

Socialization of *Halal Digital Transformation Cold Chain Last Mile* to Increase Company Transparency and Competitiveness

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Abstract

Digital transformation in last mile logistics can improve transparency and consumer trust, yet many small and medium providers still lack halal traceability knowledge and digital readiness. This community service program supported member companies of the Indonesian Halal Logistics Association in Jakarta to strengthen halal literacy and practical digital documentation for cold chain last mile delivery. The activity combined offline socialization, interactive training, mentoring, and evaluation using pre test and post test questionnaires. Topics included halal traceability principles, halal critical control points, halal regulations under BPJPH and SJPH, use of the SIHALAL system and QR code recording, segregation of halal and non halal products, and drafting simple halal logistics SOPs. Eleven participants joined the program on 14 January 2026. Mean scores improved across all indicators, including traceability knowledge from 52 percent to 85 percent, regulation knowledge from 48 percent to 82 percent, awareness of critical control points from 50 percent to 88 percent, halal digital literacy from 45 percent to 80 percent, and awareness of halal logistics as a strategic value from 55 percent to 90 percent. The program indicates that structured capacity building supported by basic digital tools can accelerate halal logistics adoption and strengthen competitiveness in cold chain last mile services in Indonesia..

Keywords: halal traceability; last-mile delivery; digital transformation; halal logistics; community service

Abstrak

Transformasi digital dalam logistik jarak terakhir dapat meningkatkan transparansi dan kepercayaan konsumen, namun banyak penyedia kecil dan menengah masih kurang memiliki pengetahuan tentang ketertelusuran halal dan kesiapan digital. Program pengabdian masyarakat ini mendukung perusahaan anggota Asosiasi Logistik Halal Indonesia di Jakarta untuk memperkuat literasi halal dan dokumentasi digital praktis untuk pengiriman jarak terakhir rantai dingin. Kegiatan ini menggabungkan sosialisasi tatap muka, pelatihan interaktif, pendampingan, dan evaluasi menggunakan kuesioner pra-uji dan pasca-uji. Topik yang dibahas meliputi prinsip-prinsip ketertelusuran halal, titik kontrol kritis halal, peraturan halal di bawah BPJPH dan SJPH, penggunaan sistem SIHALAL dan pencatatan kode QR, pemisahan produk halal dan non-halal, serta penyusunan SOP logistik halal sederhana. Sebelas peserta bergabung dalam program ini pada 14 Januari 2026. Skor rata-rata meningkat di semua indikator, termasuk pengetahuan tentang ketertelusuran dari 52 persen menjadi 85 persen, pengetahuan tentang regulasi dari 48 persen menjadi 82 persen, kesadaran akan titik kontrol kritis dari 50 persen menjadi 88 persen, literasi digital halal dari 45 persen menjadi 80 persen, dan kesadaran akan logistik halal sebagai nilai strategis dari 55 persen menjadi 90 persen. Program ini menunjukkan bahwa peningkatan kapasitas terstruktur yang didukung oleh alat digital dasar dapat mempercepat adopsi logistik halal dan memperkuat daya saing dalam layanan rantai dingin jarak terakhir di Indonesia.

Kata kunci: ketertelusuran halal; pengiriman jarak terakhir; transformasi digital; logistik halal; pelayanan masyarakat

