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Cracking the Code: Unveiling halal warehousing breach factors through regulators, warehouse operators, technology innovators and accelerators

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Abstract
This study explores key factors contributing to breaches in halal warehousing from the perspectives of regulators, operators, technology innovators, and accelerators. Using interviews and thematic analysis, it identifies major vulnerabilities, including integrity issues, fraud, weak governance, poor control mechanisms, communication breakdowns with authorities, ethical concerns, and procedural gaps. The study highlights the potential of technologies such as blockchain, IoT, and AI to improve transparency, traceability, and compliance. However, the research is limited by its single geographical focus and limited technological analysis. Future studies should further investigate technology implementation challenges and opportunities in halal warehousing and supply chains.

Keywords: Halal Warehousing; Halal Breach Factors; Halal Supply Chain; Halal Integrity.

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1.0 Introduction

A warehouse is a facility for storing finished products that have just been manufactured, where they are temporarily stored before being distributed to retailers or end-users. The primary objective of the warehouse is to protect the products from theft and to prevent any damage or spoilage that could affect their quality. Another key concern is ensuring the security of products' halal status, particularly for food, pharmaceutical, or health-related products that have been certified halal due to their ingredients and manufacturing processes are sustained.

The importance of the warehouse lies in maintaining the halal status of these products and ensuring their safe delivery to end users while preserving their original halal certification. Unfortunately, some halal warehouses are no longer reliably secure. Certain irresponsible operators have misused their halal-certified facilities by storing non-halal products, which creates a risk of cross-contamination and threatens the integrity of halal products. As Omar et al. (2018) highlight, warehousing is a critical aspect of the halal supply chain, where the potential for cross-contamination with non-halal products jeopardizes the integrity of halal goods. The industry faces significant challenges in enforcing halal-related regulations and managing halal supply chains (Ruzulan et al., 2023).

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1.1 Statement of the problem

The Halal food industry has become complex, with a rising global demand for Halal-certified product from increasing of awareness level and knowledge of the consumers among muslims and non- muslims (Zulfakar et al., 2014; Chong et al., 2021)The primary purpose of a halal warehouse is to preserve the halal status of certified products, ensuring they are protected from cross-contamination with non-halal products. This includes preventing contact between products or contamination through water spillage, which could potentially compromise their halal status. The goal of halal warehousing is to minimize these risks and maintain the integrity of halal products.

One notable case occurred, known as the "Meat Cartel Syndicate," where a halal-certified warehouse was used to receive, mix, and repack both halal and non-halal imported meat under different brand names. This incident did not happen by accident but was carried out intentionally, perhaps to maximize warehouse productivity. The Meat Cartel Syndicate has been linked to food falsification, substituting non-halal meat products for halal ones, which has severely undermined consumer trust and confidence for halal certification in Malaysia and has raised significant attention throughout the nation (Rozlin and Ramli, 2020; Adam, 2021). Unfortunately, this action has tarnished the reputation of halal warehouse operators in Malaysia, as the responsibility and trust given by the authorities were betrayed and misused by some operators. At the international level, the implementation of halal warehousing models remains limited, which may potentially compromise the halal status of halal-certified products. This paper aims to investigate the factors leading to security breaches in halal warehouses.

1.2 Research objective

Since this case has severely impacted on the reputation of halal warehouse operators, the objective of this paper is as follows:
To investigate the factors contributing to security breaches in halal warehouses from the perspectives of regulators, approved halal operators, and innovation accelerator agencies in Malaysia.

1.3 Gaps in current research

Below are the lists of research papers related to the Halal warehouse security area. The lists are purposely used to differentiate the intention and objective of those papers, which can reveal the gap that can be focused on for this research. The existing literature emphasizes the significance of halal certification, halal standards, and traceability in maintaining the integrity of the halal supply chain (Omar et al., 2018).

Table 1. List of previous research papers related to Halal warehouse from the Scopus database from 2014 to 2023.

