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OPTIMISING HALAL SUPPLY CHAIN WITH BLOCKCHAIN-DRIVEN RISK MANAGEMENT

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ABSTRACT

The Halal industry, a significant driver of global economic growth, is confronted with unique risks that threaten halal integrity throughout the supply chain. Effective risk management is critical yet underdeveloped within this sector. This paper explores the utilisation of blockchain technology to enhance the management of halal-related risks, ensuring compliance and integrity from production to consumption. Blockchain's inherent capabilities, such as traceability, transparency, and immutability, address critical issues like contamination, non-compliance, and fraud. The research explored the key risk factors in the halal supply chain, examined how blockchain can mitigate these risks, and developed a Blockchain-Driven Supply Chain Risk Management Model for the halal industry. Focusing on Malaysia's halal sectors, including food, cosmetics, pharmaceuticals, modest fashion, and tourism, this study evaluated how blockchain can improve supply chain performance metrics like cost-effectiveness, timeliness, reliability, and sustainability. By integrating blockchain, businesses can ensure real-time data transparency, prevent unauthorised modifications, and enhance the overall integrity of halal products. The findings are expected to contribute to better risk management practices, operational efficiency, and competitive advantage for halal firms in the global market.

Keywords: Halal Integrity, Supply Chain Management, Risk Management, Blockchain Technology, Halal Industry

INTRODUCTION

The Halal industry represents a significant sector of global trade, characterised by stringent adherence to Islamic principles throughout its supply chains (Tieman 2017). However, ensuring the integrity of Halal products has considerable challenges, such as contamination, non-compliance with standards, and fraudulent activities. These issues not only jeopardise consumer trust but also hinder the industry's potential for sustainable growth and global competitiveness (Khan, Haleem & Khan, 2022). Effective risk management practices tailored to the unique complexities of Halal supply chains are thus imperative.

This paper aims to improve supply chain performance in Malaysia's Halal industry by identifying key risks, optimising performance, and developing a Blockchain-Driven Supply Chain Risk Management Model. The goal is to encompass a range of Halal sectors, including food, cosmetics, pharmaceuticals, modest fashion, and tourism, assessing existing methods to improve both integrity and efficiency.

HALAL SUPPLY-CHAIN BLOCKCHAIN MODEL

Consortium Blockchain is a key instrument in halal risk assessment procedures, contributing to the integrity and compliance of the halal supply chain. Figure 1 shows how this

technique works in this particular situation. The first step in the process is the identification of Validator Nodes, which are regulatory organisations that only approve transactions after confirming the quality guarantee has been provided by manufacturers and shipping companies (Geetanjali, Iman & Bhoopesh 2019).

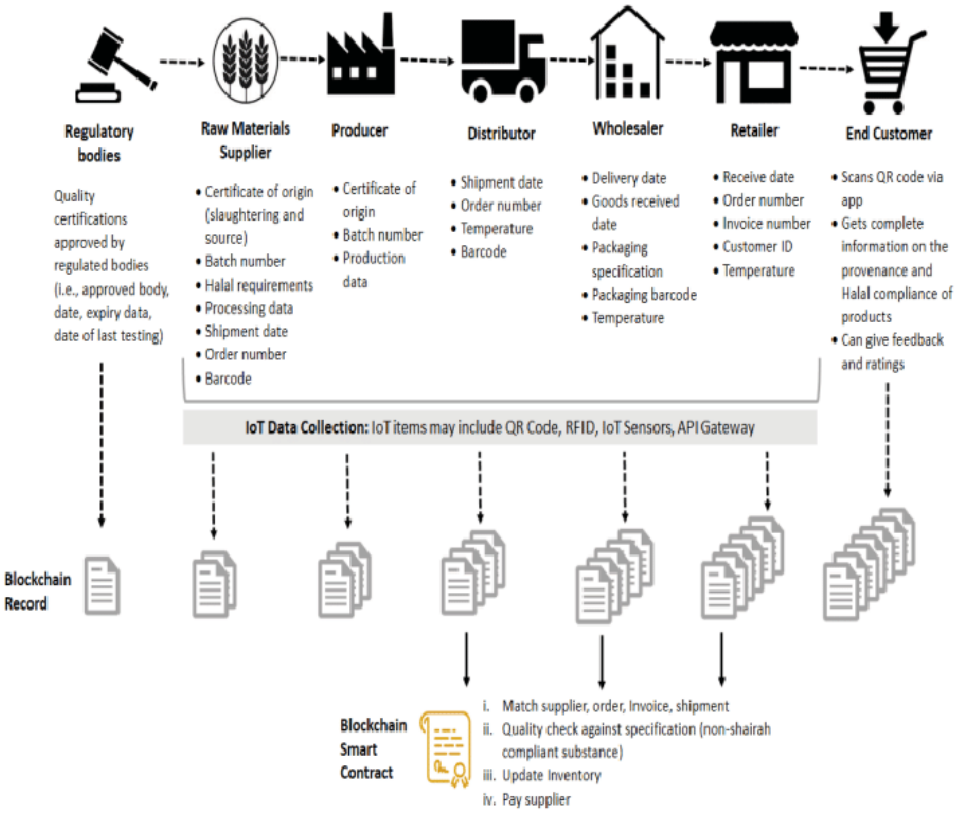

Figure 1: Blockchain Technology in Halal Supply Chain
Source: Geetanjali, Iman and Bhoopesh (2019)

Automation is facilitated by Internet of Things (IoT) devices like QR codes, RFID tags, sensors, and API Gateways. These devices autonomously gather and upload data onto the Blockchain, ensuring real-time transparency and accuracy in product provenance and adherence to Shariah standards. A fundamental aspect of this Blockchain implementation is the deployment of Smart Contracts, computer-programmed agreements that execute actions automatically upon fulfillment of predefined conditions. For instance, Smart Contracts enable seamless matching of supplier orders, invoices, shipments, and automatic payments among distributors, wholesalers, and retailers. They also enforce contractual terms and conditions, thereby minimising disputes and bolstering operational efficiency (Prayudanti & Sucipto (2021).

