Agrociencia

UNLEASHING HALAL POTENTIAL: EXPLORING THE DYNAMICS OF HALAL LOGISTICS IN TANGERANG CITY, INDONESIA

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Citation: Nurhayati N, Chelbi A, Mabrouk AB, Young FC. 2025. Unleashing halal potential: exploring the dynamics of halal logistics in Tangerang City, Indonesia. **Agrociencia.** https://doi.org/ 10.47163/agrociencia.v59i3.3272

Editor in Chief:
Dr. Fernando C. Gómez Merino

Received: July 16, 2024.
Approved: January 17, 2025.
Published in Agrociencia: March 25, 2025.

ABSTRACT

The rapid expansion of the global halal market has increased the demand for efficient and standardized halal logistics. This study examines key challenges and enablers of halal logistics implementation in Tangerang City, Indonesia, a region experiencing significant growth in halal consumerism. Using a quantitative cross-sectional approach, data were collected from 170 consumers across diverse social backgrounds. The survey, distributed via Google Forms, was analyzed using structural equation modeling (SEM) with WrapPLS to identify key logistics barriers and improvement opportunities. The findings reveal three major challenges: 1) inconsistent halal certification processes, causing compliance confusion; 2) low consumer awareness, impacting purchasing confidence; and 3) weak stakeholder collaboration, leading to inefficiencies. The study also identifies four key enablers: 1) technology adoption, particularly tracking systems and digital platforms to enhance supply chain transparency and operational efficiency; 2) education and training programs to improve halal literacy among logistics professionals and consumers; 3) regulatory harmonization and stakeholder collaboration to ensure smoother implementation of halal logistics; and 4) optimized transportation solutions to maintain halal integrity and improve delivery efficiency.

Keywords: public awareness, information systems, information technology, regulations.

INTRODUCTION

The global market is increasing the demand for halal products that adhere to the teachings of the Islamic religion. Indonesia, as the country with the largest Muslim population in the world, has a big responsibility to ensure the production and distribution of quality halal products (Soesilowati and Yuliana, 2013). Challenges

remain in ensuring the halal status of these products, especially in terms of logistics (Aziz and Zailani, 2016). Poorly managed logistics can lead to cross-contamination, violations of halal standards, and uncertainty in the halal supply chain (Zainuddin *et al*., 2020).

Halal logistics, according to Islamic principles, is a process that ensures that all aspects of the delivery of goods and services, including processing, production, storage, transportation, and distribution, do not contain haram or non-halal elements (Nafis, 2019; Gunardi, 2023). This requires the inspection and supervision of goods and their production processes in order to ensure the halal and cleanliness of products (Alfarizi, 2022), as well as meeting the requirements of Muslim consumers (Putra *et al*., 2023).

Companies must ensure that all activities carried out during the production process do not violate Islamic law, such as avoiding the use of non-halal materials and maintaining the cleanliness of the work environment (Mahmudah *et al*., 2022). Halal logistics must be carried out in accordance with Islamic law, which includes storage that is clean and free of contamination (Ahmad and Shariff, 2016). Transportation must be carried out using halal means of transportation while avoiding the use of non-halal means (Dewi and Trihardani, 2017). Distribution must ensure that the products are not contaminated during the handling, storage, and distribution processes (Kurniawati *et al*., 2022).

A well-integrated logistics system is an important aspect of ensuring halal production. (Mu'ti sazali and Ligte, 2019). This study investigates the factors that support the implementation of halal logistics and its strategies in Indonesia, with a focus on studies in Tangerang City, which raises a number of pertinent questions: 1) How does public awareness affect the implementation of halal logistics? 2) Is the information system influencing the implementation of halal logistics? 3) How do information technologies affect the implementation of halal logistics practices? 4) What role does transportation play in facilitating the implementation of halal logistics? And 5) How do regulations influence the implementation of halal logistics in Tangerang City?

