study. Subsequently, the collected questionnaire data can be analyzed using the HOR 1 methodological framework as follows;

ARPj $= Oj \sum i \; SiRij$

ARP3 = 5 x ((1x2) + (3x5) + (3x4) + (3x4) + (9x6) + (3x9))
= 610

The ranking of the Aggregate Risk Potential (ARP) values is as follows: Ranks 1 to 10 begin with A20 (732), followed by A35 (704). The third rank is A6 (702), then A34 (648), A18 (630), A3 (615), A5 (600), A2 (582), A10 (567), and A33 in 10th place (450). Subsequently, from 11 to 20 start with A38 and A46 (both value 360), followed by A28 (324), A8 (306), A45 (304), A25 (234), A37 (210), A7 (205), A1 (202), and A47 in 20th place (168). The rankings from 21 to 30 feature several repeated values, starting with A31 and A42 (both value 150), followed by A27 (126), A19 (108), A30 (99), A4 (78), and finally A21, A26, A29, and A41 (all value 72). Rankings 31 to 40 include A32 (66), A24 (65), A11 (64), A13 and A39 (both value 60), A12 (48), A23 and A44 (both value 36), A22 (24), and A9 (value 21). Finally, rankings 41 to 49 begin with A43 and A15 (both value 10), followed by A17 (8), A16 and A36 (both value 6), and lastly, A14, A40, and A49 (all value 4).

3.4. Pareto Diagram

The sorted ARP values are then used to construct a Pareto Diagram to identify the risk agents that are prioritized based on the cumulative percentage of the ARP values. The Pareto Diagram is based on the 80/20 principle, which posits that approximately 80% of risk events are caused by 20% of risk agents. Based on Fig. 2, 17 risk agents were identified as prioritized for the implementation of mitigation strategies, as they account for 80% of the risk events. Therefore, further analysis is required to prevent their occurrence.

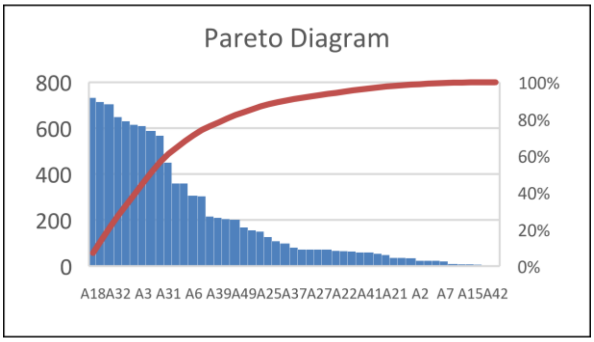

Fig 2. Pareto diagram

The 17 priority risk agents in the slaughterhouse (TPA) supply chain: the high volume of slaughtered chickens (A18), lack of adequate administrative support (A4), unpleasant odors affecting the environment (A33), irregular working hours (A32), absence of information technology integration from the farms to the central TPA (A16), the perception that halal and environmental concerns are not core values (A36), planning systems that do not update machinery or labor conditions (A3), lack of integration between production, warehouse, and delivery systems (A35), data input errors (A8), demand exceeding human resource capacity (A31), careless employee handling during loading and unloading processes (A40), accumulation of packaging waste (A48), weather effects (A6), non-integrated waste Standard Operating Procedures (SOP) (A47), un-hygienic/poorly maintained production equipment (A23), disruptions (accidents, transportation, demon-strations) during delivery (A39), and supplier fraud (A5).

Furthermore, a Pareto Diagram was employed to determine the number of risk agents to be prioritized for mitigation using the 80/20 principle. It contains information on the 17 risk agents selected for mitigation. These 17 risk agents are: the high volume of slaughtered chickens (A18), lack of adequate administrative support (A4), unpleasant odors affecting the environment (A33), irregular working hours (A32), absence of information technology integration from the farms to the central TPA (A16), the perception that halal and environmental concerns are not core values (A36), planning systems that do not update machinery or labor conditions (A3), lack of integration between production, warehouse, and delivery systems (A35), data input errors (A8), demand exceeding human resource capacity (A31), careless employee handling during loading and unloading processes (A40), accumulation of packaging waste (A48), weather effects (A6), non-integrated waste Standard Operating Procedures (SOP) (A47), unhygienic/poorly maintained production equipment (A23), disruptions (accidents, transportation, demonstrations) during delivery (A39), and supplier

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fraud (A5).

3.5. HOR 2 Analysis

After analyzing risk events and risk agents using HOR 1, 17 risk priorities were obtained based on the highest ARP values according to the Pareto Diagram concept in the chicken slaughterhouse (TPA) supply chain. This was followed by efforts to reduce risk agents through the design of mitigation strategies for the TPA supply chain.

Based on Table 4, there are 17 mitigation strategies that have been formulated based on the priority of predetermined risk agents, enabling their implementation within the company. Subsequently, the 16 proposed mitigation strategies based on risk agents in sequential order are as follows: the number of chickens slaughtered (A18) with the mitigation strategy of scheduling slaughter and setting a maximum daily capacity, as well as managing queues using a systematic approach (PA1); poor administrative support (A4) with the mitigation strategy of implementing digitalization of administrative processes and administrative staff training (PA2); unpleasant odors affecting the environment (A33) with the mitigation strategy of implementing controlled organic waste processing and a proper ventilation system (PA3); irregular working hours (A32) with the mitigation strategy of implementing shift-based scheduling (PA4); lack of integrated information technology from farms to the central slaughterhouse (TPA) (A16) with the mitigation strategy of developing an application-based system from farmers to the TPA system for data transparency (PA5); Halal and environmental aspects not being considered core values (A36) with the mitigation strategy of socializing the importance of Halal and environmental practices and providing training (PA6); planning systems not updated with machine or labor conditions (A3) with the mitigation strategy of implementing a machine condition monitoring system and a real-time labor attendance system (PA7); lack of integration between production, warehouse, and delivery systems (A35) with the mitigation strategy of implementing a warehouse management system (PA8).

Furthermore, data input errors (A8) with the mitigation strategy of conducting data input training and implementing double validation using software (PA9); demand exceeding human resource capacity (A31) with the mitigation strategy of implementing a seasonal recruitment system (contract workers) (PA10); employees being less careful during loading and unloading processes (A40) with the mitigation strategy of implementing supervision at every loading and unloading stage (PA11); accumulation of packaging waste (A48) with the mitigation strategy of tightening contracts and scheduling waste collection by partners (PA12); weather effects (A6) with the mitigation strategy of preparing contingency or alternative plans and conducting weather monitoring (PA13); non-integrated waste Standard Operating Procedures (SOP) (A47) with the mitigation strategy of developing integrated SOPs for all types of waste and monitoring their implementation (PA14); unhygienic or poorly maintained production equipment (A23) with the mitigation strategy of establishing a routine sanitation schedule and periodic equipment condition monitoring (PA15); disruptions (accidents, transportation, demonstrations) during delivery (A39) with the mitigation strategy of preparing alternative routes and real-time delivery monitoring (PA16); supplier fraud (A5) with the mitigation strategy of implementing traceability from farmers (PA17). The proposed risk mitigation strategies, which have been formulated and validated, were used as the HOR 2 questionnaire to analyze the risk mitigation strategies. This questionnaire was distributed to parties responsible for and possessing experience and knowledge related to the operations of PT. XYZ, with the respondent in this study represented by the production manager.

