

Navigating Halal Compliance in the Maritime Industry: A Systematic Analysis of Challenges and Best Practices

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Abstract – Halal food management within the maritime industry presents unique challenges due to the complex global supply chain, inconsistent halal certification standards, and risks of cross-contamination. Despite the growing demand for halal-certified food among Muslim seafarers and passengers, maritime operators face significant hurdles in ensuring compliance with halal regulations. This study conducts a systematic meta-analysis using the PRISMA framework to identify the key challenges, regulatory gaps, and best practices in maritime halal food logistics. The findings highlight the need for harmonised certification processes, improved traceability mechanisms, and the integration of advanced technologies such as blockchain and AI to enhance compliance. The study concludes by proposing a structured framework to optimise halal food management in maritime operations.

Keywords: blockchain technology, certification standards, halal food logistics, maritime industry, supply chain management

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1.0 INTRODUCTION

Halal food management is an essential component of the global food industry, ensuring that food production, transportation, and consumption adhere to Islamic principles. While various sectors have developed robust halal food supply chains, the maritime industry remains an underexplored domain despite its critical role in global food transportation. The complexity of the maritime supply chain, involving multiple intermediaries and ports with varying halal certification standards, presents significant challenges in maintaining halal food integrity (Gezgin et al., 2024). Additionally, cross-contamination risks, improper segregation of Halal and non-Halal goods, combined with insufficient personnel training, increase the risk of cross-contamination and complicate compliance efforts (Ali et al., 2021).

The maritime industry operates under international regulations such as those set by the International Maritime Organisation (IMO) and the Maritime Labour Convention (MLC), which emphasise hygiene and food safety but lack specific guidelines for halal compliance (International Maritime Organization (IMO), 2022). This study aims to address these gaps by systematically analysing existing literature on halal food logistics within maritime operations. By leveraging the PRISMA framework, this research identifies key challenges, evaluates existing regulatory measures, and proposes best practices to ensure effective halal food management at sea. The study further explores technological advancements such as blockchain and AI-driven monitoring systems as potential solutions to enhance transparency, traceability, and compliance in halal food logistics (Sunmola et al., 2025).

2.0 LITERATURE REVIEW

2.1 Halal Food Management in the Maritime Industry

Ensuring halal integrity throughout the maritime supply chain requires adherence to strict logistical protocols. Key measures include utilising halal-certified storage and goods facilities, maintaining clear

segregation between halal and non-halal goods, and implementing standardised halal compliance practices (LBB International, 2024). Companies like Nippon Express and Yusen Logistics have adopted halal logistics solutions, including dedicated storage facilities and certification programs, to mitigate risks of cross-contamination (Nippon Express, 2025; Yusen Logistics, 2025).

The IMO and MLC provide general guidelines on food safety and hygiene aboard ships, but their lack of specificity regarding halal compliance necessitates additional measures. Best practices include the development of onboard halal food policies, crew training programs, and regular halal compliance audits. Additionally, sourcing food supplies from certified halal providers and integrating digital certification systems can improve transparency and regulatory adherence (International Labour Organization (ILO), 2022).

2.2 Challenges in Halal Food Logistics

The primary challenges in maritime Halal food logistics include cross-contamination risks, inconsistent certification standards, and limited traceability mechanisms. Inadequate segregation protocols in ports and onboard vessels heighten the risk of contamination, while the absence of a unified global Halal certification standard leads to discrepancies in compliance requirements across different regions. These inconsistencies complicate shipping operations and pose regulatory challenges for maritime food suppliers (Abd Aziz et al., 2024).

To mitigate these risks, traceability systems are essential in ensuring the integrity of Halal food throughout transportation. Blockchain technology and AI-driven monitoring provide potential solutions by establishing a secure and verifiable record of product movement and certification status. These digital solutions can bridge regulatory gaps and enhance compliance in maritime food logistics, ensuring greater transparency and efficiency (Masudin et al., 2022; Sunmola et al., 2025).

2.3 Regulatory Frameworks and Standards

Regulatory inconsistencies pose a significant challenge in maritime halal food management. International organisations such as the Islamic Development Bank (IsDB) and the Standards and Metrology Institute for Islamic Countries (SMIIC) have established halal food standards, but their implementation remains uneven across maritime operations (Wace, 2018). Different countries enforce varying certification schemes, leading to logistical obstacles for halal food transportation.

To standardise halal compliance, policymakers must work towards harmonising global certification processes and establishing clear halal-specific protocols in ports. The adoption of international halal standards can improve consistency and facilitate smoother operations in maritime food logistics. Furthermore, enhanced regulatory oversight and increased collaboration between certification bodies can strengthen the halal supply chain.

