
ROLE OF HALAL FORENSICS IN ARTIFICIAL INTELLIGENCE: ENSURING THE INTEGRITY OF HALAL PRODUCTS

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ABSTRACT

In the age of artificial intelligence (AI), the question of the integrity and purity of halal products has grown more complicated and difficult. The authenticity of products consumed by consumers, particularly Muslims, is seriously questioned due to the lack of clarity surrounding the source of components, the rise in cross-border trade, and the manipulation of halal labeling. Over the past few decades, there has been a considerable increase in the demand for halal products worldwide due to a number of causes, including the growth of the Muslim population, consumer knowledge of halal requirements, and the expansion of halal markets outside food. As a result, the problems would not only erode customer trust but also jeopardize the nation's standing as a reliable centre for the worldwide halal business. Therefore, this study aims to explore the role of halal forensics as a scientific medium that supports transparency, justice and integrity in the halal verification system. The type of research used is qualitative research. This study uses content analysis methods by referring to published papers and authoritative sources related to the study. The expected findings are the integration of halal forensics and AI technology would help to improve the efficiency of halal monitoring in real-time, strengthen consumer trust, and position Malaysia as a leader in global halal innovation. This scientific approach in halal verification system would be able to support sharia in facing the technology of artificial intelligence. In conclusion, halal forensics is a demonstration of the nation's dedication to honesty, justice, and world peace in addition to being a technological verification tool. This aligns with the goal of creating a world-class nation that protects consumer rights and fosters interfaith and international cooperation.

Keywords: *Halal Forensic, Halal Product Integrity, Artificial Intelligence (AI), Global Peace*

Introduction

The integrity of halal products is a key focus in a rapidly growing global industry, driven by high demand from Muslim and non-Muslim consumers. The global halal market has reached trillions of dollars a year with increasing demand not only from Muslim countries but also non-Muslim countries. This is due to several factors such as rising in Muslim population, increased consumer awareness about halal standards and expansion of halal markets beyond food. Consumers are also becoming more aware of the halal logo, ingredients and production process for each product. The increased awareness of sharia compliance has driven the need to ensure that every halal product complies with strict standards from sourcing to end-users. The integration of technologies such as blockchain, halal forensics and digital tracking systems, as well as strengthening international enforcement and standardization, is very helpful to strengthen the integrity of halal products.

Artificial Intelligence (AI) is currently in a phase of rapid progress with the ability to go beyond traditional data analysis to generate new content that is creative and interactive. Technologies such as *generative AI*, machine learning, and multimodal AI are widely used in various sectors including medicine, education, business, entertainment, and security. AI is now integrated in everyday devices, smart applications as well as industrial automation systems, making it an integral part of modern life. The implementation of AI also emphasizes responsible innovation, risk control and standard development to ensure that its benefits can be maximized for human well-being.

The presence of AI is able to bring various benefits in the halal industry. This can be seen through the combination of the power of smart technology and strict sharia compliance requirements. AI is able to improve the transparency and traceability of the halal supply chain through real-time tracking systems, machine learning-based ingredient analysis, as well as the integration of technologies such as blockchain and halal forensics to detect prohibited substances more accurately and quickly. These advancements help reduce the risk of halal logo fraud, cross-contamination and non-compliance with international standards thus strengthening consumer confidence.

Therefore, the integration of halal forensics and AI technology would help to improve the efficiency of halal monitoring in real-time, strengthen consumer trust and position Malaysia as a leader in global halal innovation. This integration would help to improve the integrity of halal products.

Hence, this paper will explore the role of halal forensics as a scientific medium that supports transparency, justice and integrity in the halal verification system with the integration of AI so that the integrity of halal products and halal industry can be strengthened. The discussion will be focusing on the halal verification system to support sharia in facing the technology of artificial intelligence.

Concept of Halal Forensic

Halal forensic is an integration of two terms which are forensic or forensic science and halal. Generally, forensic involves investigation or operation with detailed research to get the scientific evidence by involving expertise of science and technology. The term of forensic is from Latin which are forensic and forum that referring to debate and discussion in trial and judgement (Frank Crispino, 2001). In terms of terms, forensic is the use of scientific methods to solve an investigation case (Ahmad Syukran Baharuddin, 2015). Forensic science is a process of applying the modernity of science in solving various problems including biological forensic, physical forensic, chemical forensics, computer forensic, documents and writing and accounting forensic (Ahmad Syukran Baharuddin, 2017). In another aspects, it also includes various field such as pathology forensic, ontology forensic, entomology forensic (identifying the circumstance of death of a corpse; time, cause and place through the study of insects found on corpses), serology forensic (analysis of fluids produced from the body such as semen, blood, sweat and saliva), anthropology forensic (forensic related to physical traits as well as human bones an living things) and toxicology forensic (Athirah Mahussin et al., 2021). Forensic science also can be understood as a skill to solve a particular case or investigation that use the application of science to solve the case. While in Islam, forensic terms use several words such as *al-Tibb al-Qadha'i*, *al-Tibb al-Qanuni*, *al-Tibb al-'Adli*, *al-Tibb al-Janaa'i*, *Tibb al-Mahakim*, *al-Tibb al-Syar'ie* dan *al-tasyrih*.