that the priority order of risk mitigation strategies based on ETD values is as follows: scheduling slaughter and setting maximum daily capacity along with implementing a queuing system (PA1); executing a seasonal recruitment system (contract workforce) (PA10); implementing a warehouse management system (PA8); conducting controlled organic waste processing and ensuring adequate ventilation systems (PA3); applying shift-based scheduling (PA4); developing integrated Standard Operating Procedures (SOPs) for all types of waste and implementing supervision (PA14); establishing a routine sanitation schedule and periodic equipment condition monitoring (PA15); implementing a real-time machine condition monitoring system and real-time workforce attendance system (PA7); providing data input training and implementing double validation using software (PA9); conducting socialization on the importance of halal and environmental aspects along with relevant training (PA6); tightening contracts and waste collection schedules with partners (PA12); developing an application-based system from farmers to the Slaughterhouse (TPA) system for data transparency (PA5); implementing supervision at every loading and unloading process (PA11); preparing alternative routes and real-time delivery monitoring (PA16); digitalizing administrative processes and providing administrative staff training (PA2); scheduling contingency or alternative plans and conducting weather monitoring (PA13); and implementing traceability from farmers (PA17).

Furthermore, to prevent or reduce the occurrence of priority risk agents, proposed risk mitigation strategies were identified in accordance with the previously determined risk priorities. As a result, 17 proposed risk mitigation strategies were obtained from the conducted identification and analysis.

In this context, mitigation strategies related to halal standards include: scheduling slaughter and setting maximum daily capacity along with implementing a queuing system (PA1), as failure to implement proper scheduling may lead to worker fatigue—for instance, forgetting to recite the basmalah—and potentially cause other risks. Subsequent strategies include: executing a seasonal recruitment system (contract workforce) (PA10); applying shift-based scheduling (PA4); establishing a routine sanitation schedule and periodic equipment condition monitoring (PA15); implementing a real-time machine condition monitoring system and real-time workforce attendance system (PA7); providing

Table 4. Risk mitigation strategy

Risk Agent	Code	Risk Mitigation Strategy	Reference
The number of slaughtered chicken	A18	Manage slaughter schedules and daily maximum capacity, and manage queues using the system	(Sucipto et al., 2020)
There is no good administration support	A4	I Implementing the digitization of administrative processes and training administrative staff	(Rohmah & Rusdianto, 2025)
Unpleasant odors affecting the environment	A33	Performing controlled organic waste treatment and good ventilation system	(Siregar et al., 2024)
Unorganized working hour	A32	Implementing shift scheduling	(Zahra et al., 2025)
There is no information technology integration within cage and the center of the slaughterhouse	A16	Developing a system through an application from farmers to the landfill system for data transparency	(Wibowo & Aribowo, 2025)
Halal and the environment are not considered as core values	A36	Conducting outreach and training on the importance of halal and the environment	(Malik et al., 2025)
The planning system did not update the condition of machinery or labor	A3	Implementing a machine condition monitoring system and a real-time workforce attendance system	(Arviana & Suseno, 2024; Zakiyyah et al., 2024)
There is no integration between production, warehouse, and shipping systems	A35	Implementing warehouse management system	(Setiawan et al., 2024)
Data entry error	A8	Conducting data entry training and double validation using software	(Sitohang et al., 2022)
Demand exceeds human resource capacity	A31	Implementing a seasonal recruitment system (contract workers)	(Sumantika et al., 2021)
The employees were not carefully during the loading and unloading process	A40	Implement a monitoring system for every loading and unloading process	(Nugroho, 2022)
Packaging waste piles up	A48	Tightening contracts and waste collection schedules with partners	(Ramadhani et al., 2022)
Weather effect	A6	Schedule backup or alternative plans and monitor the weather	(Sitorus et al., 2023)
Non-integrated waste operational standards	A47	Developing integrated operational standards for all types of waste and conducting monitorings	(Juanda et al., 2025)
Unhygienic equipment and poorly maintained tools	A23	Establish a routine sanitation schedule and periodically monitor the condition of equipment	(Sutrisno & Nugrahadi, 2023)
Disruptions (accidents, transportation, demonstrations) during delivery	A39	Preparing alternative routes and real-time shipment monitoring	(Izzuddin et al., 2020; Hidayat et al., 2024)
Fraud by the suppliers	A5	Implementing traceability from the farmer	(Dilla & Fathurohman, 2021)

data input training and implementing double validation using software (PA9); conducting socialization and training on the importance of halal and environmental aspects (PA6); developing an application-based system from farmers to the TPA system for data transparency (PA5); implementing supervision at every loading and unloading process (PA11); preparing alternative routes and real-time delivery monitoring (PA16); digitalizing administrative processes and providing administrative staff training (PA2); and implementing traceability from farmers (PA17).

Meanwhile, mitigation strategies related to environmental sustainability include: implementing an integrated management system (PA8); conducting controlled organic waste processing and ensuring adequate ventilation systems (PA3); developing integrated SOPs for all types of waste and implementing supervision (PA14); tightening contract terms and waste collection schedules with partners (PA12); and scheduling contingency or alternative plans along with conducting weather monitoring (PA13).

Moreover, based on the calculation and analysis results, the priority order of risk mitigation strategies at the TPA was determined. The highest priority is

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assigned to scheduling slaughter and setting maximum daily capacity along with implementing a queuing system (PA1), with an ETD value of 2074. The proposed strategy PA1 needs to be implemented because chickens are poultry animals that are prone to stress or highly sensitive to environmental changes such as temperature fluctuations, noise, crowding in crates, and the effects of transportation or handling (Tamzil et al., 2022). Stressed chickens can also cause weight loss, reduced meat quality, and increased mortality (Sahranisa & Siagian, 2025). If the number of chickens slaughtered exceeds the capacity, it will result in a high workload that causes employee fatigue, which can impact subsequent processes and reduce the quality of the products produced.

The second measure is to implement a seasonal recruitment system (contract workers) (PA10) with an ETD value of 1988. This mitigation is proposed to reduce the workload of employees during peak production periods. Therefore, adding seasonal or contract workers can increase productivity and ensure that customer needs are met in a timely manner (Bareno et al., 2022).

The third priority is the implementation of a warehouse management system (PA8) with an ETD value of 1859. This proposal is necessary to mitigate data discrepancies caused by input errors, as the recording process is still conducted manually and is non-integrated. This system can facilitate accurate real-time recording and inventory counts, thereby enabling more efficient scheduling of deliveries (Sihaloho & Hidayati, 2023).

The fourth priority is implementing controlled organic waste processing and an adequate ventilation system (PA3), with an ETD value of 1546. The waste processing system can mitigate environmental pollution; for instance, liquid waste can be treated to match soil pH levels before disposal, while solid waste can be sold or repurposed as fish feed (Victoria et al., 2022). A good ventilation system is also necessary because it affects worker comfort and performance (Asjanita & Meidita, 2024).