The objectives of this study are to 1) examine the impact of public awareness on the implementation of halal logistics in Tangerang City, 2) examine the impact of information systems and technologies on the implementation of halal logistics, 3) investigate the impact of transportation in supporting the implementation of halal logistics, and 4) evaluate the role of regulations in the implementation of halal logistics in Tangerang City. By identifying the factors that play a role, this research aims to provide a better understanding of the implementation of the halal logistics system in Indonesia, particularly in Tangerang City, as well as recommendations to increase its effectiveness.

MATERIALS AND METHODS

This research used a quantitative approach (Creswell and Creswell, 2018) to obtain a comprehensive understanding of the implementation of halal logistics in Tangerang

City. A survey was designed to model the implementation of halal product logistics based on the consumer community's perception of the need for halal products.

Research sample size

The respondents to this study were members of the consumer community in Tangerang City, with 170 selected through a combination of purposive and convenience sampling. The sample was determined based on the requirements of partial least squares structural equation modeling (PLS-SEM), which suggests a minimum sample size of 10 times the number of research survey questions. Given that the survey consisted of 14 items, the required minimum sample size was 140 respondents.

To ensure diversity, respondents were selected randomly from various social and economic backgrounds. The survey was conducted at multiple shopping centers and traditional markets across Tangerang City, where consumers actively make purchasing decisions. These locations were chosen due to their high consumer footfall and relevance to the study's focus on consumer perceptions.

The inclusion criteria required participants to be aged 17 and above and to have a basic understanding of halal and non-halal food and beverages. Since the exact visitor numbers in these locations were unknown, a convenience sampling procedure was used, allowing researchers to approach and survey willing participants on-site. Data collection took place over a specified period, March to April 2024, to capture a representative consumer perspective.

Data collection

The survey was distributed to the consumer communities via Google Forms and WhatsApp to assess their awareness of halal products and perceptions of halal logistics implementation. In addition, secondary data from authoritative sources was used to document the regulatory framework and industry standards regulating halal practices. These sources included official government regulations, halal certification standards issued by the Indonesian Ulama Council (MUI), and guidelines from the Halal Product Assurance Agency (BPJPH). These references were crucial for analyzing how halal logistics principles are implemented and perceived in the market.

Researchers approached consumers directly. Following a brief introduction to potential participants, they were asked to complete the survey within 10 minutes. If the respondent was in a hurry, the researcher provided a survey link via phone/WhatsApp to allow respondents to complete the questionnaire via the Google Forms link provided. Relevant information from willing participants was recorded, including their responses to halal logistics.

Data analysis

Survey data was analyzed using structural equation modeling (SEM) with the warpPLS software (Purwanto *et al*., 2019) to test the relationship between variables and identify factors that impact the application of halal logistics by the consumer community (Wardhani *et al*., 2020).

RESULTS AND DISCUSSION

Participant characteristics

The participant population characteristics (Table 1) showed a balanced gender distribution, allowing for a nuanced analysis of how gender may influence perceptions and awareness of halal logistics. Understanding gender dynamics is essential, as it can impact consumer preferences and decision-making processes in the halal market. Participants are mostly male (53.53 %), with senior high school (52.94 %) being the most common education level and student (62.35 %) being the most frequent occupation.

The age distribution, educational background, and socioeconomic status of the respondents are critical factors that can affect awareness and understanding of halal logistics. For instance, younger consumers may exhibit different attitudes towards halal products compared to older generations, influenced by varying levels of education and exposure to halal standards. The educational background correlates with the level of awareness and understanding of halal logistics. Higher education levels may lead to greater awareness of halal certification processes and the importance of logistics in maintaining product integrity. Furthermore, socioeconomic status can influence purchasing power and access to halal products, thereby affecting consumer behavior in the halal market. By analyzing these demographic factors, the study aims to identify trends and patterns that can inform strategies for enhancing halal logistics practices and consumer engagement.

Consumer awareness is a critical factor influencing halal logistics adoption. This study finds that higher awareness levels significantly impact halal logistics implementation in Tangerang City ($p < 0.001$), highlighting the role of public knowledge in ensuring compliance. Rahman *et al.* (2021) similarly emphasize that consumers with greater

Table 1. Respondent characteristics from the consumer perception survey of halal logistics conducted in Tangerang City, Indonesia, in 2024.