The term halal origin from the root word *halla*, *yahillu*, *hillan* which means release, break, dismiss and enable (Abdul Aziz Dahlan, 1997). From etymology, halal means *harus* or something that was not

prohibited by *syara'*. While in epistemology, halal is a good thing and reward will be gained for those who implement it (Ali Mukhtar & Anuar Ramli, 2019). According to al-Qaradhawi (1994), halal is something that is required where there is no prohibition on it and being permitted to do according to *syara'*. While according to *International Islamic Fiqh Academy* (IIFA), the meaning of halal includes things that are *makruh, harus, sunat, wajib* while the things that contradict are haram. Halal from syariah perspectives need to be viewed comprehensively because it includes the meaning as good (*toyyib*) which means clean, pure, safe and quality (Alias & Harlida, 2017).

Halal forensic is a growing field. According to Mohd Sukri (2018) in his book entitled *Forensik Halal Perspektif Sains, Syariah & Perniagaan* has summarized four basic elements on determination of halal in halal forensic which are Islamic law, halal standards and act, halal science, and halal management. Based on this summarization, halal forensic can be formulated as a scientific approach to analyse halal product content, ingredients or material to detect adulteration or fraudulent. However, due to absence of halal-related acts and regulations in Malaysia has caused halal forensic enforcement to be complicated. Although the international halal standard is being drafted, it would require a long timeline because of differences of opinion due to differences of *mazhab* in determining the *hukm* (Mohd Sukri, 2018). The use of science and technology through halal forensics as the process of proofing is very important to identify ingredient or material. It was needed to validate the presence of prohibited ingredients or material in a particular product. While in halal management element, controlling started from farm to the plate (from farm to table) is highly emphasized to ensure that every process was complied with the standards and regulations involved. All of the four elements are interconnected with each other.

Role of halal forensics as a scientific medium that supports transparency, justice and integrity in the halal verification system

As the global halal market continues to expand, the need for robust scientific verification methods has become increasingly critical to maintain consumer trust and ensure compliance with Islamic dietary laws (Dhalan et al., 2018). The complexity of modern product production has created vulnerabilities that traditional halal verification methods struggle to address, necessitating the development of advanced forensic approaches (Abidin et al., 2020).

Enhancing Traceability and Transparency

Enhancing traceability and transparency in the halal supply chain is crucial for ensuring the integrity, safety, and compliance of halal products. This involves the use of advanced technologies and systematic approaches to track and verify the halal status of products from their origin to the end consumer. The implementation of Halal Traceability Systems (HTS) using technologies such as blockchain, QR codes, RFID and IoT significantly improves the transparency and traceability of halal products (Shuib et al., 2021). This ensures that all stages of the supply chain comply with Syariah requirements thereby maintaining halal integrity. Blockchain provides an immutable and decentralized ledger that securely records and verifies halal certification information, addressing issues related to transparency, traceability, and fraud prevention (Nashiruddin et al., 2024). Combining blockchain with QR codes and RFID enhances traceability by allowing easy access to product information and ensuring data integrity through an immutable ledger (Shuib et al., 2021).

IoT devices enable real-time tracking of products throughout the supply chain, improving visibility and control over the logistics process (Wan-Chik et al., 2023). It facilitates efficient data management and communication, ensuring that all stakeholders have access to accurate and timely information. While HTS are essential for verifying the halal status of products and ensuring compliance with halal standards. These systems help maintain the integrity of the halal supply chain by preventing cross-contamination and ensuring that all processes adhere to Islamic Sharia law (Shuib et al., 2021). The collaboration between stakeholder would give out an effective HTS to establish common goals and share knowledge. This would help to build consumer trust by providing assurance that products meet halal standards and are free from contamination. It also would help businesses to comply with regulatory requirements and improve the efficiency with the quality of halal products production.