The fifth priority is to implement shift scheduling (PA4) with an ETD value of 1530. This also affects employee performance when chicken slaughtering exceeds the usual daily amount, resulting in irregular working hours or overtime. Shift scheduling can be implemented in 2 or 3 shifts to optimize productivity (Anugrah et al., 2023).

The sixth priority is formulating integrated Standard Operating Procedures (SOPs) for all types of waste and implementing supervision (PA14), with an ETD value of 894. In this regard, the developed SOPs must encompass all waste types, covering handling, segregation, temporary storage or pre-collection by buyers, and treatment prior to disposal. Furthermore, implementing a supervision system is essential to ensure that the SOPs are executed in accordance with established regulations and that all employees comprehensively understand these procedures, thereby reducing environmental pollution (Oktoyani et al., 2023).

The seventh priority is to create a routine sanitation schedule and periodically monitor equipment conditions (PA15) with an ETD value of 826. Sanitation schedules and equipment condition monitoring need to be carried out daily to prevent cross-contamination from unclean equipment or areas and to check the condition of equipment such as knives, chicken conveyor chains, feather plucking machines, and workrooms (Sasmita et al., 2025).

The eighth priority is to implement a machine condition monitoring system and real-time workforce attendance system (PA7) with a score of 782. The machine condition monitoring system automatically reduces downtime and improves maintenance efficiency (Nazara, 2022). The attendance system can use fingerprints, which are more effective and make it easier to manage employee punctuality data (Zuhdi & Sutabri, 2024).

The ninth strategy is to conduct data input training and double validation using software (PA9) with an ETD value of 756. This proposal includes digital data input training, such as data on the number of chickens, production dates, and production volumes, so that production performance can be monitored properly and the risk of data input errors can be reduced (Ginting & Insandi, 2024). The tenth strategy is to conduct outreach and training on the importance of halal and the environment (PA6) with an ETD value of 735. This is important because employees do not fully understand the concept of the halal supply chain, and awareness of the environment needs to be raised, so outreach is necessary (Mamilianti, 2024).

The eleventh priority is to enforce more stringent contractual agreements and waste collection schedules with partners (PA12), with an ETD value of 598. This measure is crucial to ensure partners adhere strictly to the predetermined waste collection timelines, thereby preventing the accumulation of waste or refuse (Harihah et al., 2020). The twelfth priority is the development of an application-based system connecting farmers to the Slaughterhouse (TPA) system for data transparency (PA5), with an ETD value of 378. This system facilitates farmers and business operators in tracing chicken supply chain transactions, such as stock levels and chicken quality (Usman et al., 2021).

The thirteenth priority is the implementation of a supervision system for every loading and unloading process (PA11), with an ETD value of 360. This supervision is effective in ensuring employees handle products carefully, avoiding rushed operations that could lead to product damage. Any damage occurring during loading or unloading can be promptly reported (Arslan et al., 2021).

The fourteenth priority is the preparation of alternative routes and real-time delivery monitoring (PA16), with an ETD value of 312. Alternative routes are utilized to mitigate the impact of disruptions during transportation, such as traffic congestion, adverse weather conditions, or other unforeseen events. Real-time monitoring enables the company to track shipments en route efficiently (Romadhona & Zulfairah, 2024).

The fifteenth priority is the digitalization of administrative processes and staff training (PA2), with an ETD value of 289. This initiative streamlines administrative workflows, reduces data errors, accelerates administrative processing, and minimizes data loss through backup procedures (Nurdyansa et al., 2024). The sixteenth priority is scheduling contingency or alternative plans and conducting weather monitoring (PA13), with an ETD value of 282. This mitigation strategy aims to avoid operational disruptions caused by weather uncertainties. Through weather monitoring, the company can adjust product delivery routes accordingly (Touloumidis et al., 2025).

The seventeenth priority is implementing traceability from farmers (PA17), with an ETD value of 123. This strategy enhances data transparency regarding the provenance of chickens, including farm origins, harvest dates, flock quantities, and appropriate bird weights, thereby strengthening the company's trust in its suppliers (Apandi & Ibrahim, 2025).

3.6. Managerial Implication

Based on the above explanation, this study ultimately reinforces the research conducted by Wahyuni that the transformation process is a critical point in the poultry industry. However, environmental factors such as odor, solid waste, and production space density are risk components that have a significant influence; this has not been highlighted much in previous research. These findings also complement Purwaningsih's statement that operator behavior is not the only cause of risk, as this study found that digital systems and non-integrated waste SOPs can have a significant impact on halal and environmental risks.

This study provides a broader picture of Rizqi's analysis model by adding an environmental sustainability component, resulting in a more comprehensive Halal–Sustainability approach. Based on the result of this research, it is important for broiler management companies to implement managerial policies that focus on standardizing production processes, food safety, and logistics and distribution efficiency. The managerial implications of this study are as follows:

1. Operationally, the chicken processing requires stringent standards to maintain the quality of the slaughtered chicken products.
2. The chicken slaughtering process within the company must utilize sterilized equipment adhering to hygienic and halal principles.
3. Regarding distribution, to ensure operational sustainability, the company needs to schedule deliveries meticulously and prepare emergency Standard Operating Procedures (SOPs). This is crucial to prevent the quality of the chicken meat from deteriorating due to prolonged exposure outside the cold chain. Furthermore, this approach helps anticipate unforeseen events such as adverse weather conditions and other transportation disruptions.
4. The waste management phase for byproducts such as feathers, bones, blood, offal, and production wastewater must be systematically designed to prevent environmental pollution and related issues. This also constitutes a form of the company's social responsibility.
5. Waste materials like feathers can be recycled for the production of fish feed and as raw materials for other industries, such as manufacturing shuttlecocks or feather dusters. Similarly, bone and offal waste can be repurposed for fish feed, thereby granting the company's waste products economic value while mitigating environmental contamination.

4. CONCLUSION

Based on the conducted analysis, 17 primary risk priorities were identified, the high volume of slaughtered chickens , unpleasant odors, irregular working hours, a lack of integrated information technology from farms to the central slaughterhouse (TPA), halal and environmental concerns not being regarded as core values, an outdated planning system regarding machine or workforce conditions, a lack of integration between production, warehouse, and delivery systems, data input errors, demand exceeding human resource capacity, careless employee handling during loading/unloading processes, accumulation of packaging waste, weather effects, non-integrated waste SOP, unhygienic/poorly maintained production equipment, and disruptions (accidents, transportation issues, demonstrations) during delivery, and supplier fraud.

The applicable risk mitigation strategies are scheduling slaughter and setting maximum daily capacity along with implementing a queuing system, executing a seasonal recruitment system (contract workforce), implementing a warehouse management system, conducting controlled organic waste processing with adequate ventilation systems, applying shift-based scheduling, and developing integrated SOP for all waste types and implementing supervision, establishing a routine sanitation schedule and periodic equipment condition monitoring, implementing a real-time machine condition monitoring and workforce attendance system, providing data input training and double validation using software, conducting socialization and training on the importance of halal and environmental practices, enforcing stricter contracts and waste collection schedules with partners, developing an application-based system from farmers to the TPA for data transparency, implementing supervision for every loading/unloading process, preparing alternative routes and real-time delivery monitoring, digitalizing administrative processes and training administrative staff, scheduling contingency or alternative plans with weather monitoring, and implementing traceability systems.

