

Risk Assessment and Mitigation in Halal Supply Chains: Exploring Unique Risks and Mitigation Strategies

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ABSTRACT

In Malaysia, the halal supply chain is a critical component of the nation's economic and religious framework, with the government and industry players actively working to ensure compliance with Shariah principles. This study profiles unique risks present in halal supply chains, such as fraud, mislabelling, and contamination, while also exploring effective mitigation strategies. This research is conducted using both qualitative and quantitative methods, such as surveying halal-certified companies throughout Southeast Asia. The results show that halal supply chains have unique challenges and that companies with monitoring systems and partnerships with certification bodies are crucial in managing that risk. As a result, this study could provide insights into risk management in halal industries and produce guidelines for companies operating within these industries.

Keywords: Risk assessment, mitigation strategies, halal supply chain, halal certification bodies, transportation

INTRODUCTION

Since products and services that meet halal principles and regulations are encouraged in Islam, their pervasiveness in global trade has increased significantly. With an estimated global market exceeding \$2 trillion across all industry sectors like food, pharmaceuticals, cosmetics, and tourism, among others, Muslim consumers constitute a significant portion of the halal market (Sarker et al., 2020). The halal market is growing, especially in non-Muslim majority countries, and demand for halal-certified products has spread beyond the food and beverage sector to health products, cosmetics, and even financial services (Lada et al. 2019). With this expansion comes a necessity to ensure that halal products are authentic, safe, and free from contamination or fraud at every point in the supply chain.

Then there is the halal supply chain, which encompasses the entire journey of halal products from production to processing, storage, and transportation. Since Islamic law has strict requirements, businesses need to maintain halal certification at every step of the supply chain (Hussain et al., 2021). But the growing halal industry also brings its risks in terms of the integrity of these products. These risks include fraud (e.g. misrepresentation of non-halal products as halal), mislabelling (i.e. products incorrectly labelled as halal and falsely claiming the halal certification), and contamination, especially if halal and non-halal products share production or transportation space (Omar et al., 2020). This breakdown creates risks for consumers and can lead to financial losses and a loss of reputation for companies that practice halal in the supply chain.

In the halal market, fraud and mislabelling have been a growing challenge for companies and consumers alike. Research indicates that actions like using false halal certificates or replacing halal elements with non-halal substitutes can result in serious legal and ethical problems (Ahmed et al., 2017, Ahmed et al., 2019). Likewise, contamination risks, particularly in the situations of shared production facilities or transport, can contribute to undermining the halal status of a product, with implications for product recalls, fines, and loss of consumer trust (Alserhan, 2020).

As the world becomes more entangled in global supply chains, the importance of risk assessment and mitigation is as relevant as ever. Risk management in halal supply chains entails identifying, assessing, and responding to the specific hazards that may jeopardize the integrity of halal products. Strategies have been developed to manage these risks, with examples found in the literature such as third-party audits, halal certifications, traceability systems, and supplier relationship management (Hussain et al., 2021). Moreover, technological innovations, including blockchain and digital traceability systems, are increasingly being utilized as solutions to ensure the authenticity of products and their compliance from production to sale (Yusof & Kamarulzaman, 2021).

This paper explores the unique risks in halal supply chains related to fraud, mislabelling, and contamination. The research will also cover the measures that businesses can take to protect themselves against these threats, like certification programs, risk assessments, and adopting technology. This paper aims to shed light on potential strategies for managing halal supply chains, given the importance of authenticity, safety, and consumer trust to the success of the halal industry, through an examination of the risks and mitigation strategies.

LITERATURE REVIEW

Growth of the Halal Market

Over the last few years, there has been exponential growth in the halal market due to a combination of demographic expansion, socioeconomic factors, and a growing public awareness of ethical and sustainable consumption. The concept of halal includes any object (animal, food, drinks, etc.) or act (non-Muslim related) guided by Islamic law (Shariah), and halal products are distributed in many sectors, such as food, pharmaceuticals, cosmetics, and financial services, so the halal market is very diverse and extensive. This section highlights factors behind the rapid growth of the halal market and its implications for global supply chains.