Addressing Non-Compliance Issues

Halal forensics helps identify and address non-compliance issues such as improper slaughtering techniques, mislabelling, adulteration and contamination. By employing advanced analytical methods, it ensures that halal standards are met across the entire supply chain. Forensic techniques, such as DNA testing and chemical analysis, can be employed to verify the halal status of products. These methods can detect non-halal ingredients or contamination providing a scientific basis for compliance verification. Table below shows the laboratory techniques that can be used in analysis of ingredients in halal products.

	Laboratory technique	Function
DNA testing	Polymerase Chain Reaction (PCR)	Determining porcine Deoxyribonucleic Acid (DNA)
Chemical Testing	Gas chromatography-Mass Spectroscopy (GC-MS)	<ul style="list-style-type: none"> GC: Isolation process of material. MS: Identify the type of the material.
	Gas Chromatography-Flame Ionisation Detector (GC-FID)	<ul style="list-style-type: none"> Nitrogen gas & helium as separation of material. Hydrogen gas and compressed air for combustion of separated material.
	Fourier Transform Infrared Spectroscopy (FTIR)	<ul style="list-style-type: none"> Identify the originality of material such as the source of gelatine. Determine the type of skin and fur
	High Performance Liquid Chromatography (HPLC)	Identify and differentiate gelatine from porcine or bovine
	Differential Scanning Calorimetry (DSC)	Detect the changes of chemical and physical characteristics of material through the process detection of changes in heat
	Scanning Electron Microscope (SEM)	Determine the morphology of material such as porcine skin and porcine fur.
	Atomic Absorption Spectroscopy (AAS)	Detect the presence of metal in various product.

Table 1.1: Laboratory technique in analysis of ingredients in halal products

With the transparency and traceability that can be provided by applying the laboratory technique, non-compliance issues can be addressed by identifying the ingredients used in halal products.

Supporting Halal Assurance Systems (HAS)

Halal Assurance Systems (HAS) are frameworks designed to ensure that products, particularly food items, comply with halal standards throughout their production processes. These systems are crucial for maintaining the integrity and authenticity of halal products, which is increasingly important given the

global demand for halal products. HAS may provide traceability systems. Traceability is essential for HAS implementation, linking perceived benefits such as market competitiveness and operational efficiency to readiness for HAS (Abd Rahman et al., 2017). This involves tracking the entire production process to ensure compliance with halal standards. It also helps to identify critical control points. Identifying and managing Halal Control Points (HCP) is vital. These points include potential contamination sources in materials, equipment, and packaging processes (Perdani et al., 2018). Effective management of HCPs ensures that products remain halal throughout production.

HAS can be integrated with other management systems like quality management, safety management, and environmental management systems to enhance overall business performance (Puspaningtyas et al., 2021). This integration helps streamline processes and improve productivity, quality and safety. By implementing HAS, it would increase consumer confidence in halal products, ensuring that they meet both safety and quality standards. SMEs also can leverage HAS to tap into the global halal market, enhancing their competitiveness and market reach.

Building Consumer Trust

The use of forensic science in halal verification helps build and sustain consumer trust in halal certification bodies. Studies have shown that transparency, regulatory enforcement, and continuous engagement are critical factors influencing consumer confidence in halal certification processes (Ramlan et al., 2025). Effective HSCM is crucial for maintaining the integrity of halal products, which directly impacts consumer trust. Factors such as government regulations, halal certification, and supply chain relationship management play significant roles in enhancing the performance of SMEs in the halal sector (Maflahah et al., 2025).

Besides, trust in halal products significantly influences consumers' purchase intentions. This trust is further reinforced by the consumers' religiosity levels which affect their attitudes towards halal products (Koc et al., 2024). The strategies that can be implemented to enhance consumer trust are implement robust HSCM practices, leverage technology for traceability and enhance consumer education. By focusing on these factors and strategies, consumer trust in halal products can be maintained, ensuring sustained market growth and consumer loyalty.

Legal and Regulatory Support

Forensic science provides the necessary legal and regulatory support to ensure the validity and reliability of halal certification. This includes adhering to standards and regulations, which are vital for maintaining the integrity of the halal verification system (Wilson-Wilde & Scott, 2024). Accreditation and certification are vital mechanisms to ensure the competence and qualifications of practitioners involved in the halal certification process. This helps in maintaining high standards and public confidence in the certification (Tontarski, 2022). The Forensic Science Regulator in England and Wales, for example, sets quality standards and requires accreditation to international standards like ISO/IEC 17025, ensuring systematic quality assurance (Tully et al., 2020). Implementing and maintaining these standards can be challenging, especially for small and micro-enterprises. Financial constraints, regulatory complexities, and limited awareness are significant barriers. Solutions include financial support, regulatory reforms, and educational programs to simplify the certification process and increase accessibility for small businesses.