This research has a limitation, it focuses on only one industrial location, so the results are still limited. Therefore, in subsequent studies, researchers are expected to be able to measure changes in risk impact through the implementation of the proposed mitigation measures that have been formulated, so that research needs to be conducted in a scheduled and chronological manner. Furthermore, researchers can also conduct comparative studies so that the assessment can be more comprehensive.

REFERENCES

Abyad, A. (2021). The Pareto Principle: Applying the 80/20 Rule to Your Business. *Middle East Journal of Business*, *15*(1), 6–9. https://doi.org/10.5742/MEJB.2021.93880

http://dx.doi.org/10.30656/intech.v11i2.11350

Adha, D. A., Madalina, R., & Hendra, J. (2024). Pengaruh Perilaku Konsumen Muslim dalam Memilih Produk Halal Terhadap Pertumbuhan Ekonomi (Studi Kasus Pada Industri Makanan dan Minuman). *Al-Sharf Al-Sharf Jurnal Ekonomi Islam*, *5*(3), 268–292. https://www.ejurnalilmiah.com/index.php/Mudharib/article/view/11910

Anugrah, A., Lamatinulu, & Safutra, N. (2023). Analisis Penjadwalan Tenaga Kerja Dengan Metode Tibrewala, Philippe dan Browne Pada PT. Letawa. *Rekayasa Sistem Industri & Manajemen*, *1*(1), 68–75. https://insinyur.fti.umi.ac.id/index.php/JRSI/article/view/426

Apandi, A. A. A., & Ibrahim, I. (2025). Leveraging Digital Twin Technology to Enhance Transparency, Traceability, and Compliance in Halal Supply Chains. *International Journal of Research and Innovation in Social Science (IJRISS)*, *9*(15), 2454–6186. https://doi.org/10.47772/IJRISS.2025.914MG006

Arslan, O., Arican, O. H., Unal, A. U., & Bamyaci, M. (2021). Investigation of the Effectiveness of Maritime Supervision Services in Ship Solid Bulk Cargo Handling Operations. *Social Sciences Studies Journal*, *7*(90), 4905–4915. https://doi.org/10.26449/sssj.3608

Arviana, D., & Suseno. (2024). Optimalisasi Produktivitas dan Manajemen Risiko pada Sistem Produksi Aleta Leather Menggunakan Metode House of Risk. *Jurnal Teknologi Dan Manajemen Industri Terapan*, *3*(2), 160–170. https://doi.org/10.55826/jtmit.v3i2.354

ASCM. (2022). *The SCOR Digital Standard*. ASCM. https://www.ascm.org/corporate-solutions/standards-tools/scor-ds/

Asjanita, L., & Meidita, F. (2024). Manajemen Sistem Ventilasi (Ventilation System) Ayam Broiler Di Kandang Closed House Teaching Farm Universitas Andalas Management of Broiler Chicken Ventilation System in Closed House Teaching Farm Cage of Andalas University. *Jurnal Tropicalanimal*, *2*(1), 8–16. https://tropicalanimal.ppj.unp.ac.id/index.php/jeta/article/view/31

ASQ. (2025). *What is A Pareto Chart?* ASQ Excellence Through Quality. https://asq.org/quality-resources/pareto?srsltid=AfmBOorL7HOvkwvnq_qfL9sjIt9VdLCDCgA1VezskzOItMLxkb_jaPV_

Azizah, N., Rizkinnikmatussolihah, M., & Santoso, M. A. (2022). Perkembangan Industri Halal di Indonesia. *Journal of Islamic Economics Studies and Practices*, *1*(2), 219-233. https://doi.org/10.54180/jiesp.2022.1.2.219-233

Bareno, R. A., Llamedo, E. E., & Cano, J. B. (2022). Contractual Labor Engagement : Perspectives of Employees and Small and Employess And Small And Medium Enterprises (SMES). *Ioer International Multidisclipinary Research Journal*, *4*(4), 276–287. https://doi.org/10.54476/ioer-imrj/066842

BPN. (2023). *Katalog Data Prioritas Badan Pangan Nasional Tahun 2023*. Badanpangan.Go.Id. https://badanpangan.go.id/katalog-data

DataPARC. (2025). *Using Pareto Charts For Quality Control*. DataPARC. https://www.dataparc.com/blog/using-pareto-charts-for-quality-control/

Dilla, Z. U., & Fathurohman, M. S. (2021). Implementasi Halal Traceability Supply Chain Dengan Model Supply Chain Operation Reference (Scor) Industri Makanan Halal. *Jurnal Ekonomi Syariah Teori Dan Terapan*, *8*(5), 617. https://doi.org/10.20473/vol8iss20215pp617-629

Dwi, L., Tias, A., & Nizar, M. (2024). Ekosistem Halal Berkelanjutan untuk Industri Pengolahan Daging. *National Conference for Community Service Project (NaCosPro)*, 444–460. https://journal.uib.ac.id/index.php/nacospro/article/view/9588

Enru, R. R., Moektiwibowo, H., & Meladiyani, E. (2020). Analisis Pengendalian Persediaan Ayam Broiler Hidup Dengan Pendekatan Metode Economic Order Quantity (EOQ). *Jurnal Universitas Dirgantara Marsekal Suryadarma*, *9*(1), 21–38. https://journal.universitassuryadarma.ac.id/index.php/jtin/article/view/485

Farida, N., Kurniastuti, T., & Septiawan, B. (2023). Pelatihan dan Pendampingan Legalitas Usaha Produk Makanan UMKM Berbasis Produk Halal. *Jurnal Altifani Penelitian Dan Pengabdian Kepada Masyarakat*, *3*(5), 706–713. https://doi.org/10.59395/altifani.v3i5.481

Fathoni, M. Z. (2020). Analisis Risiko Pada Proyek Pembuatan Lintel Set Point Dengan Metode Kualitatif (Studi Kasus : PT. XYZ). *Jurnal PASTI*, *14*(2), 113. https://doi.org/10.22441/pasti.2020.v14i2.002

Ginting, T. T. M., & Insandi, A. M. (2024). Implementasi Recording Data Produksi Secara Komputerisasi di Peternakan Namorambe. *Jurnal Pengabdian Masyarakat Mentari*, *1*(4), 94–99. https://doi.org/10.59837/jpmm.v1i4.22

Hakim, A. (2021). Studi Implementasi Konsep Halal Supply Chain Pada Pasokan Daging Ayam Di Pasar Baru Karawang. *Buana Ilmu*, *5*(2), 140–157. https://doi.org/10.36805/bi.v5i2.1515

Harihah, Z., Isril, & Febrina, R. (2020). Politik Pengelolaan Sampah (Studi tentang Implementasi Kemitraan Pengelolaan Sampah di Kota Pekanbaru). *Journal of Government Civil Society*, *4*(1), 19–35. https://jurnal.umt.ac.id/index.php/jgs/article/view/2355