INTRODUCTION

The logistics sector is among the most rapidly expanding industries in Indonesia. This growth increases the need for competent professionals who possess a solid and comprehensive understanding of logistics handling principles (Lesmini et al., 2021). In this context, digital transformation has become a strategic driver of modern logistics development, particularly in last mile delivery services. The accelerated expansion of e-commerce, shifting consumer expectations, and rising demand for fast, transparent, and reliable delivery have encouraged logistics firms to integrate digital technologies into daily operations (Harsanto et al., 2024). In Indonesia, these changes are increasingly linked with growing public awareness of halal products, which adds further complexity to logistics management, especially in maintaining halal compliance until products reach end consumers. As the country with the largest Muslim population in the world, Indonesia has strong potential to advance the halal industry, including halal logistics, where halal assurance must be safeguarded across the entire supply chain and not only at the production stage (Maulizah & Sugianto, 2024). Halal supply chain traceability and food safety have become critical issues in the food industry, particularly in Indonesia as a Muslim majority country. Prior work has proposed a halal traceability model supported by blockchain and Internet of Things technologies to strengthen transparency, efficiency, consumer trust, and sustainability within food supply chains (Kurniawan et al., 2025). The increasing level of halal awareness has also reshaped consumer behavior, making halal certification and assurance decisive considerations in purchasing decisions. Halal logistics therefore plays a strategic role in protecting product integrity, preventing contamination, and improving distribution efficiency, especially for food and beverage products (Rizaldy et al., 2025). Evidence from previous studies suggests that digital innovation within halal supply chains contributes to better operational performance, stronger transparency, and higher consumer trust (Harsanto et al., 2024). Nevertheless, adoption of digitally enabled halal logistics among small and medium logistics providers remains limited, largely due to constraints in digital literacy, human resource capacity, and technological readiness (Abdul et al., 2025). Within halal logistics, the last mile stage is often considered one of the most vulnerable phases, particularly for cold chain services that manage temperature sensitive products. This stage involves direct interaction between products, couriers, and consumers, which increases the likelihood of halal integrity breaches, including cross contamination and inappropriate handling (Firdaus et al., 2021). Inadequate documentation, weak product segregation, and the absence of integrated digital systems further intensify these risks, positioning last mile delivery as a critical control point for halal assurance. Traceability functions as a central mechanism to ensure transparency and accountability in halal supply chains, enabling systematic tracking and documentation of product origin, handling, and distribution throughout the chain (Sadiyah & Erawati, 2024). In a halal context, traceability provides assurance that halal requirements are consistently

fulfilled from upstream to downstream activities. Digital tools such as QR codes, blockchain, Internet of Things, and RFID can reinforce traceability by improving the accuracy of data recording, monitoring, and verification, which in turn influences Muslim consumers' trust and purchase intention (Jannah & Al Banna, 2021; Shahrudin et al., 2025). Despite its importance, implementation of halal traceability remains relatively low among small and medium logistics companies. Limited conceptual understanding, the lack of dedicated standard operating procedures for halal logistics, and low halal digital literacy continue to be major barriers (Wahyuni & Arfidhila, 2019; Abdul et al., 2025). Many providers still interpret halal compliance as a regulatory burden rather than as a strategic asset that can strengthen competitiveness and consumer confidence. Halal integrity refers to a condition in which a product retains its halal status across the full supply chain and remains free from actions that could compromise compliance (Mohamed et al., 2016). This emphasizes the strategic role of logistics in maintaining halal compliance during transportation, storage, and handling, where effective traceability becomes essential. The application of advanced technologies including Internet of Things, RFID, barcode systems, cloud computing, and blockchain has been reported to improve transparency, data reliability, and accountability within halal supply chains (Siregar & Zahradika, 2023; Anwar et al., 2025). Other studies also indicate that well designed digital traceability systems, supported by Industry 4.0 technologies, can enhance visibility, efficiency, and stakeholder trust, although practical implementation gaps remain (Harsanto et al., 2024). This community service program was implemented in collaboration with cold chain logistics companies affiliated with the Indonesian Halal Logistics Association. Initial observations showed that while partners had applied adequate temperature control, halal related documentation, product segregation, and digital traceability practices were still limited and not yet systematically integrated. The key issues identified included low awareness of halal critical control points in last mile delivery, the absence of halal logistics standard operating procedures, limited familiarity with digital halal systems such as SIHALAL and QR code based traceability, and low managerial recognition of halal logistics as a strategic value. To respond to these challenges, the community service activity aimed to strengthen halal literacy and digital readiness among partner companies through structured socialization and assisted application of halal traceability principles. The program emphasized halal regulations, core traceability concepts, practical introductory digital tools, and recommendations for developing basic halal logistics standard operating procedures. This initiative was designed as an entry level intervention to narrow the gap between conceptual knowledge and operational practice, supporting the development of a transparent, accountable, and competitive halal logistics system aligned with the Indonesian Sharia Economy Masterplan.