The growth of the halal market is mainly attributed to the rising Muslim population globally. In 2021, about 1.9 billion Muslims lived in the world, constituting over 24% of the world's population (Pew Research Center, 2021). Being a large and fast-growing demographic, this group represents a significant consumer base for halal products. Furthermore, because many Muslim-majority countries are witnessing economic growth and urbanization, the demand for goods and services that meet halal certification is increasing not just in these countries but around the world (Aziz et al., 2020).

Apart from the Muslim population, non-Muslims are also showing interest in the halal market. One of the main reasons for this trend is the growing awareness of the ethical and sustainable qualities of halal-certified products. Some halal certification procedures implement strict standards that can also apply to non-halal products, based on product safety, cleanliness, and ethical sourcing, which has been shown to attract a wide array of consumers concerned with responsible and ethical consumption (Omar et al., 2020). The global shift towards sustainable and ethical consumerism, often driven by concerns about food safety, animal welfare, and environmental sustainability, aligns closely with the values that halal practices embody (Zailani et al., 2021). As a result, there has been a growing interest in halal-certified products in other sectors, including pharmaceuticals, cosmetics, personal care products, and even financial services (Sarker et al., 2020).

One of the extraordinary growth is the halal food market. As reported by Global Data (2021), the worldwide halal food industry has been valued around USD 1.9 trillion in 2021, with forecasts pointing to further growth and expansion, particularly in markets such as Southeast Asia, the Middle East and Europe. Halal food sales

are projected to rise by a CAGR of 6.4% between 2021 and 2026 (Global Data, 2021). This growth is extensively driven by the increasing proportion of Muslims in Asia-Pacific, Africa, and Europe, and as halal food is getting mainstreamed (Shamsuddin et al., 2021).

With growth potential, the halal market must also rise to many challenges, including supply chain integrity and product authenticity. As more people seek halal certified products, the opportunities for fraud, mislabelling, and contamination, all of which can erode consumer faith and slow market growth. Facilitating the halal market space is paramount concerning current risk management, auditing, and traceability technologies. In the quest for preserving product authenticity and gaining consumer confidence, there have been increasing demands of transparency and accountability in halal supply chains (Hussain et al., 2021), where halal certification process itself has been a focal point.

Due to demographic transformations, higher ethical consumption, and an increased worldwide request for halal products in numerous industries, the halal market is expanding rapidly. As this market grows, more opportunities arise; yet businesses are compelled to implement risk management techniques to secure the integrity and safety of their halal supply chains. The growing market creates both opportunities and challenges in terms of halal certification and supply chain management; however, adequate regulations, the establishment of halal-certified supply chains, and the tracking of these supply chains will be key to maintaining long-term consumer trust and market growth.

Halal Supply Chains: Unique Risks

Halal supply chains have unique risks due to the requirements of halal certification and compliance with Islamic law. Risks such as these can threaten the integrity of halal products and can cause consumer mistrust and damages to financial and reputational assets on both corporate and governmental levels. Here are the prevalent risks in halal supply chains:

Fraud and Mislabelling

The biggest risk to halal supply chains is fraud and halal issues, specifically the packaging of non-halal food as halal. Halal fraud can happen anywhere in the supply chain, from the sourcing of raw materials to the production of finished goods (Hussain & Ng, 2019). This can occur as a result of replacing halal certified materials with non-halal ingredients, tampering with halal certification, or representing substances with no halal certification. These practices can severely subvert consumer trust, resulting in reputational damage (Vatansever & Lim, 2018; Mohiuddin & Khan, 2019), legal issues, and financial losses.

Halal supply chains are often susceptible to fraud because halal sourcing and verification are complicated with a globalized supply chain. Therefore, manufacturers may falsely label food or cosmetics as halal despite the use of cheaper, non-halal ingredients (Bauer & Hassan, 2021). Additionally, fraudulent halal certifications refer to the operations of organizations that possess fake or tarnished halal certificates which they claim as their own (Sarker et al., 2020). As a result of growing demand for halal products an alarming amount of fraudulent halal certifications issued by unrecognized or dubious certifying bodies (Hussain et al., 2021).