No.	Research Title	Author	Year Publish	Keywords
1.	Technology application in halal logistics: transport and warehouse perspective	Wan-Chik R.Z.; Khairuddin M.M.B.; Rahman N.A.A.	2023	Not mentioned in the article
2.	Implementation of halal logistics in halal pharmaceutical industry: a study on halal warehouse system in pharmaniaga life science	Wong M.S.M.A.; Hussin Z.-I.; Moidin S.	2023	Halal Logistics; Halal Pharmaceutical; Halal Requirements; Halal Warehouse
3.	Challenges faced by halal warehouse during the implementation of Islamic Shariah compliance: Malaysian perspective	Ismail I.A.; Rozar N.M.; Usman I.; Menhat M.; Kamaruddine S.A.; Razik M.A.	2023	Challengers, Halal Warehouse, Islamic Shariah Compliance, Malaysia
4.	Implementing air cargo halal warehouse: insight from Malaysia	Abdul Rahman N.A.; Mohammad M.F.; Abdul Rahim S.; Mohd Noh H.	2018	Air cargo; Challenges; Halal; Halal logistics; Halal warehouse; Malaysia
5.	Regulator's perspective on halal air cargo warehouse compliance	Khairuddin M.M.; Rahman N.A.A.; Mohammad M.F.; Majid Z.A.; Ahmad M.F.	2018	Halal compliance; Halal integrity; Halal warehouse; Regulator
6.	Applying the TOE framework in the halal warehouse adoption study	Ngah A.H.; Zainuddin Y.; Thurasamy R.	2017	Barriers; Contributing factors; Enabler; Halal warehouse adoption; PLS; TOE framework
7.	Contributing factors of halal warehouse adoption	Ngah A.H.; Zainuddin Y.; Thurasamy R.	2014	Not mentioned in the article

2.0 Literature Review

2.1 The Halal concept eco-system

In Malaysia, the concept of Halalan Toyyiban is implemented across the food industry through various approaches, including production, processing, manufacturing, distribution, and marketing. This involves compliance with Shariah law, which is formalized through the development of halal standards, certification programs, and control systems. Key frameworks, such as MS1500:2009, provide guidelines on halal food production and handling. Although halal certification is voluntary, it is offered by recognized bodies such as JAKIM, JAIN, and MAIN to ensure products meet halal standards and prevent misuse of the halal logo, as governed by the Trade Descriptions Act 2011 (APD 2011) (Zawanah et al., 2008).

Efforts to strengthen the practice of Halalan Toyyiban are ongoing, with a focus on increasing awareness of halal certification procedures among entrepreneurs. This engagement is crucial, as consumers increasingly seek products that are certified halal, which assures purity, cleanliness, and quality. Understanding both religious and economic demands is essential, particularly in developing Muslim entrepreneurs in the halal food processing industry (Zawanah et al., 2008).

2.2 Halal Warehouse Non-Compliant Factors

The management of halal warehouses requires strict adherence to halal standards to prevent breaches and ensure compliance with these standards for maintaining the integrity of halal products. The typical non-compliance issues found in halal warehousing:

i. Cross-Contamination (mix of product status)
   Issue: This occurs when halal products meet non-halal or doubtful items. This can occur due to inadequate segregation during storage or transportation.
ii. Improper Storage Conditions
   Issue: Failing to maintain specific environmental conditions, such as temperature and humidity, can compromise the halal status of sensitive products.
iii. No dedicated equipment for handling Halal products
   Issue: The use of non-dedicated equipment, like forklifts and other handling tools, for halal products will jeopardize the halal status.
iv. Inadequate Documentation and Traceability
   Issue: A lack of proper documentation or traceability can lead to breaches in halal compliance, making it difficult to verify the halal status of products.
v. Lack of Staff Training
   Issue: Employees unaware of or untrained in halal standards can inadvertently cause compliance issues.
vi. Non-Compliance with Halal Certification Requirements
   Issue: Some warehouses may not fully comply with the specific certification requirements set by halal certifying bodies.
vii. Improper Handling and Transportation
   Issue: Mishandling during loading, unloading, and transport can lead to breaches, such as physical damage, that expose products to contamination.

3.0 Research Methodology

This research employs a qualitative approach to gather data and insights from selected informants. The qualitative method was chosen to enable an in-depth exploration of specific and critical areas, particularly the breach factors in halal warehousing, which require detailed understanding and contextual interpretation. Quantitative methods were deemed unsuitable for this study, as they are primarily used for measurement and comparison, whereas qualitative methods are more appropriate for exploring characteristics, perspectives, and underlying meanings. Purposive sampling is employed to select specific individuals to participate in the interview sessions. Careful selection of informants is a critical element to ensure the output effectively addresses the research objectives. The list of informants is presented in Table 3.1 The interviews were conducted using a semi-structured format, either face-to-face or online interview via platforms such as Microsoft Teams, depending on the availability of the informants. This semi-structured approach allowed flexibility in the sequencing of questions, thereby optimizing interview time, as some topics were naturally addressed through the flow of conversation.

The interview transcripts were analyzed using thematic analysis. This involved a systematic coding process, beginning with open coding, where meaningful words, phrases, and sentences were identified and labeled. These initial codes were then grouped into related categories through axial coding, allowing relationships and patterns to emerge across the data. Finally, selective coding was applied to refine and integrate the categories into overarching themes that represent the implied meanings within the interview data. These themes subsequently formed the basis of the research findings.