GENERAL DESCRIPTION OF THE COMMUNITY, PROBLEMS, AND TARGET SOLUTIONS

General description

The target community of this community service program consists of small and medium-sized logistics service providers operating in last-mile delivery and cold chain distribution. The partner companies are members of the Indonesian Halal Logistics Association (AHLI) and are actively

involved in the distribution of halal food products, seafood, and other temperature-sensitive goods. Demographically, the participants are working-age adults with diverse educational backgrounds, primarily engaged as logistics operators, supervisors, and managerial staff in last-mile and cold chain services.

Geographically, the community is located in urban areas of Jakarta and its surroundings, where last-mile delivery activities are highly concentrated due to dense population, high e-commerce demand, and intensive food distribution. The partners predominantly operate short-distance delivery routes using two-wheeled vehicles, which are common in urban last-mile logistics. These operational characteristics make the partners particularly vulnerable to halal integrity risks at the final stage of distribution.

The activity targets both economically productive community groups and non-economic community groups within the logistics sector. Economically productive groups include logistics entrepreneurs, managers, and operational staff responsible for cold chain distribution. Non-economic groups include logistics community members and association-based groups who play a role in coordination, awareness-building, and knowledge dissemination within AHLI. Documentation in the form of photographs accompanies this section to illustrate the characteristic and general problems or target;

Table 1. Target description

No	Name of target	Characteristics of the target	Amount	General problem or targets
1	Non-Economic target	Logistics community members, association-based groups	17	Education sector (halal literacy), awareness
2	Economic target	Logistics entrepreneurs, last-mile and cold chain operators	17	Economy Sector operational competitiveness

Source: Authors' field observations and community service documentation (2026)

Problem

The halal logistics industry in Indonesia faces significant challenges related to traceability and regulatory compliance, which are critical for ensuring the integrity of halal products throughout the supply chain. Although there is growing awareness of the importance of halal certification, many logistics providers, especially small and medium-sized enterprises (SMEs), struggle to implement effective halal traceability systems. These challenges are exacerbated by limited knowledge regarding halal critical control points, insufficient integration of digital tools, and a lack of standardized operating procedures (SOPs) that can ensure consistent halal compliance during the transportation and delivery phases (Lesmini et al., 2021).

Halal traceability, which ensures that products maintain their halal status from production to consumption, is a cornerstone of halal logistics. However, in practice, many logistics providers lack the infrastructure and expertise to apply traceability mechanisms effectively. This gap in implementation significantly impedes the growth of the halal logistics sector, as the absence of robust traceability systems can lead to contamination, non-compliance, and a loss of consumer trust (Firdaus et al., 2021; Wahyuni & Arfidhila, 2019). Furthermore, the integration of digital tools such as QR codes, blockchain, and Internet of Things (IoT) remains underutilized, even though these technologies have been shown to enhance the transparency and accountability of halal supply chains (Kurniawan et al., 2025).

Given the rapid expansion of e-commerce and the increasing demand for halal-certified products, it is crucial to address these challenges and promote the adoption of digital halal logistics

solutions. Strengthening halal literacy among logistics providers and providing practical guidance on implementing traceability systems are essential to ensuring the success of halal logistics in Indonesia. By enhancing the capabilities of logistics providers, it is possible to improve halal compliance, reduce risks of contamination, and boost consumer confidence in halal products.

Table 2. Problems and Solutions

No	Baseline Survey Results (Pre-Test, n=11)	Identified Problem	Implemented Solution	Indicators of Goal Achievement
1	Average understanding of halal traceability concepts was 52%, and awareness of halal critical control points was 50%.	Low level of halal traceability knowledge and limited awareness of halal critical points in last-mile delivery	Structured knowledge transfer through material delivery, interactive training, mentoring, and guided discussion	Increased post-test scores (traceability 85%; critical points 88%), improved skills and behavioral readiness
2	Knowledge of halal regulations (BPJPH, SJPH) was 48%, and halal digital literacy (SIHALAL, QR Code) was 45%. Most participants reported not having structured halal SOP documentation.	Lack of halal SOPs and limited digital documentation practices	SOP recommendations, operational mentoring, and digital halal socialization (SIHALAL and QR Code introduction)	Improved documentation practices, higher digital literacy (80%), reduced risk of cross-contamination
3	Awareness of halal logistics as a strategic value was 55%, with most participants perceiving halal compliance mainly as a regulatory obligation.	Low perception of halal logistics as a strategic competitive advantage	Strategic awareness strengthening through digital halal transformation socialization and reflective discussion	Increased strategic awareness (90%) and improved perception of service competitiveness