Harma, U., & Dompak, T. (2020). Pengelolaan Limbah Bahan Berbahaya dan Beracun Ditinjau Dari Aspek Hubungan Industrial dan Corporate Social Responsibility. *Dialektika Publik : Jurnal Administrasi Negara Universitas Putera Batam*, *5*(1), 10–16. https://doi.org/10.33884/dialektikapublik.v5i1.2413

Herman, H., Setianto, Y. A., & Sulistyowati, L. (2023). Analisis Pengelolaan Air Limbah Rumah Potong Hewan dan Dampaknya Terhadap Lingkungan Ditinjau dari Perspektif One Health (Studi kasus pada UPTD Rumah Potong Hewan Jone). *Al*

Qalam: Jurnal Ilmiah Keagamaan Dan Kemasyarakatan, *17*(4), 2784. https://doi.org/10.35931/aq.v17i4.2438

Hidayat, N., Astuti, S. D., Azhari, M., Malaikosa, E. J., Iswahyudi, S., Djajasinga, Nico Djundharto, D., & Tha, C. H. (2024). *Manajemen Logistik Dan Rantai Pasok Terintegrasi*. CV Rey Media Grafika. https://books.google.co.id/books?hl=id&lr=&id=VcsMEQAAQBAJ&oi

Hidayatuloh, S., Uswatun Kasanah, Y., & Arini, R. W. (2024). Pengukuran Green Supply Chain Pada UMKM Produsen Ayam Potong dan Distribusi Ayam Broiler. *Jurnal INTECH Teknik Industri Universitas Serang Raya*, *10*(1), 61–69. https://doi.org/10.30656/intech.v10i1.7826

Hutagalung, W. L. C., Jannah SB, M., & Rinaldi, R. (2024). Potensi Penerapan Produksi Bersih Pada Rumah Potong Hewan (RPH) Kota Jambi. *Jurnal Bio-Geo Material Dan Energi*, *1*(1), 23–28. https://doi.org/10.22437/bigme.v1i1.12308

Izzuddin, I. A., Ernawati, D., & Rahmawati, N. (2020). Analisa Dan Mitigasi Risiko Pada Proses Supply Chain Dengan Pendekatan House of Risk Di PT. XYZ. *JUMINTEN*, *1*(3), 129–140. https://doi.org/10.33005/juminten.v1i3.102

Jeman, B., & Tandean, V. A. (2024). Pengaruh Penerapan Teknologi Robotic Process Automation Terhadap Efektifitas Proses Akuntansi di Perusahaan. *Jurnal Akuntansi Pajak Keuangan*, *2*(3), 133–145. https://journal.bukitpengharapan.ac.id/index.php/JUSAPAK/article/view/389

Juanda, I., Hania, S., Tua Natalis Situmorang, M., & Pascasarjana Sahid, S. (2025). Komponen Manajemen Keselamatan Proses dan Lingkungan di PT X. *PESHUM*, *4*(2), 3264–3274. https://ulilalbabinstitute.id/index.php/PESHUM/article/view/7905

Jumiono, A. (2022). Identifikasi Titik Kritis Kehalalan Bahan Hewani dan Produk Turunan Hewan. *Jurnal Ilmiah Pangan Halal*, *4*(2), 51–58. https://doi.org/10.30997/jiph.v4i2.9909

KNEKS. (2023). *Master Plan Industri Halal Indonesia 2023-2029*. Komite Nasional Ekonomi dan Keuangan Syariah. https://adesy.org/2023/11/25/masterplan-industri-halal-indonesia-2023-2029-road-map-strategis-pengembangan-ekonomi-halal/

Kuncorosidi, & Sanjaya, N. S. (2021). Supply Chain Risk Management (SCRM) Analysis On The Supply Chain of Halal Food Products Using SCOR, HOR And Pareto Diagram Method (Case Study On Ibu Mimin's Chicken Slaughter House). *Islamic Economic, Accounting and Management Journal (TSARWATICA)*, *3*(1), 48–77. https://ojs.stiesa.ac.id/index.php/tsarwatica/article/view/939

Kurniawan, M. A. (2020). Analisis Distribusi Daging Sapi Dari Rumah Pemotongan Hewan (Rph) Sampai Kekonsumen Kota Binjai. *Journal of Animal Science and Agronomy Panca Budi*, *5*(2), 6–15. https://jurnal.pancabudi.ac.id/index.php/jasapadi/article/view/1143

Kurniawati, D. A., & Cakravastia, A. (2023). A review of halal supply chain research: Sustainability and operations research perspective. *Cleaner Logistics and Supply Chain*, *6*(January), 100096. https://doi.org/10.1016/j.clscn.2023.100096

Kusumawati, A., Ala, A., Nohong, M., Halim, A., Njemiah, Ulfawati, A., Thaha, R. R. H., Oemar, M. A. F. I., Dharsana, M. T., Natsir, A. I. P., & Hermansyah, F. I. (2025). *Harmoni Dengan Alam Mitigasi Dan Pelastarian Lingkungan* (1st ed.). K-Media. https://kmedia.co.id/product/harmoni-dengan-alam-mitigasi-dan-pelestarian-lingkungan/

Luin, N. E. N., Suardika, I. B., & Adriantantri, E. (2020). Analisis dan Pengendalian Resiko Rantai Pasok Menggunakan Metode House Of Risk (HOR) (Studi Kasus: UD. Karya Mandiri). *Jurnal Valtech (Jurnal Mahasiswa Teknik Industri)*, *3*(2), 66–74. https://ejournal.itn.ac.id/valtech/article/view/2674

Malik, A., Romadhon, M. F., Putri, N. C., & Pratama, R. A. (2025). Produksi Halal Dan Standar Syariah Dalam Industri. *Al-A'mal : Jurnal Manajemen Bisnis Syariah*, *2*(1), 97–103. https://journal.staittd.ac.id/index.php/ai/article/view/382

Mamilianti, W. (2024). Sosialisasi dan Pelatihan Keamanan Pangan dan Proses Sertifikasi Halal Produk Makanan dan Minuman Olahan. *Jurnal Pengabdian Dan Peningkatan Mutu Masyarakat (Janayu)*, *5*(3), 326–335. https://doi.org/10.22219/janayu.v5i3.35581

Maryuliano, I., & Andarwulan, N. (2024). The halalan thayyiban supply chain in handling blood products of slaughtering cattle, chicken, and pig for feeding and handling al-jallalah 1 (cattle, chicken, and catfish). *Halal Studies and Society*, *1*(2), 30–37. https://doi.org/10.29244/hass.1.2.30-37

Maslina, M., Zulfikar, I., & Rahmawati Hamzah, S. (2022). Evaluasi Standar Hygiene Sanitasi Rumah Potong Hewan Km 5,5 Balikpapan. *IDENTIFIKASI*, *8*(1), 594–604. https://doi.org/10.36277/identifikasi.v8i1.228