Quality Assurance and Continuous Improvement

Implementing quality assurance programs in forensic laboratories ensures that testing is accurate and reliable. This continuous improvement process helps minimize errors and enhances the overall credibility of halal certification (Garcia-Repetto, 2016). Establishing clear and detailed SOPs is fundamental for forensic laboratories. These procedures outline the methods and protocols for testing, ensuring consistency and reliability in results. Adhering to SOPs helps minimize variability and errors in testing processes. Accreditation of forensic laboratories also can demonstrate that the laboratory meets international standards for testing and calibration, thereby enhancing the credibility of halal certification.

Besides, implementing robust quality control measures, such as the use of control samples and proficiency testing, helps identify and rectify any discrepancies in testing results. These measures ensure that the testing process remains reliable and that any potential errors are caught early. Hence, a robust quality assurance program would enhance the credibility of halal certification, help identify and rectify potential sources of error, leading to more accurate testing outcomes and reducing the likelihood of non-compliance with halal standards and lead to increased efficiency, reducing turnaround times for certification and improving overall laboratory performance.

Role of AI technology in ensuring integrity of halal products

AI technology plays a significant role in ensuring the integrity of halal products, contributing to both national development and global peace.

Ensuring Halal Compliance and Integrity

Halal compliance and integrity can be ensured by automated compliance checks. AI can automate halal compliance checks, identifying irregularities in sourcing and composition, and facilitating risk management (Sunmola et al., 2025). This ensures that products meet halal standards consistently. AI combined with blockchain technology would enhance traceability and transparency in the halal supply chain. This integration allows for tracking product provenance, ensuring that halal products are free from cross-contamination and adhere to Islamic principles. AI technologies such as machine learning and computer vision would help to improve quality control processes to ensure that halal products maintain their integrity throughout the supply chain (Nawaz et al., 2025).

Promoting Ethical and Sustainable Practices

Ethical and sustainable practices can be promoted by ethical sourcing. AI-driven approaches in halal compliance promote ethical sourcing and sustainable practices, which are crucial for maintaining the integrity of halal products (Rahman, 2025). This aligns with broader humanitarian goals and supports responsible consumption. AI can optimize resource utilization, reduce waste and improve operational efficiency in the halal food industry (Masood et al., 2025). This contributes to sustainable food systems and enhances food security.

Building Consumer Trust

AI technologies offer solutions for the certification and monitoring of halal compliance, which fortifies consumer trust in halal products (Nawaz et al., 2025). Enhanced transparency and traceability would reassure consumers about the authenticity of halal products. The integration of AI would also help in navigating the complexities of different halal standards globally, ensuring that products meet diverse regulatory requirements and consumer expectations (Akbar et al., 2023).

Supporting National and Global Peace

The halal industry, supported by AI, is a significant economic driver. For instance, Malaysia's National Transformation 2050 agenda aims to position the country as a global leader in the halal supply chain, contributing to national economic growth (Misnan et al., 2018). AI also fosters international cooperation by providing a common framework for halal compliance, which can bridge cultural and regulatory differences. This cooperation is essential for global peace and ethical AI governance (Belosludtsev & Dziuba, 2024).

The integration of halal forensics and AI technology to ensure the integrity of halal products

The integration of halal forensics and AI technology can significantly enhance the efficiency of halal monitoring in real-time, strengthen consumer trust, and position Malaysia as a leader in global halal innovation.

Improving Efficiency of Halal Monitoring in Real-Time

AI technologies, including machine learning and blockchain, can automate halal compliance checks, identify irregularities in sourcing and composition, and facilitate risk management. Blockchain ensures traceability and transparency, providing verifiable information on ingredient origin and production

processes (Mangruwa et al., 2024). Besides, this efficiency also can be improved by real-time data analysis. AI-driven solutions can enhance the traceability of halal products by providing real-time data analysis and monitoring capabilities, ensuring compliance with halal standards throughout the supply chain (Kusnadi et al., 2024).

Strengthening Consumer Trust

Consumer trust can be strengthened by transparency and traceability. The use of blockchain technology in the halal supply chain can significantly boost consumer trust by ensuring transparency and traceability of halal-certified products. Consumers can access detailed information about the halal status of products, from slaughtering activities to final distribution, via their smartphones. Besides, AI can streamline the halal certification process, making it more efficient and reliable. This reduces the risk of counterfeit certificates and ensures that all products meet the required halal standards.