Contamination

Another major risk in halal supply chains is contamination within facilities where halal and non-halal products are processed. When halal and non-halal items are stored, handled, or processed together without proper segregation it can cause cross-contamination. Trace products, which can compromise the halal status of even the final product, are especially concerning for the food and cosmetics industries due to the presence of alcoholic or pork products in the raw products (Mahmud et al., 2020).

The risk of cross-contamination sorely aggravates in common production facilities or places where halal and non-halal supply chains meet, such as with transportation or storage. Because even minor contamination can make a product non-halal strict segregation and cross-contact avoidance measures must be taken (Alserhan, 2020). This represents a particularly difficult problem for companies which obtain materials from worldwide

suppliers or work with multi-purpose processing plants in which are created a range of different product types within a single location. Prevention can be achieved using dedicated halal processing lines, separate halal storage areas, and clear labels to avoid accidental combinations of halal and non-halal products (Saad & Al-Shamari, 2021).

Certification Risks

Risks related to certification are significant in halal supply chains, as the halal certification process is the primary way consumers can be assured that products meet Islamic dietary laws. However, sunlight standards are inconsistent because certification systems can be very heterogeneous from region to region or certification body to certification body. Such inconsistencies can lead to doubts in the halal certification processes, which may erode consumers' trust in halal products in general (Hussain et al., 2021).

Inadequate auditing by certifying authorities may result in violations of halal standards, which may not be discovered until the product is already in stores. In addition, challenges have also been reported regarding the accreditation of halal certifiers, such as whether the certifying body has sufficient manpower or expertise in determining every relevant aspect to halal, including, but not limited to, sourcing, manufacturing and packaging (Hussain & Ng, 2019). Moreover, the verification process can easily be played with as some entities seek to evade strict inspections or furnish deceptive documentation to acquire halal certification (Saad & Al-Shamari 2021).

Supply Chain Transparency

The other significant risk in halal supply chains is the transparency in sourcing and production processes. Traceability of products from raw materials to final goods plays a crucial role in halal certification, however tracking the halal status of products throughout the entire supply chain can be tough. Because the production and transportation of halal products typically involves many different actors and extends very often across borders, ensuring complete transparency is particularly challenging in this regard (Bauer & Hassan, 2021).

This is particularly common among ingredients that are sourced from numerous suppliers in various countries, sometimes creating a lack of proper documentation and making assurance of their halal status a challenge. Companies may have little control over the practices of their supplier, as well leading to unintended contamination and/or non-compliance (Hussain et al., 2021). Thus, the application of blockchain and other technologies are obtaining popularity in halal supply chain to facilitate real time tracking and product traceability from farm to shelf (Yusof & Kamarulzaman, 2021). These technologies can improve the visibility of halal supply chains, thus enabling better risk monitoring and management in terms of fraud, contamination and certification.

Mitigation Strategies

It is crucial to implement effective strategies for risk mitigation of Halal product across the supply chain to ensure authenticity, quality and safety of Halal products. Ensuring the products conform to the necessary halal standards becomes continually more difficult as the halal industry expands. Multiple mitigation strategies have been devised and implemented to mitigate the specific risks present in halal supply chains (Senathirajah et. al., 2024). These strategies involve third-party certification, transparency in the supply chain, and training and awareness, in great part to minimize fraud, contaminants, and certification issues.

Contractor Recognition and Certifications

The most recognized mitigation of halal supply chain risks is the involvement of third-party halal certifiers. Halal certification is important because it ensures that the products meet Islamic dietary laws, and a strict process of certification contributes to the clarity and confidence of the consumer. A third-party certification body offers an unbiased evaluation of the extent to which the products, production processes, and ingredients are consistent with halal (Sadiq & Fazal, 2022).