Misrochah, N., Lutfianasari, U., & Pradipta, R. Z. (2025). Peningkatan Enviromental Add Value Usaha Mikro Kecil dan Menengah (UMKM) melalui Pelatihan Sertifikasi Halal di Kecamatan Mranggen. *Jurnal Komunitas: Jurnal Pengabdian Masyarakat*, *7*(2), 309–316. https://www.ojs.stiami.ac.id/index.php/jks/article/view/3789

Munizu, M. (2017). Pengaruh Kepercayaan, Komitmen, Dan Teknologi Informasi Terhadap Kinerja Rantai Pasokan (Studi Kasus Ikm Pengolah Buah Markisa Di Kota Makassar). *Jurnal Manajemen Dan Agribisnis*, *14*(1), 32–42. https://doi.org/10.17358/jma.14.1.32

Nattassha, R., Handayati, Y., & Simatupang, T. M. (2020). Linear and circular supply chain: SCOR framework stages, actor analysis and the illustrative case of cassava farming. *International Journal of Business and Globalisation*, *26*(1/2), 3. https://doi.org/10.1504/IJBG.2020.109823

Nazara, A. Y., & Pratiwi, A. I. (2025). Menanggulangi

Line Stop Produksi Assembling Akibat Delay Supply PPC Warehouse dengan Metode SMART. *Jurnal Teknik SILITEK*, *05*(01), 13–32. https://jurnalteknikpasifik.id/index.php/jts/article/view/139

Nazara, K. Y. (2022). Perancangan Smart Predictive Maintenance untuk Mesin Produksi. *Seminar Nasional Official Statistics*, *2022*(1), 691–702. https://doi.org/10.34123/semnasoffstat.v2022i1.1575

Nugroho, F. A. (2022). Penerapan Materials Handling Equipment Untuk Penanganan Barang. *Jurnal Bisnis, Logistik Dan Supply Chain (BLOGCHAIN)*, *2*(2), 64–71. https://doi.org/10.55122/blogchain.v2i2.535

Nurdyansa, N., Fatma, F., Erniwati, E., & Amri, N. F. (2024). Pelatihan Digitalisasi Data Administrasi dan Analisis Data Sederhana Menggunakan Google Workspace dan Kecerdasan Buatan Pada Staf Administrasi Universitas Pancasakti Makassar. *Jurnal Pengabdian Sosial*, *1*(9), 1407–1416. https://doi.org/10.59837/kvmvh620

Oktoyani, R., Sufianti, E., & Gedeona, H. T. (2023). Strategi Implementasi Kebijakan Pengawasan dalam Pengelolaan Limbah Bahan Berbahaya dan Beracun di Kabupaten Purwakarta. *Jurnal Media Administrasi Terapan*, *3*(2), 109–123. https://doi.org/10.31113/jmat.v3i2.61

Pangestuti, D. C., Nastiti, H., & Husniaty, R. (2022). Analisis Risiko Operasional Dengan Metode FMEA. *Jurnal Akuntansi, Ekonomi Dan Manajemen Bisnis*, *10*(2), 177–186. https://doi.org/10.30871/jaemb.v10i2.3235

Perdana, Y. R., Ciptono, W. S., & Setiawan, K. (2019). Broad span of supply chain integration: theory development. *International Journal of Retail & Distribution Management*, *47*(2), 186–201. https://doi.org/10.1108/IJRDM-03-2018-0046

Pujawan, I. N., & Geraldin, L. H. (2009). House of risk: a model for proactive supply chain risk management. *Business Process Management Journal*, *15*(6), 953–967. https://doi.org/10.1108/14637150911003801

Puji, A. A., & Satriardi, S. (2024). Pemetaan, Pengendalian Dan Sistem Pendukung Keputusan Mitigasi Risiko Rantai Pasok Proses Bisnis PT. XYZ. *JISI: Jurnal Integrasi Sistem Industri*, *11*(2), 145–158. https://doi.org/10.24853/jisi.11.2.145-158

Purwaningsih, R., Susanto, N., Prastawa, H., Susanty, A., Nugroho WP, S., & Ramadani, P. I. (2021). Pemberdayaan Rumah Potong Ayam Menggunakan Metode House of Risk Untuk Meningkatkan Bisnis Sustainability. *Jurnal Pasopati*, *3*(3), 153–160. https://ejournal2.undip.ac.id/index.php/pasopati/article/view/12118

Putri, N. W. W. (2025). Integrasi Prinsip Lingkungan dalam Bisnis Syari'ah untuk Mewujudkan Sustainability. *AT-TAJIR : Jurnal Manajemen Bisnis Syariah*, *2*(2), 152–164. https://ejournal.alkifayahriau.ac.id/index.php/attajir/article/view/413

Ramadhani, F. R., Linda, O., & Pangestika, R. (2022). Personal Analysis of Slaughterer Hygiene and Sanitation of Waste Management at UPTD Slaughterhouses (RPH) Depok City. *Jurnal Keselamatan, Kesehatan Kerja Dan Lingkungan (JK3L)*, *3*(2), 111–122. https://jk3l.fkm.unand.ac.id/index.php/jk3l/article/view/53

Revaldiwansyah, M. B., & Ernawati, D. (2021). Analisis Pengukuran Kinerja Supply Chain Management Dengan Menggunakan Metode Supply Chain Operation Referance (SCOR) Berbasis ANP Dan OMAX (Studi Kasus Pada PT. Karya Giri Palma). *JUMINTEN*, *2*(3), 1–12. https://doi.org/10.33005/juminten.v2i3.266

Riadi, S., Tondoyekti, K., & Hady, L. K. (2025). Harmonisasi Sertifikasi Halal dan Eco-Friendly sebagai Inovasi dalam Industri Syariah di Indonesia : Pendekatan Systematic Literature Review pada Ekonomi Hijau dan Bisnis Syariah. *Economics and Digital Business Review*, *6*(1), 214–226. https://ojs.stieamkop.ac.id/index.php/ecotal/article/view/2006

Rizqi, A. wasiur, Ummah, N. H., & Yuliana, S. D. (2023). Analisis Risiko Halal Supply Chain Produk Otak-otak Bandeng Bu Afifah Menggunakan Metode House Of Risk. *Jurnal Agroindustri Halal*, *9*(3), 269–277. https://doi.org/10.30997/jah.v9i3.9726

Rohmah, F. I. N., & Rusdianto, R. Y. (2025). Optimalisasi Pengelolaan Surat Masuk Dan Keluar Dalam Mendukung Proses Administrasi PT Rekaindo Global Jasa. *Jurnal Cendekia Ilmiah*, *4*(2), 1733–1738. https://ulilalbabinstitute.id/index.php/J-CEKI/article/view/7269

Romadhona, H., & Zulfairah. (2024). Pengaruh Internet of Things (IoT) dan Big Data terhadap Akurasi Pelacakan Pengiriman Ekspedisi. *Jurnal Greenation Ilmu Teknik*, *2*(2), 75–84. https://doi.org/10.38035/jgit.v2i2.264

Rozudin, M., & Mahbubah, N. A. (2021). Implementasi Metode House Of Risk pada Pengelolaan Risiko Rantai Pasokan Hijau Produk Bogie S2HD9C (Studi Kasus: PT Barata Indonesia). *JISI: Jurnal Integrasi Sistem Industri*, *8*(1), 1–11. https://doi.org/10.24853/jisi.8.1.1-11