Table 3.1: List of informants

No.	Informant code	Industry/ Department	Position	Experience
1.	JKM1	Regulator	Deputy director	10 years
2.	JKM2	Regulator	officer	10 years
3.	MYS1	Technology accelerator	Director	10 years
4.	MYS2	Technology accelerator	Officer	10 years
5.	MMS	Technology innovator	Officer	10 years
6.	MRT	Technology innovator	Officer	10 years
7.	NP	Warehouse operator (sea freight)	Deputy director	10 years
8.	CL	Warehouse operator (ground freight)	Manager	10 years
9.	DBS	Warehouse operator (multi-modal)	Manager	10 years
10.	MSK	Warehouse operator (airfreight)	Manager	10 years

4.0 Discussion

This research aims to investigate the factors leading to halal warehouse breaches from the perspectives of the regulator, technology accelerator and innovator, and ultimately from the halal warehouse operator. From the interview with these informants, the finding of factors as per below:

4.1 Integrity Issues

Respondents frequently highlighted breaches related to a lack of integrity across different stakeholders in the halal warehousing process.

JKM1 : Noted that "the company itself may intend to betray" and that "there is no transparency, and these lead to the exploitation of system weaknesses.
JKM2 : Highlighted "employees themselves, whether it is an issue of integrity or fear of fraud.
MYS1 : Emphasized how important it is to ensure the staff in the warehouse have high integrity.
MRT : Suggested that "the ethics of the warehouse owner themselves are often compromised.
MMS : Raised concerns about "bad intentions" and groups who seek profits unlawfully.

No.	Informants feedback categories	Theme
i.	Untrustworthy	
ii.	Betrayal	Integrity issues
iii.	Opportunist attitude	

The informant's feedback reveals several key themes regarding the factors that lead to breaches in halal warehousing processes. One of the most prominent themes is integrity issues, which are frequently mentioned by the informants. Many cited that a lack of integrity among employees, management, and even external stakeholders is a major contributing factor. For instance, JKM1 pointed out that companies themselves may engage in dishonest practices, exploiting weaknesses in the system due to a lack of transparency. MYS1 also emphasized the importance of ensuring that warehouse staff uphold high standards of integrity, while MRT and MMS highlighted how unethical behavior and bad intentions by individuals seeking profit often led to breaches.

4.2 Fraud and Misappropriation

Several respondents referred to fraud and misappropriation, highlighting how these acts breach the halal warehousing process:

JKM2 : Discussed "fraud" and the risk of "misappropriation".
MRT : Noted how "misappropriation occurs due to the ethics of the entrepreneur."
MKG : Talked about fraud being "beyond MAS Cargo's operational control" when "shippers don't declare correctly."
NP : Related it to "false declarations", connecting the issue to the infamous "meat cartel case."

No.	Informants feedback categories	Theme
i.	Fraudulent actions	
ii.	False declarations	Fraud and misappropriation
iii.	Misleading information	

Another significant theme is fraud and misappropriation, which frequently arises in the feedback. Respondents from JKM2, MRT, and MKG reported various fraudulent practices, including falsifying documents, incorrect declarations, and unethical storage practices that compromise the integrity of halal products. NP highlighted the infamous "meat cartel" case as an example of how false declarations can disrupt the halal supply chain. Incorrect declarations of transported goods and fraudulent transport companies can significantly increase logistics costs and disrupt operations (Cempirek et al., 2016).

4.3 Weak Governance and Lack of Control

A recurring issue is the lack of robust governance and control systems in halal warehousing:

JKM2 : Mentioned "weak governance within the company", which can lead to mismanagement.
DB : Pointed out that breaches happen because "there is no control and no monitoring."
MMS : Described "opportunities and easy ways for people to escape" due to "lacking monitoring and self-control."

No.	Informants feedback categories	Theme
i.	Poor control and monitoring of the process	
ii.	Lack of mandatory procedures	Weak governance and lack of control
iii.	Lack of adherence to SOP.	

Weak governance and lack of control also surfaced as an important issue. Several respondents, including JK2 and DBS, expressed concerns about the absence of proper monitoring and oversight. Poor governance within companies, along with insufficient control over operations, allows opportunities for unethical behavior. MMS noted that the lack of self-control and inadequate monitoring in the warehousing system creates an environment ripe for breaches.

4.4 Authority Involvement and Communication Breakdown

Respondents emphasized the role of external authorities and the gaps in communication that could lead to breaches:

MKG : Stressed that fraud is beyond control because the shipper and the authorities prepare documentation.

MKG : Also mentioned how "enforcement agencies like MAQIS and customs" play a part, but if declarations are wrong, our integrity could be compromised.

No.	Informants feedback categories	Theme
i.	Non-transparency	Authority involvement and communication breakdown
ii.	Exploiting weaknesses	
iii.	Errors in the declaration	
iv.	Failure of communication between parties	

The role of external authorities and communication breakdowns was another theme that emerged. Respondents, such as MKG, highlighted the involvement of authorities like MAQIS and customs in halal security processes. However, gaps in communication between shippers, authorities, and service providers, such as incorrect declarations or failure to communicate business changes, often lead to breaches that are beyond the control of warehousing operators.