Source: Authors' field observations and community service documentation (2026)

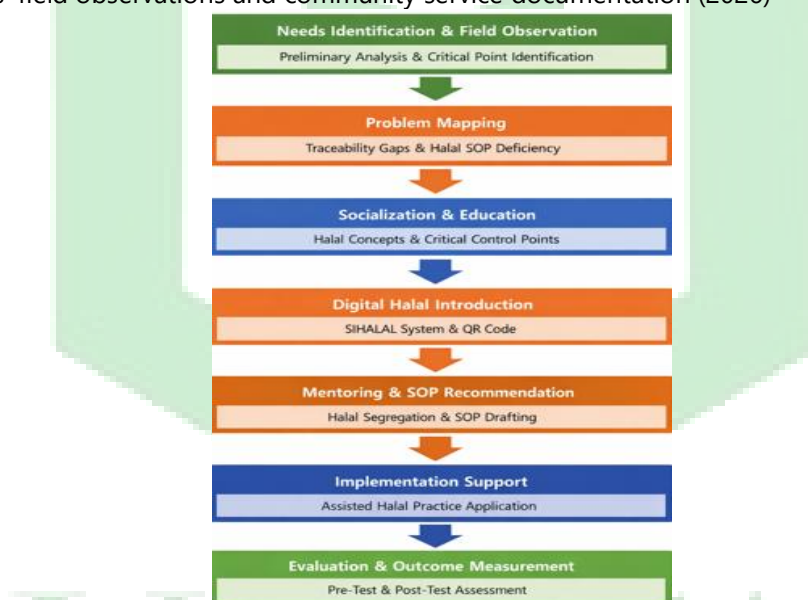


Figure 1: Flow of innovation

Figure 1 illustrates the flow of innovation in the implementation of digital halal traceability for cold chain last-mile delivery. The process begins with needs identification and field observation to map halal critical points and operational gaps. This is followed by problem mapping and socialization activities focusing on halal traceability concepts and regulatory awareness. The innovation flow then introduces digital halal tools, including the SIHALAL system and QR code-based identification, supported by mentoring and recommendations for halal logistics standard operating procedures. The process concludes with implementation support and evaluation

through pre-test and post-test assessments to measure improvements in knowledge, skills, and operational awareness.

Target solution

The target solutions were implemented through a structured and sequential intervention process. The first stage involved identifying partner needs and mapping halal critical control points in the last-mile cold chain delivery through observation and discussion. The second stage focused on socialization and education regarding halal traceability concepts, halal regulations, and the importance of maintaining halal integrity during the distribution process.

The third stage introduced digital halal transformation through entry-level tools, including the SIHALAL system and QR code-based product identification, as an initial step toward traceability implementation. The fourth stage provided recommendations for developing simple halal logistics SOPs related to product segregation, handling, and documentation. The final stage involved mentoring and evaluation to strengthen behavioral change, improve operational practices, and enhance managerial awareness of halal logistics as a strategic competitive advantage.

Through this approach, the community service program aimed to bridge the gap between theoretical concepts and practical implementation, supporting the development of transparent, accountable, and sustainable halal logistics practices among last-mile cold chain logistics companies. Describe every step of your intervention until the outcome is reached.

METHOD

This community service program employed a mixed-method approach consisting of offline socialization, interactive training, and mentoring. The program targeted logistics providers affiliated with the Indonesian Halal Logistics Association, focusing on improving halal traceability and digital literacy for cold chain last mile delivery. Pre- and post-test questionnaires were used to assess participants' knowledge and awareness of halal logistics principles, including halal critical control points, regulations, and digital traceability tools such as SIHALAL and QR codes. The training also covered the development of simple halal logistics SOPs. Data analysis was based on the comparison of pre- and post-test scores to evaluate the effectiveness of the intervention..