3.0 RESEARCH METHODOLOGY

This study employs a systematic review methodology using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure a rigorous and comprehensive analysis of halal food management in the maritime industry. The research follows four key phases: identification, screening, eligibility, and inclusion.

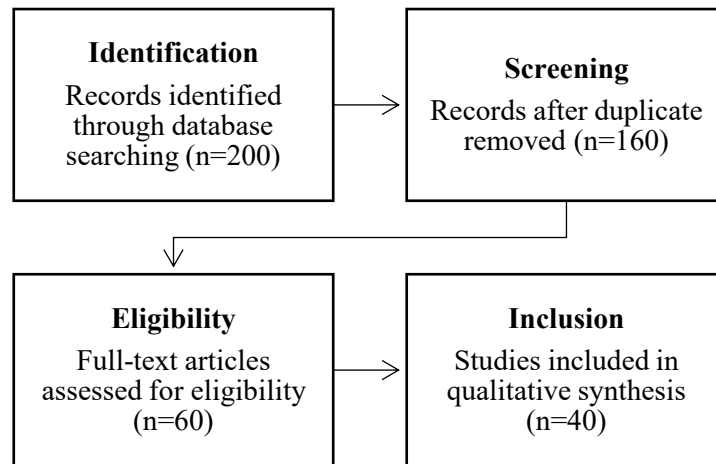


Figure 1: PRISMA Flow Diagram will be inserted here to illustrate the identification, screening, eligibility, and inclusion process

1. Identification: A comprehensive literature search was conducted using databases such as Scopus, Web of Science, and Google Scholar. The search utilised keywords such as "halal food logistics," "maritime industry halal compliance," "halal certification in shipping," and "blockchain in halal logistics." Only peer-reviewed journal articles and industry reports published between 2022 and 2025 were considered. Articles prior to 2022 were excluded to ensure the review reflects the most recent developments in halal logistics, especially considering the rapid technological advancements and regulatory changes in recent years.
2. Screening: Duplicates and irrelevant studies were removed. Studies that did not focus on halal food in maritime logistics were excluded.
3. Eligibility: Full-text articles were assessed for relevance based on predefined inclusion criteria:
 - (a) relevance to halal food logistics
 - (b) application to maritime industry operations, and
 - (c) inclusion of regulatory, technological, or operational perspectives. Studies lacking empirical or theoretical relevance were excluded.
4. Inclusion: A total of 40 studies met the criteria and were included in the review. The selected studies were analysed to extract key themes related to challenges, regulatory frameworks, and best practices in halal food management within maritime logistics.

4.0 FINDINGS AND DISCUSSION

The review of 40 selected articles revealed that approximately one-third addressed regulatory fragmentation, another one-third discussed supply chain inefficiencies, and the remainder focused on technological adoption challenges. This distribution underscores the need for balanced attention to all three aspects.

The meta-analysis highlights three major challenges in Halal food logistics: regulatory fragmentation, supply chain inefficiencies, and limited technological adoption. The lack of standardised Halal-specific handling protocols at ports and onboard vessels increases the risk of non-compliance and cross-contamination (Masudin et al., 2022). Additionally, varying certification standards across jurisdictions create operational hurdles for shipping companies, requiring extra layers of verification.

The study also finds that emerging technologies such as blockchain and AI present viable solutions to enhance traceability and regulatory adherence. These innovations not only help in maintaining an

unalterable record of Halal certification but also streamline real-time tracking of food products throughout maritime logistics networks. Furthermore, structured Halal compliance training for maritime personnel is essential to strengthen best practices and mitigate operational risks.

5.0 CONCLUSION

Ensuring the integrity of Halal food in maritime logistics requires a holistic approach that addresses regulatory inconsistencies, supply chain vulnerabilities, and technological limitations. This study underscores the urgent need for harmonised Halal certification standards, coupled with improved traceability systems to safeguard Halal food integrity across international shipping routes.

The integration of blockchain and AI technologies offers a promising pathway to enhance compliance, reduce operational inefficiencies, and strengthen food security measures. Future research should focus on developing standardised international Halal regulations for maritime operations, exploring the feasibility of implementing blockchain-driven solutions, and identifying cost-effective strategies for widespread adoption. Collaborative efforts among policymakers, industry stakeholders, and certification bodies are crucial to establishing a seamless and globally recognised Halal food supply chain in the maritime sector. This aligns with findings from Masudin et al. (2022) on traceability systems and Sunmola et al. (2025) on AI-driven halal compliance frameworks, further supporting the feasibility of the proposed framework.

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