Regular audits by recognized certification agencies are an essential part of remaining halal compliant. Audits verify the halal certification is valid and ensure companies are compliant with requisite standards throughout a product's lifecycle. This may include site inspections, ingredient verification, and supplier reviews to verify that all stages of production are compliant with halal standards. According to Sadiq and Fazal (2022), regular audits are needed to highlight areas of concern and take action to prevent these areas of non-compliance from resulting in issues that lead to compromised product integrity.

In addition, there is also the option of self-certification where companies audit their own environmental impact, but this option is generally less reliable than certification from independent organizations. Halal integrity, especially for halal products that are gone through international borders, is best similarly or externally ensured by third-party audits, particularly by international or national bodies (Hussain et al., 2021). By working in association with certification bodies to implement standardized protocols, this process can be further bolstered, resulting in halal certification that is homogenous, clear, and recognized worldwide.

Supply Chain Transparency

In particular, transparency in the halal supply chain is an critical method to reduce fraud, mislabelling and contamination risks. Modern global supply chains can make it hard to trace the halal status of ingredients and finished products, especially if raw materials are sourced from different domains and suppliers. Traceability systems are a capability for increasing supply chain transparency (Johan & Canggih, 2024; Zaheer et al., 2021).

Traceability enables every ingredient, every processing stage, and every handling of the product to be tracked and verified from origin to plate. Halal traceability systems empower companies to detect and monitor halal compliance in the supply chain more accurately. Blockchain technology has emerged as a potential solution for ensuring transparency. By providing secure, decentralized records of transactions, blockchain enables stakeholders to trace the entire product journey from source to shelf (Zaheer et al., 2021). In addition to being hard to falsify, blockchain also allows for a tamper-proof record of the halal status of the product at each step.

Moreover, with the increasing utilization of digital platforms and internet of things (IoT) technologies, real time monitoring can be made at warehouses, transportation, and manufacturing plants to make sure that no halal product is either contaminated or cross-contaminated (Zaheer et al., 2021). According to Chaudry et al. (2021), these technologies are becoming increasingly critical in ensuring the integrity and traceability of halal products, facilitating compliance for businesses and trust for consumers to the authenticity of products.

Training and Awareness

The main reason behind non-compliance and risk exposure is human error and lack of awareness of market players and stakeholders in the halal supply chain. But one of the most effective ways to counteract these risks is through training and education. Training all individuals involved in the halal supply chain, including procurement managers, production workers, and quality control staff, enabling workers to be conscious of halal, helps reduce the chances of errors that may lead to the product not being halal (Anwar et. al., 2024; Khidzir et al., 2021).

The training should encompass topics such as halal food dietary laws, how contamination occurs and why it should be avoided, best practices for handling and processing halal products and how to detect fraud or mislabelling in the supply chain. Employees also need to be educated about the possible consequences if the halal standards are not followed, to the company and to the consumers (Khidzir et al., 2021). As the halal supply chain consists of many parties and each of these parties may be scattered in different geographical regions, training should be standardized among all the partners in the supply chain, including suppliers, distributors, and retailers in order to achieve uniform compliance.

Collaboration with Stakeholders

Another important mitigation strategy is collaboration among different parties in the halal supply chain, such as suppliers, certification bodies, regulatory authorities, and consumers (Senathirajah et. al., 2024; Putit et. al., 2024). The synergy of efficient collaboration allows businesses to exchange best practices, maintain uniformity in certification standards, and take proactive measures for the risks. Regulatory authorities help get the ball rolling for setting standards on halal certification, allowing marketplaces to audit and impose these guidelines.

Technology application on Halal Supply Chain Management

In addition to blockchain and traceability systems, other tools such as artificial intelligence (AI) and big data are becoming effective tools for risk mitigation in halal supply chains. These technologies are capable of processing big data to uncover discrepancy, assess risk and predict future compliance issues before they occur (Yusof & Kamarulzaman, 2021). Using AI to automate the halal verification process helps reduce human error and increase efficiency in the auditing of businesses.