Consumers benefit by accessing comprehensive product information through mobile apps, where QR codes provide detailed insights into product origins and Shariah compliance. Moreover, consumer feedback and ratings are recorded on the Blockchain, promoting transparency and continual enhancement across the supply chain. Overall, the adoption of Consortium Blockchain in the Halal food sector promises enhanced traceability, efficiency, and trust among stakeholders. It reinforces compliance with halal standards, mitigates risks such as contamination and fraud, and improves overall service quality through robust risk assessment and management practices.

HALAL SUPPLY CHAIN RISK MANAGEMENT

Effective management of risks within the Halal supply chain is crucial for ensuring compliance with Islamic principles and meeting consumer expectations. The Halal supply chain encompasses various stages, from sourcing raw materials to the final distribution of products, each fraught with potential risks that could compromise Halal integrity (Ivanov, Dolgui & Sokolov 2019). Risks may include issues such as contamination, non-compliance with standards, and fraudulent practices, all of which can undermine consumer trust and damage brand reputation. Thus, a comprehensive risk management procedure designed especially for the halal sector is necessary to solve these issues. Usually, this approach starts with the identification and classification of risks using thorough literature research, industry expert advice, and potential field observations. These risks can be divided into four categories: contamination (including cross-contamination with non-Halal substances), process (relating to manufacturing and handling procedures), material (concerning the source and nature of raw materials), and integrity (focusing on adherence to Halal standards throughout the supply chain).

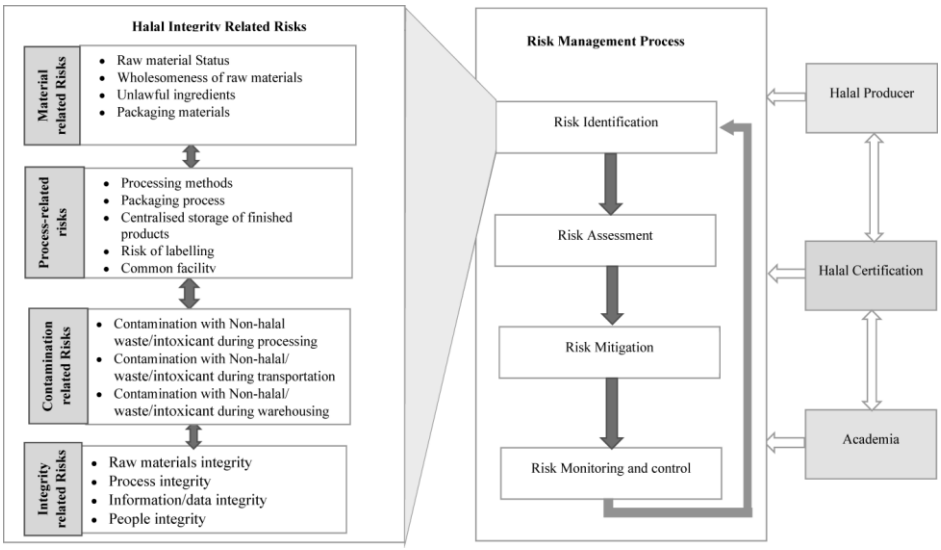

Figure 2: Halal Supply Chain Risk Management Framework
Source: Khan, Haleem, and Khan (2022).

Figure 2 introduces a structured research framework aimed at identifying and assessing significant risks through a combination of literature review and expert input. By employing innovative methods such as Intuitionistic Fuzzy Numbers (IFN) and D-number techniques, the severity of identified risks is quantified to prioritise them into "high priority" and "low priority" categories. Key risks identified include concerns over raw material status and processing methods, emphasising their pivotal role in maintaining Halal compliance (Khan et al., 2022).

However, there are a few limitations, such as potential gaps in risk identification due to constraints in accessing relevant literature. Furthermore, while the framework effectively evaluates risk severity, it currently lacks provisions for developing specific risk mitigation strategies, which presents an avenue for future research. Methodologically, the study leverages expert opinions, highlighting the need for rigorous validation and analysis to mitigate biases inherent in subjective assessments.

CONCLUSION

This paper holds significant implications for both academic research and industry practice. By exploring how blockchain technology can address specific challenges in the Halal supply chain, the research contributes to advancing knowledge in supply chain management and blockchain applications within regulated industries. Moreover, these findings can guide policymakers, regulators, and industry practitioners in adopting innovative technologies to strengthen compliance, transparency, and consumer trust in Halal products. Ultimately, the study aims to foster sustainable growth and competitive advantage for Halal firms operating in the global marketplace, ensuring their alignment with Islamic principles and regulatory standards.

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