RESULTS AND DISCUSSION

This section presents the results of the community service activity aimed at strengthening participants' understanding of halal traceability, halal regulations, and critical control points in last-mile cold chain logistics. The outcomes of the program were evaluated using pre-test and post-test instruments administered to 11 participants representing logistics companies affiliated with the Indonesian Halal Logistics Association (AHLI). The discussion focuses on the effectiveness of the applied methods—offline socialization, interactive training, mentoring, and guided discussions—in improving participants' knowledge, awareness, and halal digital literacy. Furthermore, the findings are analyzed in relation to relevant theories and previous community service practices in the field of halal logistics and supply chain management.

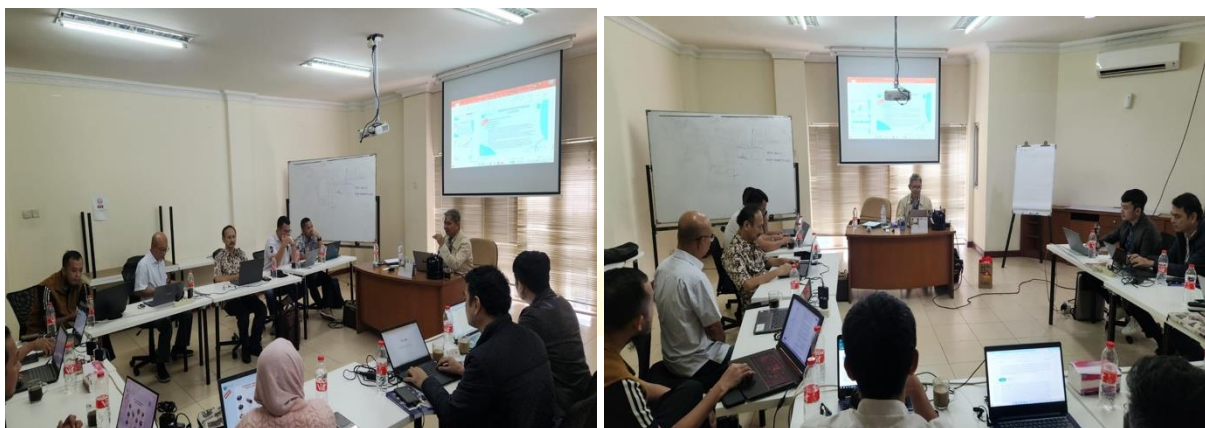


Figure 2 Interactive Discussion of socialization

This section presents the results of the community service activity based on predetermined indicators, followed by a discussion of the effectiveness of the applied methods and their relevance to existing theories and previous community service practices.

The results of the activity were obtained through pre-test and post-test instruments administered to 11 participants representing logistics companies operating in last-mile cold chain delivery and affiliated with the Indonesian Halal Logistics Association (AHLI). The evaluation focused on five main indicators: knowledge of halal traceability concepts, understanding of halal regulations, awareness of halal critical control points in last-mile delivery, halal digital literacy, and awareness of the strategic value of halal logistics.

Results of Knowledge and Awareness Improvement

The results indicate a significant improvement in participants' knowledge and awareness after the implementation of the community service program. Before the activity, most participants demonstrated a low to moderate level of understanding of halal traceability and its application in last-mile cold chain delivery. After the intervention, there was a noticeable shift toward higher levels of knowledge and awareness across all indicators.

Table 3. Knowledge Level of Participants Before and After the Activity

Knowledge Indicator	n	Pre-Test (%)	Post-Test (%)
Understanding of halal traceability concepts	11	52	85
Knowledge of halal regulations (BPJPH, SJPH)	11	48	82
Awareness of halal critical points in last-mile delivery	11	50	88
Halal digital literacy (SIHALAL, QR Code)	11	45	80
Awareness of the strategic value of halal logistics	11	55	90

Source: Pre-test and post-test results (2026)

The table 3 shows consistent improvement in all indicators following the activity. The highest increase was observed in awareness of halal critical control points in last-mile delivery, indicating that participants became more aware of the vulnerability of the final distribution stage, particularly in cold chain operations. Improvements in halal digital literacy also suggest that the introduction of SIHALAL and QR code-based traceability effectively enhanced participants' understanding of digital halal systems.

The results of this community service activity indicate that the applied methodological approach was highly effective in addressing the identified problems faced by last-mile cold chain logistics companies. The integration of educational, participatory, empowerment-based, and research results-based approaches resulted in measurable improvements in participants' knowledge,

digital literacy, and awareness of halal traceability. The significant increase in post-test scores across all indicators confirms that the intervention successfully met its predetermined objectives and responded appropriately to the real operational needs of the partner companies.