METHODOLOGY

This study utilized a mixed-methods approach to map the risks present within halal supply chains and analyse whether the mitigation strategies employed by companies were effective. This study uses a method approach; including qualitative and quantitative methods to provide a holistic view of the challenges and potential solutions in halal supply chains.

Data Collection

This study was conducted based on data obtained from a survey to 100 halal-certified companies operating mainly in Southeast Asia which are Malaysia, Indonesia, Thailand and Singapore. This includes companies engaged in halal food production, logistics, or halal certification services. To focus solely on companies where halal is the basis of business, we looked for companies that also have formal halal certifications.

The target companies include a cross-section of halal industry sectors, ranging from food production to halal distribution logistics and retail. It enabled capturing a holistic understanding of the risks encountered along the halal supply chain from sourcing activities to the final consumer delivery. At the level of geographic coverage across halal certified companies in the region (as many of the selected companies were also based in Malaysia, which is a well-known centre of halal certification and halal food production).

The survey was delivered through an online platform, and companies were contacted through email invitations. The firms were told their involvement would be anonymous and that the information would be used only for research. The survey was held from August to October 2024. In the data collection process ethical considerations were meticulously adhered to, ensuring the integrity and confidentiality of the research. Participation in the survey was entirely voluntary, and respondents were informed that their responses would remain anonymous, with data used solely for research purposes. All participants provided informed consent prior to their involvement, aligning with ethical guidelines for research involving human subjects (Khidzir et al., 2021). The research team ensured that all data were securely stored, with restricted access to maintain confidentiality. These measures were implemented to uphold ethical standards and protect the rights and privacy of the participants, as emphasized in studies on ethical research practices in supply chain management (Hussain et al., 2021).

Survey Design

The survey was administered using a structured questionnaire comprising 20 questions, organized into four main sections :

Table 1: Survey Design

Section	Objective	Example Questions	Adapted/Adopted from
Risk Information	Identify risks faced by companies in halal supply chains.	- What risks do you most frequently encounter in your halal supply chain? (e.g., fraud, mislabelling, contamination). - Have you noticed any cross-contamination issues in your facility? If yes, please describe.	Hussain et al. (2021); Omar et al. (2020)
Risk Assessment	Understand how organizations assess and prioritize risks.	- How do you evaluate the probability and consequences of risks identified in the halal supply chain? - On a scale of 1-5, how severe is the risk of contamination in your production facility?	Sadiq & Fazal (2022); Mahmud et al. (2020)
Risk Mitigation	Explore strategies used by companies to mitigate risks.	- What mitigation strategies do you use to stay compliant with halal standards? - Are you using technologies such as blockchain or traceability systems to monitor the halal status of products in your supply chain?	Yusof & Kamarulzaman (2021); Zaheer et al. (2021)
Company Profile	Collect demographic data about the company and its role in the halal industry.	- What is the size of your company (small, medium, large)? - Which halal certification body do you work with (e.g., JAKIM, MUI, Halal Japan)?	Khidzir et al. (2021); Lada et al. (2019)

Data Analysis

Qualitative and quantitative analyses were performed with the survey data. This dual goal allows a comprehensive view of the risks and mitigation measures along halal supply chains.

The descriptive statistics were calculated for the quantitative data obtained from the closed-ended questions. The prevalence of risk, risk severity, and risk mitigation strategies used were computed as frequencies and percentages. The severity of risks and effectiveness of mitigation strategies were graded on a Likert scale (1–5). For example, the answers of the question "How severe do you consider the risk of contamination?" were coded as follows:

- 1 (Very Low) • 2 (Low) • 3 (Moderate) • 4 (High) • 5 (Very High)

Qualitative Analysis: Open-ended question responses were analysed using a thematic analysis approach. Thematic analysis refers to the processes of identifying, analysing, and reporting patterns (themes) within a qualitative dataset, which were then mapped to categories of relevant risk areas and mitigation strategies. For instance, common themes from the responses about contamination risks were “cross-contamination when using shared facilities” and “insufficient segregation of halal versus non-halal products.” The mitigation strategies included themes, such as “third-party certification” and “use of traceability technology.”