Gender	Frequency	Percentage
Male	91	53.53
Female	79	46.47
Education		
Postgraduate	13	7.65
Under graduate	60	35.29
Senior high school	90	52.94
Junior high school	7	4.12
Occupation		
Teacher/Lecturer	4	2.35
Entrepreneurship	18	10.59
Employment	38	22.35
Students	106	62.35
Labor/Farmer	4	2.35

halal awareness demonstrate stronger trust and purchasing behavior toward halal-compliant businesses. The correlation between education and halal logistics awareness (Table 1) aligns with Rahman *et al*. (2021), who found that exposure to halal-related education enhances consumer preferences for halal-certified products. These findings reinforce the need for targeted educational programs and awareness campaigns to enhance consumer confidence, drive market competitiveness, and promote sustainable halal logistics practices.

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Traceability is a crucial aspect of halal logistics, ensuring transparency and compliance throughout the supply chain. This study highlights the need for enhanced digital tracking and monitoring systems to maintain halal integrity. Sayogo (2018) emphasizes that online traceability systems significantly improve consumer trust by providing real-time access to halal product information, reducing uncertainty in the supply chain. Integrating digital traceability tools, such as blockchain and IoT-based tracking, can strengthen supply chain transparency, preventing cross-contamination risks and ensuring adherence to halal certification requirements. As the halal logistics sector evolves, technological advancements in traceability will be key to reinforcing compliance and consumer confidence.

Sustainability in halal logistics is increasingly vital, with the integration of green supply chain practices enhancing both compliance and environmental responsibility. This study highlights the importance of eco-friendly logistics solutions to maintain halal integrity while minimizing environmental impact. Firdiansyah *et al*. (2021) emphasize that green supply chain management (GSCM) can improve halal logistics efficiency by reducing waste, optimizing transportation, and ensuring sustainable resource utilization.

Effective stakeholder collaboration is essential for ensuring seamless halal logistics implementation. This study highlights the need for stronger partnerships between producers, distributors, certification bodies, and regulatory authorities to enhance compliance and efficiency. Haleem *et al*. (2021) emphasize that collaborative efforts among key stakeholders improve logistical coordination, reduce operational bottlenecks, and strengthen halal supply chain transparency. Enhancing communication channels, establishing standardized guidelines, and fostering cooperation between halal certification agencies and logistics providers can streamline halal compliance. As the halal logistics ecosystem expands, stakeholder collaboration will be instrumental in ensuring regulatory alignment, operational efficiency, and consumer trust.

The effectiveness of halal logistics services plays a crucial role in enhancing industry performance and market competitiveness. Well-integrated halal logistics frameworks

contribute to operational efficiency, regulatory compliance, and consumer trust. Noorliza (2020) found that businesses that implemented structured halal logistics services had better supply chain resilience, higher customer satisfaction, and stronger brand positioning in the halal market. Optimizing logistics operations, such as streamlined warehousing, halal-certified transportation, and robust supply chain management, can enhance overall industry performance. As the demand for halal products grows, investment in high-quality halal logistics services will be a key differentiator for businesses looking to expand their market share and strengthen their competitive advantage.

Indonesia holds a dominant position in the global halal market, driven by its large Muslim population and increasing demand for halal-certified products. This study highlights the growing importance of halal logistics in supporting Indonesia's expanding halal industry. According to Bank Indonesia (2021), the halal sector has seen rapid development, particularly in food, pharmaceuticals, cosmetics, and logistics, as businesses and policymakers work to strengthen halal certification frameworks. As Indonesia strengthens its halal certification policies and logistics infrastructure, businesses must adapt to evolving regulations and consumer expectations to remain competitive in both domestic and international markets. A well-integrated halal logistics ecosystem will be essential in ensuring that Indonesia maintains its position as a global leader in the halal industry while supporting sustainable economic growth.