From a theoretical standpoint, the effectiveness of the method is consistent with adult learning theory, which emphasizes the importance of relevance, experience-based learning, and problem-oriented instruction for professional learners. Participants in this program were not passive recipients of information; rather, they actively engaged in discussions, shared operational experiences, and reflected on real challenges encountered during last-mile cold chain delivery. This learning model aligns with experiential learning theory, which suggests that knowledge becomes meaningful when learners can directly apply new concepts to their work environment. As a result, participants demonstrated not only cognitive improvement but also greater readiness to implement halal traceability practices in their daily operations.

The empowerment-based approach also played a critical role in enhancing the effectiveness of the program. Instead of focusing solely on compliance, the activity emphasized capacity building and gradual adoption of halal traceability systems. This approach is particularly relevant for small and medium-sized logistics companies, which often face resource constraints. By introducing halal traceability as an entry-level digital transformation supported by simple tools such as SIHALAL and QR codes, the program reduced perceived complexity and increased participants' confidence to begin implementation.

In relation to the state of the art, this community service activity reflects recent developments in halal logistics empowerment programs that move beyond awareness campaigns toward digital integration. Previous community service initiatives in halal logistics have largely focused on socialization of halal concepts and regulatory compliance. In contrast, this program integrates digital traceability tools with mentoring and SOP recommendations, offering a more comprehensive and practice-oriented model. The findings suggest that the incorporation of digital tools, even at a basic level, enhances transparency and accountability more effectively than awareness-based approaches alone.

Moreover, the focus on last-mile cold chain delivery represents a novel contribution within community service practices in halal logistics. While many programs concentrate on upstream processes such as production and certification, this activity addresses the final distribution stage, which is often overlooked despite its high risk of halal integrity violations. The significant improvement in participants' awareness of halal critical control points at the last-mile stage demonstrates the relevance and timeliness of this focus in responding to contemporary logistics challenges.

From the authors' perspective, the most meaningful outcome of this program is the observed shift in managerial perception. Participants increasingly viewed halal logistics not merely as a regulatory requirement, but as a strategic instrument for building consumer trust, improving service quality, and enhancing competitiveness. This shift is essential for sustainable adoption, as long-term implementation of halal traceability systems depends heavily on managerial commitment and strategic orientation.

Overall, the discussion confirms that community service methods that combine education, digital innovation, mentoring, and empowerment are effective in bridging the gap between theoretical frameworks of halal traceability and their practical application. The results reinforce the importance of human resource development as a foundation for digital halal logistics transformation, particularly in last-mile cold chain operations where operational complexity and risk are highest.

CONCLUSIONS AND SUGGESTIONS

This community service program on the socialization of digital halal traceability for cold chain last-mile delivery has successfully achieved its objectives of enhancing halal literacy, digital readiness, and strategic awareness among participating logistics companies. The results demonstrate clear improvements in participants' understanding of halal traceability concepts, halal regulations, awareness of halal critical control points, and familiarity with digital halal tools such as the SIHALAL system and QR code-based identification. These improvements confirm that structured educational, participatory, and empowerment-based interventions are effective in strengthening human resource capacity in halal logistics implementation, particularly at the vulnerable last-mile stage.

The discussion further highlights that the integration of digital tools with mentoring and practical SOP recommendations contributes to a shift in participants' perceptions of halal logistics. Halal compliance is increasingly viewed not merely as a regulatory obligation but as a strategic value that enhances transparency, consumer trust, and business competitiveness. This shift in mindset is a critical outcome of the program, as sustainable adoption of halal traceability systems depends largely on managerial commitment and strategic orientation.

Based on these findings, it is suggested that future community service initiatives focus on continuous mentoring to support the practical implementation of halal logistics standard operating procedures and the gradual integration of digital traceability systems into daily business processes. Strengthening collaboration among universities, logistics associations, and regulatory institutions is also recommended to ensure the sustainability and scalability of halal logistics development. Expanding similar programs to a broader range of small and medium-sized logistics companies would further contribute to the establishment of a transparent, accountable, and competitive halal logistics ecosystem at the national level.

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