RESULTS OF THEMATIC ANALYSIS

- **Contamination Risk:** The most commonly reported cause of contamination was cross-contamination in establishments that produce halal and non-halal items. Several companies cited the absence of physical separation in production lines.

- **Mitigation approach:** There are third-party audits and halal certifications among companies (65%) as the main approach to mitigate risks. Furthermore, 40% of respondents cited blockchain as an emerging tool for ensuring traceability and transparency.

A comparative analysis of responses by company size and geographic area was also conducted to evaluate if larger companies or companies located in certain regions utilized more optimal mitigation strategies.

Ethical Considerations

All ethical guidelines were adhered to in conducting this research. Participation in the survey was voluntary, and respondents were told that their responses would be maintained anonymously. All participants provided consent to participate in this research, which was carried out following relevant ethical guidelines for research involving human subjects. All data were securely stored, and the research team had restricted access.

FINDINGS AND DISCUSSION

This section presents the results of the survey of 100 halal-certified companies in Southeast Asia. companies in Southeast Asia. The survey not only aimed to identify the specific threats and risks that companies operating in halal supply chains face but also to assess how effective the strategies employed by them to mitigate their risks are.

Part 1: Risk Identification

1. Risk Analysis of Halal Supply Chains

- **Fraud:** 75% of respondents found this to be a risk, as there are real concerns about non-halal ingredients/forces being used and not being disclosed.
- **Mislabelling:** 63% of companies identified mislabelling as a major problem, with worries about wrong halal certification and labelling.
- **Contamination:** 58% of participants expressed specific concerns regarding contaminated material being received in their supply chain operations, especially cross-contamination.
- **Other Risks:** 30% indicated inconsistent certification standards as an emerging issue, revealing some of the challenges posed by certification bodies and their disparate auditing standards.

2. Experiences with Cross-Contamination

- 45% of the respondents had issues with cross contamination in their facilities. These incidents were primarily in connection to shared production lines where halal and non-halal products were processed together. Several companies emphasized that insufficient separation between production lines was a major cause of contamination.

3. Most Concerning Risk

- 40% of participants considered contamination as the primary risk, or fraud (35%) and mislabelling (25%). This makes it clear that the need for product purity and separating halal from non-halal is a matter of utmost concern.

4. Sourcing Ingredients from Halal-Certified Providers

- Reliance on certification systems was further evidenced by the fact that 82% of companies stated that they source their ingredients from halal-certified suppliers. On the other hand, 18% of those surveyed pointed to difficulties finding halal-certified raw materials because they are either in limited supply or extremely costly.

Section 2: Risk Assessment

5. Methods for Assessing Risk Likelihood

- External Audits: 70% of organizations use external audits by certification bodies to evaluate risks.
- Internal audits: 55% do periodic internal audits, typically on a quarterly or annual basis.
- Employee Feedback: 40% include employee feedback in their risk assessment approach.
- Formal risk assessment committees: Only 30% reported having formal teams to assess and manage risks.

6. Perceived Severity of Contamination Risk

- 60% of respondents rated the risk of contamination as high (4) or very high (5). This also means that contamination is still one of the most dangerous threats in halal supply chains, potentially putting consumers and brands at risk.

7. Frequency of Risk Assessments

- 40% of companies do risk assessment every quarter, 30% annually and 20% when a problem occurs. The other 10% are using different methods, such as continuous monitoring systems.

8. Risk Prioritization

- 65% of respondents prioritize risk according to its impact on consumer safety, while 35% prioritize risk according to its marketability. This diet confirms the vast majority of businesses are on the same page about making sure their products are safe and sound.