Ruslaini, R., & Kusnanto, E.. (2020). Sustainability Dalam Rantai Pasok Global: Tinjauan Literatur Dari Perspektif Bisnis Internasional dan Manajemen Rantai Pasok. *Journal of Business, Finance, and Economics (JBFE)*, *1*(2). https://doi.org/10.32585/jbfe.v1i2.5691

Sahranisa, A., & Siagian, T. B. (2025). The Effect Of Resting Time And Body Weight Differences On The Phsiological Response Of Chickens Before Slaughter. *Jurnal Peternakan Nusantara (JPN)*, *11*(1), 27–36. https://ojs.unida.info/jpnu/article/view/17953

Sakhi, A. Z. (2024). Implementation of a Halal Production System: Integrating Islamic Values in the Modern Economy. *ICO EDUSHA*, *5*(1), 310–324. https://prosiding.stainim.ac.id/index.php/prd/article/view/530

Saputro, R. A. T., Kasanah, Y. U., Marddani, O. R., & Niami, K. (2024). Optimasi Rute Distribusi Unggas Berbasis Network Analysis-GIS Menggunakan Capacitated Vehicle Routing Problem with Time Window Pickup and Delivery. *Jurnal INTECH Teknik Industri Universitas Serang Raya*, *10*(1), 51–60. https://doi.org/10.30656/intech.v10i1.7712

Sasmita, F., Ode, W., Latif, U., & Tao, H. (2025). Impelementasi Biosekuriti dan Higiene Rumah Pemotongan Unggas Skala Kecil di Kota Kendari (Implementation of Biosecurity and Hiygiene of Small-Scale Poultry Slaughterhouse in Kendari City). *Jurnal Peternakan Lokal*, *7*(1), 11–23. https://ejournals.umma.ac.id/index.php/peternakan/article/view/2610

Selajati, R. M. A., & Syaichu, A. (2024). Analisis Manajemen Risiko Rantai Pasok Pada Ikm Tahu Takwa Mikimos Menggunakan Metode House Of Risk (Hor). *Jurnal Teknik Dan Manajemen Industri Pomosda (JTMIP)*, *02*(01), 34–42. https://jurnal.stt-pomosda.ac.id/index.php/jtmip/article/view/136

Sembiring, A. R., Ridho, M. H., Nurcahyo, M. A., & Muhammad, S. I. (2024). Leveraging Indonesia Logistics Ecosystem With Frontier. *Jurnal BPPK*, *17*(3), 12–28. https://jurnalbppk.kemenkeu.go.id/index.php/jurnalbppk/article/view/882

Setiawan, R., Sugihartanti, N. P., & Ibadurrahman, M. I. (2024). Sistem Manajemen Gudang Bebasis Web dengan Teknologi Barcode Scanner pada Industri Manufaktur : Sebuah Kajian Literatur Web-based Warehouse Management System using Barcode Scanner Technology in Manufacturing Industries : A Literature Review. *Integrasi Jurnal Ilmiah Teknik Industri*, *09*(02), 124–135. https://doi.org/10.32502/integrasi.v9i2.181

Sholehoddin, M., Kunaifi, A., Rokib, M., Arif, M., Falahuddin, & Amin, M. R. (2024). FAKTOR-Faktor Yang Mempengaruhi Nilai Industri Halal Pada Perusahaan Yang Terdaftar di Bursa Efek Indonesia. *Revenue : Jurnal Ekonomi Pembangunan Dan Ekonomi Islam*, *7*(01), 38–47. https://doi.org/10.56998/jr.v7i01.124

Sihaloho, T. Y., & Hidayati, N. (2023). Pengaruh Penerapan Warehousing Management System terhadap Kinerja Operasional Pergudangan Perusahaan Logistik XYZ. *MANAJEMEN IKM: Jurnal Manajemen Pengembangan Industri Kecil Menengah*, *18*(2), 101–112. https://doi.org/10.29244/mikm.18.2.101-112

Siregar, Z. H., Mawardi, Rigitta, P., Puspita, R., Refiza, Simorangkir, S. P., & Suita, D. (2024). Pelatihan dan implementasi perencanaan pencahayaan dan sirkulasi udara untuk lingkungan sehat dan nyaman pada Proyek Pembangunan Gedung UMKM-USU. *Jurnal Derma Pengabdian Dosen Perguruan Tinggi (Jurnal DEPUTI)*, *4*(2), 299–304. https://doi.org/10.54123/deputi.v4i2.363

Sitohang, F. A. F., Profita, A., & Widada, D. (2022). ANalisis Pengembangan Strategi Mitigasi Pada Risiko Rantai Pasok Kayu Log (Studi Kasus : PT SLJ GlobaL TBK, Samarinda). *PROFISIENSI: Jurnal Program Studi Teknik Industri*, *10*(2), 128–140. https://doi.org/10.33373/profis.v10i2.4664

Sitorus, R., Manumono, D., & Ambasari, A. (2023). Manajemen Logistik di Perkebunan Kelapa Sawit PT Surya Agrolika Reksa di Desa Beringin Jaya , Kecamatan Singingi Hilir, Kabupaten Kuantan Singingi, Provinsi Riau. *Agrofortech*, *1*(3), 1783–1796. https://jurnal.instiperjogja.ac.id/index.php/JOM/article/view/866

Sriwana, I. K., Hijrah S, N., Suwandi, A., & Rasjidin, R. (2021). Pengukuran Kinerja Rantai Pasok Menggunakan Supply Chain Operations Reference (Scor) Di Ud. Ananda. *JISI: Jurnal Integrasi Sistem Industri*, *8*(2), 13–24. https://doi.org/10.24853/jisi.8.2.13-24

Sucipto, S., Wardani, R. I., Kamal, M. A., & Setiyawan, D. T. (2020). Analisis Teknoekonomi Alat Penyembelihan Ayam Untuk Mendukung Implementasi Sistem Jaminan Halal. *Jurnal Teknologi Industri Pertanian*, *30*(1), 72–81. https://doi.org/10.24961/j.tek.ind.pert.2020.30.1.72

Sugiantara, K., & Basuki, M. (2019). Identifikasi dan Mitigasi Risiko di Offshore Operation Facilities dengan Menggunakan Metode Failure Mode and Effect Analysis. *Jurnal INTECH Teknik Industri Universitas Serang Raya*, *5*(2), 87–92. https://doi.org/10.30656/intech.v5i2.1775

Sumantika, A., Guritno, A. D., & Khuriyati, N. (2021). Mitigasi Risiko pada Industri Pengalengan Gudeg. *AgriTECH*, *41*(2), 107. https://doi.org/10.22146/agritech.35704

Sutrisno, A. W. F., & Nugrahadi, B. (2023). Pelatihan Dokumentasi Maintenance Mesin di Perusahaan Penggilingan Padi di Dwi Sri Barokah. *3 Rd E-Proceeding SENRIABDI*, *3*, 736–741. https://jurnal.usahidsolo.ac.id/index.php/SENRIABDI/article/view/1658