4.5 Ethical Practices of Warehouse Owners

The ethical conduct of warehouse operators was a consistent concern, with respondents pointing to unethical behaviour by these individuals:

MRT : Stated that the "warehouse owner's ethics" were often compromised, leading to breaches.

DBS : Mentioned how warehouse owners who are "not serious" about halal security engage in "betrayal" by storing both halal and non-halal items together.

No.	Informants feedback categories	Theme
i.	Unethical attitude	Ethical practices of warehouse owners
ii.	Lack of religious understanding	

Respondents also raised concerns about the ethical practices of warehouse owners. Several respondents, including MRTI and DBS, noted that warehouse operators sometimes fail to take halal standards seriously. This negligence often leads to breaches, such as storing halal and non-halal items together, or allowing fraudulent practices to take place to maximize profits at the expense of halal compliance.

4.6 Systemic Gaps and Procedural Weaknesses

Some respondents pointed to gaps in procedures and weaknesses in the system that allow breaches to happen:

MMS : Highlighted "many gaps" in warehouses that do not have "mandatory procedures."

MKG : Emphasized the importance of "following SOPs" but noted that some gaps allow breaches when procedures are not strictly enforced.

No.	Informants feedback categories	Theme
i.	Gaps in the process	Systemic gaps and procedural weaknesses
ii.	Waiver of established procedures	

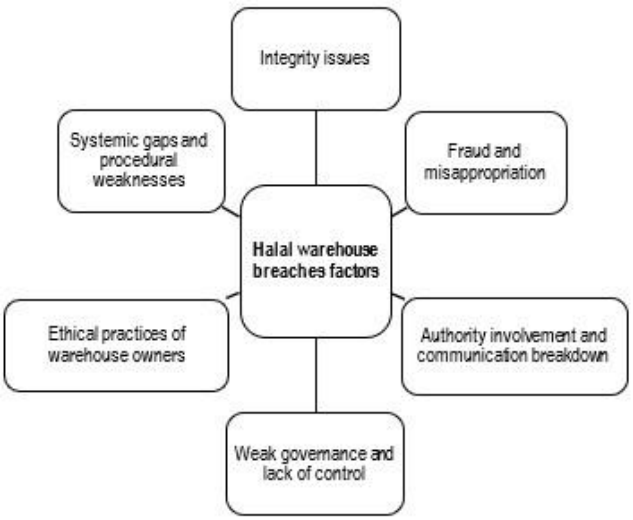


Figure 4.1: Halal warehouse breach factor security model

Lastly, the theme of systemic gaps and procedural weaknesses was discussed. MMS highlighted the numerous gaps in halal warehousing processes, including the lack of mandatory procedures and proper Standard Operating Procedures (SOPs). MKG further emphasized that adherence to standardized procedures is crucial, but noted that these are not always followed strictly, which leaves room for halal breaches.

5.0 Conclusion

This study contributes to identifying the factors that lead to breaches in Halal warehouses that result in the cross-contamination of halal products. These factors can serve as a valuable reference for raising awareness among halal warehouse operators and management teams. By understanding and addressing these factors, operators can lighten consumers' concerns on the halal status products, particularly meat and poultry. Awareness of these risks will help minimize the potential for cross-contamination, ensuring greater trust in the handling of Halal products. The study concludes that breaches in halal warehousing are primarily driven by integrity issues, weak governance and a lack of control, as well as fraud and misappropriation, authority involvement, communication breakdowns, systemic gaps and procedural weaknesses, as shown in Figure 4.1. These breaches pose significant risks to consumer trust. One limitation of this study is its limited emphasis on exploring technological solutions. Future studies could provide a more in-depth analysis of how technology can be integrated into halal warehousing.

A key recommendation for future research is to focus on integrating advanced technologies, such as blockchain, the Internet of Things (IoT), and artificial intelligence (AI), into halal warehousing. These technologies could significantly enhance transparency and traceability throughout the supply chain, ensuring that halal-certified products maintain their integrity from production to distribution. By integrating these technologies, halal warehouses can adopt a more proactive approach to risk management, improving compliance and operational efficiency. The potential of technology was acknowledged, the exploration of how different technologies can be used to prevent fraud in halal warehouses.

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Paper Contribution to the Related Field of Study

This study advances halal logistics scholarship by identifying critical warehousing vulnerabilities across governance, ethics, control, and communication. It synthesizes multi-stakeholder perspectives and evidences the promise of blockchain, IoT, and AI for transparency and compliance, providing a foundation for policy reform and future technology-enabled halal supply chain research and implementation pathways.

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