Section 3: Mitigation Strategies

9. Mitigation Strategies Employed

- Third-Party Certification: 90% of participants depend on third-party halal certification agencies to confirm adherence to halal requirements.
- Internal and External Audits: 85% perform regular audits to verify halal compliance, including internal checks, as well as external audits by certification bodies.
- Employee Training: 70% of the companies conduct employee training to create awareness of halal standards and avoid human error.
- Technology Use (Blockchain, Traceability Systems): 50% of companies use technologies such as blockchain (20%) or traceability systems (30%) to track the halal status of products throughout the supply chain
- Segregate Production Lines: 60% of the respondents who declared their process include strict segregation of halal and non-halal production lines to reduce contamination.

10. Effectiveness of Mitigation Strategies

- Very Effective: 40% of companies (5) rated their mitigation strategies as very effective.
- Effective: rated them effective (4) 35%
- Neutral: 15% rated them neutral (3).
- It is ineffective: 5% rated their strategies ineffective (2).
- Very Ineffective: 5% rating across the table one.

This demonstrates a positive perception of how effective the mitigation strategies used have been, especially concerning third-party certification and production line segregation.

11. Challenges with Implementing Mitigation Strategies

- 50% of the businesses faced challenges ranging from costs (especially for third-party certification and audits), shortage of trained staff and integration with new technologies. Companies also cited communication gaps with suppliers and the challenge of standardizing certification processes as problems.

12. Supplier Audits

- 75% regularly audit their suppliers, 50% doing theirs annually, 20% quarterly and 5% monthly. The other 25% do not perform regular audits, they depend on the audits from a certifying body or a different method.

Section 4: Company Profile

Table 2: Company Profile

Category	Details	Percentage/Description
Company Size	Small	30%
	Medium	40%
	Large	30%
Halal Certification Body	JAKIM (Malaysia)	60%
	MUI (Indonesia)	25%
	Halal Japan	10%
	Other	5%
Primary Countries of Operation	Malaysia	70%
	Indonesia	55%
	Thailand	40%
	Singapore	20%
	Other	15%
Primary Industry	Food Production	60%
	Food Retail	20%
	Logistics and Distribution	10%
	Certification Services	5%
	Other	5%
Role in the Halal Supply Chain	Manufacturer of Halal Products	55%
	Supplier of Raw Materials	25%
	Distributor/Logistics Provider	10%
	Retailer	5%
	Certification Body	5%
Years Involved in Halal Production	More than 5 years	60%
	1-3 years	25%
	3-5 years	10%
	Less than 1 year	5%
Geographic Scope of Halal Supply Chain	Regional (Southeast Asia)	60%
	Local	25%
	Global	15%

FINDINGS AND DISCUSSION

Key Risks in Halal Supply Chains

Based on the data above, the key risk factors in the Halal supply chain involve likelihoods reported are fraud expected at 75%, mislabelling at 63% as well as contamination. Notably is that 75% of companies have indicated that fraud, particularly the use of non-halal ingredients with disguise, is a significant risk. Mislabelling is identified by 63% of companies as a problem for accurate Halal certification and Halal labelling. Contamination including the impact of cross-contamination in facilities that manufacture both Halal and non-halal food is reported by 58%, with 40% identifying it as the most critical threat.

Risk Assessment and Prioritization

External audit 70% and internal audit 55%, while a majority of companies rated on the impact on consumer safety. Notably, 65% use consumer safety data to rank risks, signifying an understanding of the main impact is the risk of loss connection with the customer because of a risk event and the second risk mislabelling a high score of 60%.

Mitigation Strategies and Effectiveness

Notably third-party halal certification (90%) is the most widely used mitigation strategy, followed by internal and external audits (85%), and employee training (70%), according to the survey. Over 50% of respondents are leveraging technology, especially with blockchain and traceability systems. In fact, segregation of non-halal are also commonly adopted (60%). 75% of companies rated their mitigation strategies as either effective or very effective, underscoring the generally positive view on the effectiveness of the strategies. But there are still challenges, particularly around costs, availability of trained personnel and integration of new technologies.