Digital transformation is reshaping both financial services and halal logistics, enabling greater efficiency, transparency, and compliance. This study highlights the importance of integrating digital financial solutions with halal logistics to optimize payment systems, enhance supply chain financing, and support traceability. Feyen *et al*. (2021) emphasize that fintech innovations, including blockchain-based smart contracts and digital payment systems, play a crucial role in modernizing halal logistics by improving transaction security and streamlining cross-border trade. Leveraging digital financial services, such as Islamic fintech platforms and real-time payment gateways, can enhance halal logistics operations by reducing delays, increasing financial accessibility for halal businesses, and ensuring seamless regulatory compliance. As halal supply chains become more globalized, digital transformation will be key to bridging gaps between logistics, financial systems, and halal certification authorities, fostering greater market integration and efficiency.

Measurement model analysis (outer model)

The construct variables, as well as their validity and reliability, were evaluated using the outer model of measurement analysis. Internal consistency analysis is used to determine a test's result consistency. This analysis makes use of a composite reliability value, where a variable is considered reliable if its value exceeds 0.7 (Budiastuti and Bandur, 2018; Sarstedt *et al*., 2021). The awareness variable is reliable, as evidenced by a composite reliability score of 0.826 (Table 2) (Utomo and Saragih, 2023). Similarly, the information system (0.798) and information technology (0.765) variables, as well as the regulation (0.805) and implementation (0.863), were found to be reliable.

Table 2. Internal consistency analysis of the halal logistics research survey conducted in Tangerang City, Indonesia, in 2024.

Variable	Cronbach's alpha	Composite reliability	Average variance extracted
Awareness (AW)	0.684	0.826	0.615
Information System (IS)	0.62	0.798	0.569
Information Technology (IT)	0.545	0.765	0.55
Transportation (TR)	0.636	0.873	0.579
Regulation (REG)	0.781	0.805	0.696
Implementation (PERFORM)	0.762	0.863	0.679

In PLS-SEM analysis, in addition to Cronbach's alpha, it is important to consider composite reliability (CR) and the average variance extracted (AVE) (Ahmed and Ishtiaq, 2021). CR is a frequently used alternative to Cronbach's alpha in the context of PLS-SEM. CR is usually considered more informative as it is not affected by the number of items in the construct and can provide a more accurate picture of the construct's reliability. CR values above 0.7 are generally considered adequate. Meanwhile, AVE is used to measure how much variance is explained by the construct compared to the variance caused by error. An AVE value above 0.5 indicates that the construct can explain more than half of the variance in the measured items (Hair *et al*., 2019). Because the CR and AVE values met the requirements, they can be used as a guideline that the reliability of the measurement model is sufficient (reliable).

There was an outer loading indicator value that is smaller than 0.5 (Table 3), so it was necessary to remove the IT_1 indicator from the model. After carrying out the second stage of analysis, it was obtained that the loading values for all indicators already had external loading values above 0.5 so that a structural analysis model could be carried out (Benitez *et al*., 2020).

Structural model (inner model) analysis

Structural model analysis was carried out to test research hypotheses. The coefficient of determination (R square) is used to test the hypothesis (Sarstedt *et al*., 2021). The collinearity test assesses the strength of the correlation between latent variables or constructs. A strong correlation indicates a methodological problem in the model, which could affect the estimate of statistical significance; this is referred to as collinearity. To analyze collinearity, the Variance Inflation Factor (VIF) value is used (Purwanto and Sudargini, 2021). A VIF value above 5.0 indicates a collinearity problem (Sarstedt *et al*., 2022).

All indicators had a VIF of less than 5.0 (Table 4). Thus, the structural model in this case does not contain collinearity problems. The collinearity analysis provides critical insights into the relationships among the latent variables influencing the implementation of halal logistics in Tangerang City. Collinearity refers to the degree of

Table 3. Convergent validity of the halal logistics research survey conducted in Tangerang City, Indonesia, in 2024.