Tamzil, M. H., Indarsih, B., Haryani, N. K. D., Jaya, I. N. S., & Asnawi. (2022). Dinamika Suhu Tubuh dan Bobot Badan Ayam Broiler yang Diangkut dari Peternak ke Tempat Pemotongan Ayam Pada Waktu yang Berbeda. *Jurnal Ilmu Dan Teknologi Peternakan Indonesia*, *8*(1), 21–28. https://jitpi.unram.ac.id/index.php/jitpi/article/view/143

Tiya, N. A. D., Nuraini, H., & L. Cyrilla E. N. S. D. (2021). Kinerja Sumber Daya Manusia di Rumah Potong Hewan (Studi Kasus RPH Kategori I dan Kategori II). *Jurnal Ilmu Produksi Dan Teknologi Hasil Peternakan*, *9*(2), 89–94. https://doi.org/10.29244/jipthp.9.2.89-94

Touloumidis, D., Madas, M., Zeimpekis, V., & Ayfantopoulou, G. (2025). Weather-Related Disruptions in Transportation and Logistics: A Systematic Literature Review and a Policy Implementation Roadmap. *Logistics*, *9*(1), 32. https://doi.org/10.3390/logistics9010032

Trenggonowati, D. L., Muharni, Y., Ridwan, A., & Wardhani, A. M. (2022). House of Risk (HoR) Analysis Application for Supply Chain Risk Management (SCRM) in Micro Small and Medium – Sized Enterprises (MSMSs). *Proceedings of the*

Conference on Broad Exposure to Science and Technology 2021 (BEST 2021), *210*(February). https://doi.org/10.2991/aer.k.220131.044

Trimaryono, B., & Sulistiyowati, W. (2024). Risk Mitigation in Sausage Production Using a Combination of Supply Chain Operations Reference (SCOR) and House of Risk (HOR) Methods [Mitigasi Risiko dalam Produksi Sosis melalui Kombinasi Metode Supply Chain Operations Reference (SCOR) dan House. *UMSIDA Preprint*, 1–12. https://doi.org/10.21070/ups.5183

Ulfah, M. (2022). Mitigasi risiko rantai pasok industri kue menggunakan house of risk. *Journal Industrial Servicess*, *8*(1), 63. https://doi.org/10.36055/jiss.v8i1.14315

Usman, M., Hermadi, I., & Arkeman, Y. (2021). Rancang Bangun Sistem Ketertelusuran Rantai Pasok Ayam Pedaging Melalui Aplikasi Android Berbasis Blockchain The Design of Broiler Supply Chain Traceability System through Blockchain-Based Android Applications. *Jurnal Ilmu Komputer Agri-Informatika*, *8*, 105–114. https://doi.org/10.29244/jika.8.2.105-114

Utami, A. P., Pane, N. N. A., & Hasibuan, A. (2023). Analisis Dampak Limbah Sampah Rumah Tangga Terhadap Pencemaran Lingkungan Hidup. *Cross-Border*, *6*(2), 1107–1112. https://doi.org/10.58192/profit.v3i3.2245

Victoria, C., Jati, D. R., & Sutrisno, H. (2022). Analisis Buangan Air Limbah Peternakan Ayam di Dusun Sabang Laja Desa Merpak Kecamatan Kelam Permai Kabupaten Sintang. *Jurnal Teknologi Lingkungan Lahan Basah*, *10*(2), 156. https://doi.org/10.26418/jtllb.v10i2.56063

Vikaliana, R., Iskandar, Y., & Ikhwanissa, R. (2024). Halal Supply Chain Performance Measurement Model Involving Traceability Aspects: A Study in A Chicken Slaughterhouse. *IOP Conference Series: Earth and Environmental Science*, *1358*(1), 012030. https://doi.org/10.1088/1755-1315/1358/1/012030

Wahyuni, D., Nasution, A. H., Budiman, I., & Arfidhila, N. (2020). Halal Risk Analysis at Indonesia Slaughterhouses Using the Supply Chain Operations Reference (SCOR) and House of Risk (HOR) Methods. *Journal of Physics: Conference Series*, *1542*(1), 012001. https://doi.org/10.1088/1742-6596/1542/1/012001

Wenas, M. S., Rengkung, L. R., & Jocom, S. G. (2023). Analisis Kelayakan Internal Dan Eksternal Pembangunan Rumah Potong Ayam Yang Terintegrasi Dengan Proses Pendingin Di Kabupaten Minahasa Utara. *AGRI-SOSIOEKONOMI*, *19*(1), 657–668. https://doi.org/10.35791/agrsosek.v19i1.46892

Wibowo, D. A. A., & Aribowo, E. (2025). Rancang Bangun Sistem Informasi Menggunakan Metode Enterprise Resource Planning (ERP). *MALCOM: Indonesian Journal of Machine Learning and Computer Science*, *5*(1), 332–342. https://doi.org/10.57152/malcom.v5i1.1799

Windyarti, P., Rosyidi, K., & Nuriyanto. (2025). Penguatan Sistem Manajemen Risiko Keamanan Pangan bagi RPA CV. Satria Jaya Pandaan Pasuruan. *Humanist Journal*, *3*(2), 31–35. https://doi.org/10.59689/gyde4f84

Yusriana, & Jaya, R. (2022). Digitalisasi Sistem Traceability Dan Keberlanjutan Agroindustri Pangan: Telaah Kritis Literatur. *Jurnal Teknologi Industri Pertanian*, *32*(2), 146–155. https://doi.org/10.24961/j.tek.ind.pert.2022.32.2.146

Yuwana, N. P., & Wahyuni, H. C. (2024). Analysis of Potential Risks Food Safety and Halal Standards in Food Industry (Case Study of Wafer Production Process). *Procedia of Engineering and Life Science*, *7*, 409–421. https://doi.org/10.21070/pels.v7i0.1496

Zahra, F. A., Wolor, C. W., & Utari, E. D. (2025). Analisis Dampak Work Shift Rotasi Terhadap Work Life Balance Karyawan Perusahaan X Analysis of the Impact of Rotational Work Shifts on the Work-Life Balance of Employees At Company X. *Jurnal Intelek Insan Cendikia*, *2*(5), 9478–9485. https://jicnusantara.com/index.php/jiic/article/view/3462

Zakiyyah, A. M., Abdurrahman, G., Umilasari, R., & Deviyati, M. Y. D. (2024). Sistem Presensi Elektronik untuk Peningkatan Manajemen Tenaga Kerja BPR Bank Dhanaartha Ambulu. *Jurnal Pengabdian Masyarakat Manage*, *5*(1), 99–110. https://ejurnal.unmuhjember.ac.id/index.php/manage/article/view/1383

Zuhdi, M. I., & Sutabri, T. (2024). Implementasi Sistem Presensi Karyawan Berbasis IOT dan Website di PT Tanjung Enim Lestari Dengan Teknologi RFID dan Kamera. *Jurnal Komunikasi*, *2*(11), 851–868. https://jkm.my.id/index.php/komunikasi/article/view/113