Challenges and Opportunities

In addition, the adoption of risk mitigation strategies is increasingly popular, but cost prohibitive and inconsistency in halal certification processes remain a major challenge. The challenge is especially for smaller companies to fulfil the heavy requirements imposed on them by the certification and auditing process. These challenges underscore the need for a regional push to make certification processes more accessible and unified.

Halal-certified companies are tackling risks in halal supply chains, but they can still do more, especially in terms of cost management, managing suppliers and leveraging innovative technologies to ensure traceability in what is often a complex supply chain.

CONCLUSION

Halal supply chains face unique challenges in the form of fraud, contamination and mislabelling, resulting in a loss of integrity. These risks can compromise product safety and erode consumer trust and brand reputation, thus requiring halal-certified companies to manage these risks effectively. These findings strongly highlight the need for the implementation of a holistic, multi-pronged approach to minimize these risks. Companies that combine their strategies, such as third-party certification, traceability technologies, and employee training, can protect product integrity and maintain consumer confidence in halal products.

For example, although fraud risks, particularly concerning non-halal ingredients or processes being used without being disclosed, were among the most common risks identified by respondents, some also discussed other areas of concern. Furthermore, cross-contamination and mislabelling, particularly in multi-use facilities, are ongoing problems for companies. This awareness is needed to correct both the humans who fumble and the material systems that hit the ground.

Companies that use external audits, third-party certifications, and state-of-the-art technologies (blockchain and traceability systems, for example) are much more likely to mitigate risk, the study found. Moreover, the bulk segregation between halal and non-halal production lines is a basic process of reducing contamination risk. While these strategies are beneficial, particularly with standardization, there are still challenges in implementing them efficiently, especially so for smaller companies with fewer resources.

Therefore, halal supply chains should not only be looked at for the short-term risks but be instilled with a continual spirit of improvement and vigilance. With the adoption of integrated risk management, organisations can comply with halal standards and maintain the integrity of the halal industry.

RECOMMENDATIONS

Based on the results of this study, the following recommendations are suggested for halal supply chain adoptive companies:

Establishing Strong Risk Assessment Frameworks

Developing and implementing end-to-end risk assessment frameworks can be crucial for companies to evaluate possible risks at every step of the supply chain. This involves performing routine risk assessments that take risks like fraud, contamination, and mislabelling into account regarding their likelihood, impact, and severity. Use of a systematic risk management process will enable companies to: include measures to be taken based on the effect of product integrity and consumer health (Sadiq & Fazal, 2022).

Automates and Enhances Supply Chain Transparency.

Including technologies like blockchain and traceability systems into the supply chain can increase transparency and help mitigate fraud. Through this innovation, the halal food chain from production to retail can be monitored in real-time. As an example, the use of blockchain can offer an immutable record of product certification, helping to reduce the risk of fraud and increase consumer trust (Toloie et. al., 2023; Zaheer et al., 2021).

Enhancing Collaboration with Certification Bodies

Continuous engagement with halal certification authorities to uphold standards in halal. Regular and rigorous audits by credible certification bodies like JAKIM (Malaysia) and MUI (Indonesia) ensure halal compliance of companies. By doing this, organizations can build partnerships with these agencies to understand the external audits better, and ensure that companies are aware of the latest certification and compliance standards to avoid complications later on (Khidzir et al., 2021).

Information about Ongoing Education and Training

Providing continuous training for employees and stakeholders across the halal supply chain is a crucial step towards minimizing human error and facilitating consistent compliance with halal standards. Companies need to conduct regular training sessions focusing on halal certification requirements, risk mitigation strategies, and best practices for preventing contamination and mislabelling. This promotes sensitivity and alertness of the people [reducing the risk called] 'the human factor' (Khidzir et al., 2021), in addition to ensuring compliance.

Organized below these three tiers are the data style update, the intel on potential issues and an increased collaboration with those involved with the supply chain to implement all of the above information into risk management, not simply technological and procedural strategies. Through a holistic and collaborative approach, companies can strengthen halal supply chain resilience and maintain consumer confidence in halal-certified products.

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