Indicators	AW	IS	IT	REG	TR	PERFORM
AW1	0.837	0.036	0.021	-0.209	0.347	0.041
AW2	0.81	-0.142	-0.014	-0.186	0.107	-0.1
AW3	0.699	0.122	-0.009	0.466	-0.539	0.067
IS1	0.076	0.762	0.153	0.522	-0.692	-0.183
IS2	-0.182	0.778	-0.112	-0.101	0.462	-0.066
IS3	0.116	0.721	-0.04	-0.442	0.234	0.265
IT1	-0.28	0.477	0.345	0.286	-0.415	0.264
IT2	-0.032	-0.191	0.876	-0.066	-0.038	0.109
IT3	0.143	0.003	0.874	-0.047	0.201	-0.213
REG1	-0.166	0.172	0.089	0.792	-0.465	0.035
REG2	-0.006	-0.112	-0.019	0.726	0.15	0.024
REG3	0.178	-0.072	-0.074	0.763	0.34	-0.06
TR1	0.021	0.061	0.047	0.214	0.821	-0.013
TR2	-0.002	0.026	0.067	-0.137	0.803	0.029
PERFORM1	-0.025	0.049	-0.303	0.3	-0.245	0.768
PERFORM2	-0.016	-0.137	0.181	-0.237	0.15	0.844
PERFORM3	0.039	0.091	0.093	-0.035	0.071	0.856

AW: awareness; IS: information system; IT: information technology; REG: regulation; TR: transportation; PERFORM: implementation.

Table 4. Collinearity test results of halal logistics model evaluated in Tangerang City, Indonesia, in 2024.

AW	IS	IT	REG	TR	PERFORM
1.528	1.522	1.518	2.646	3.312	2.254

AW: awareness; IS: information system; IT: information technology; REG: regulation; TR: transportation; PERFORM: implementation.

correlation between independent variables in a regression model, and understanding this aspect is essential for ensuring the validity of the statistical analysis conducted in the study.

The absence of collinearity issues suggests that each independent variable contributes uniquely to the model, allowing to draw meaningful conclusions about the influence of each factor on the implementation of halal logistics. For example, the strong correlation between awareness and the adoption of halal logistics practices can be interpreted without the confounding effects of other variables, leading to clearer insights into how consumer awareness drives industry compliance.

Significance of the structural model path coefficients

The indirect influence hypothesis was evaluated. Testing the significance of the path coefficients of the structural model (Figure 1) is to assess the significance of the relationships or hypotheses in the structural model.

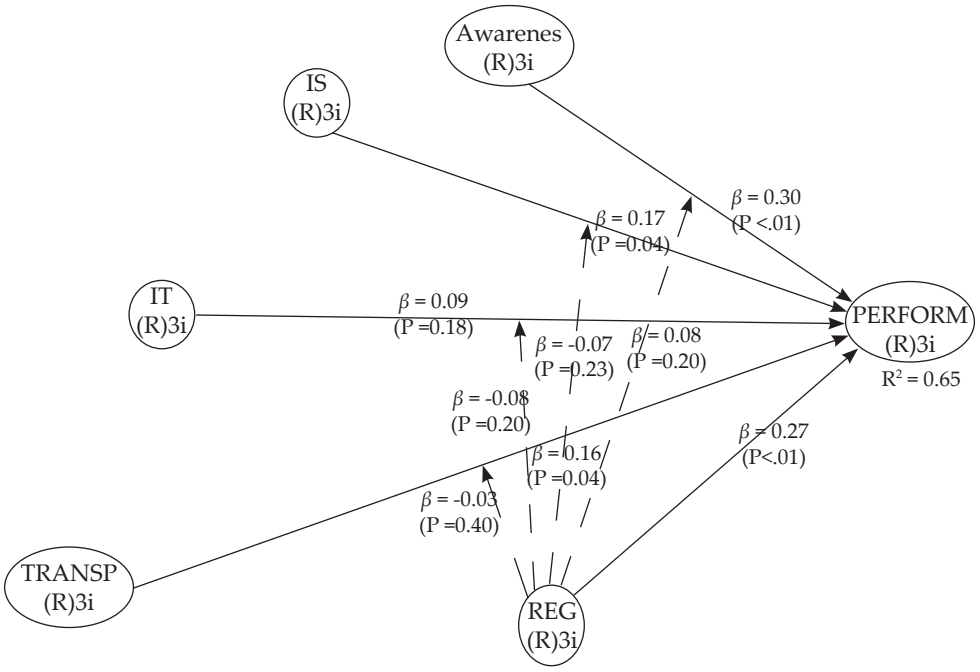

Figure 1. Path diagram of the structural model of halal logistics implementation in Tangerang City, Indonesia, in 2024**.**

The halal logistics implementation model output (Figure 1), which visually encapsulates the relationships and interactions among various factors influencing the implementation of halal logistics in Tangerang City, serves as a conceptual framework that illustrates how different variables contribute to the overall effectiveness of halal logistics practices. The model is structured to show the direct effects of independent variables, such as awareness, information systems, regulations, transportation, and information technology, on the dependent variable, which is the implementation of halal logistics.

Direct effect testing

The purpose of testing the direct influence hypothesis is to demonstrate how a variable directly affects other variables (Setyorini and Syahlani, 2019). A positive path coefficient indicates that when one variable increases, so do the others. Conversely, a negative path coefficient indicates that an increase in one variable results in a decrease

in another. If the *p*-value is below the significance level (alpha) of 0.05, the null hypothesis (*Ho*) is rejected, indicating a significant influence of one variable on others. Conversely, if the *p*-value exceeds alpha (0.05), the null hypothesis (*Ho*) is not rejected, indicating that the influence of one variable on another is not significant (Purwanto and Sudargini, 2021).

The results show that the implementation of halal logistics in Tangerang City is significantly influenced by awareness, information systems, transportation, and government regulations, as evidenced by a *p*-value < 0.05 (Table 5). However, the implementation of halal logistics is not influenced by information technology, as evidenced by a *p*-value of 0.179.

Table 5. Path coefficient of the structural model of halal logistics implementation in Tangerang City, Indonesia, in 2024.

Relationship between Variable	Original sample	*p*-value
Awareness (AW) -> Implementation (PERFORM)	0.305	**< 0.001**
Information system (IS) -> Implementation (PERFORM)	0.172	**0.035**
Information Technology (IT) -> Implementation (PERFORM)	0.089	0.179
Transportation (TR) -> Implementation (PERFORM)	0.265	**0.002**
Regulation (REG)-> Implementation (PERFORM)	0.162	**0.044**

CONCLUSIONS

This study provides empirical insights into the key factors influencing the implementation of halal logistics in Tangerang City, Indonesia, with implications for both academic and industry stakeholders. The findings reveal that public awareness, regulatory frameworks, transportation systems, and integrated information systems significantly drive the successful adoption of halal logistics practices. Among these, consumer awareness emerged as the most influential, underscoring the need for targeted education and outreach initiatives to enhance halal literacy and market responsiveness.

While traditional information technology showed limited direct impact, integrated digital solutions that enhance traceability proved more critical. The limited influence of traditional information technology suggests that real-time monitoring and digital tracking systems offer greater value for ensuring halal integrity. Efficient transportation and strict adherence to regulatory standards are also essential for maintaining halal integrity, consumer trust, and ensuring timely deliveries throughout the supply chain. The findings also emphasize the importance of stakeholder collaboration and regulatory alignment in enhancing supply chain transparency and compliance. To meet the rising demand for halal-certified products and strengthen Indonesia's global

position in the halal industry, investment in infrastructure, education, and strategic partnerships is essential. As Indonesia's halal industry continues to expand, fostering a cohesive logistics ecosystem will be crucial to maintaining global competitiveness and consumer trust.

ACKNOWLEDGEMENTS

The author would like to thank all parties who have helped carry out this research, especially respondents who have participated in this research, reviewers, and editors who provided input and suggestions so that this article was published.

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