Positioning Malaysia as a Leader in Global Halal Innovation

Malaysia has already established a comprehensive halal ecosystem, including the Halal Industry Development Corporation (HDC) and the Malaysian Standard Halal Food (MS1500:2004), which is recognized globally (Noordin et al., 2009). The integration of AI and blockchain can further enhance this ecosystem by improving the efficiency and reliability of halal certification and monitoring processes. By leveraging advanced technologies, Malaysia can strengthen its position as a global halal hub. The country's proactive approach in adopting AI and blockchain for halal monitoring can serve as a benchmark for other nations, promoting global peace and ensuring the integrity of halal products.

Ensuring Integrity of Halal Products

Integrity of halal products can be ensured by AI-Driven forensics. AI and computer vision technologies can be used in halal forensics to analyse and verify the halal status of products with high precision and objectivity (Morán-Torres et al., 2025). This ensures that all products labelled as halal meet the stringent requirements set by Islamic law. The integration of AI in halal monitoring promotes ethical sourcing and transparent practices, which are crucial for maintaining the integrity of halal products and fostering consumer trust (Siwan et al., 2024).

The integration of halal forensics and AI technology offers a transformative approach to halal monitoring, enhancing efficiency, transparency and consumer trust. By adopting these advanced technologies, Malaysia can solidify its position as a global leader in halal innovation, ensuring the integrity of halal products and contributing to global peace.

Scientific approach in halal verification system to support sharia in facing the technology of artificial intelligence

The integration of artificial intelligence (AI) into halal verification systems can significantly support Sharia compliance by enhancing transparency, efficiency, and accuracy in various sectors, including halal food safety, fatwa issuance and technological integration.

Ensure Halal Food Safety

AI-driven approaches in halal food safety can promote ethical sourcing, ensure product integrity, and foster sustainable practices. These technologies enhance transparency, traceability, and efficiency in the halal supply chain, addressing long-standing challenges in food safety and ethical consumerism.

AI technologies such as machine learning, computer vision, natural language processing, and blockchain play a vital role in quality control, supply chain transparency, and consumer trust. They offer solutions for certification and monitoring of halal compliance. Machine learning algorithms can analyse production data to monitor quality parameters and predict shelf life, ensuring compliance with halal standards (Yang et al., 2025). The models can predict and identify potential irregularities in sourcing and composition, facilitating risk management and ensuring product integrity.

Computer vision systems are used for quality assessment and defect identification in food products, ensuring that only compliant products reach consumers (Agrawal & Kumar 2023). These systems

enable real-time monitoring of food processing, enhancing the overall safety and quality of halal food products. Natural Language Processing (NLP) can automate the analysis of textual data related to halal certification and compliance, ensuring that all documentation meets regulatory standards. By analysing consumer feedback and reviews, NLP helps in understanding and addressing consumer concerns, thereby building trust. Blockchain technology ensures traceability of products throughout the supply chain, providing verifiable information on ingredient origin and production processes. Blockchain can be used to track and verify halal certification processes, ensuring transparency and accountability.

AI technologies improve transparency and traceability in the halal supply chain, addressing long-standing challenges in food safety and ethical consumerism. By providing verifiable information and ensuring compliance, AI fosters greater consumer trust in halal products. AI-driven approaches contribute to sustainable practices by optimizing resource use, reducing waste and supporting responsible consumption. It enhances efficiency in compliance checks, quality control, and supply chain operations, reducing manual efforts and errors.

AI technologies such as machine learning, computer vision, natural language processing, and blockchain play a vital role in ensuring halal food safety by enhancing quality control, supply chain transparency, and consumer trust. These technologies offer robust solutions for certification and monitoring of halal compliance, promoting ethical sourcing and sustainable practices.

Assist Fatwa Issuance

AI can assist in deriving Islamic legal rulings (fatwas) but cannot serve as an independent agent of *ijtihad* due to the lack of consciousness, intention, and jurisprudential reasoning. AI can be employed as an auxiliary tool under strict scholarly supervision. It can process vast amounts of data, including historical fatwas, scholarly articles, and legal texts, to assist scholars in deriving rulings. By analysing patterns and extracting relevant information, AI can help scholars make informed decisions based on existing jurisprudence.

AI technologies can organize and retrieve information efficiently, allowing scholars to access relevant texts and opinions quickly. This capability can streamline the research process, enabling scholars to focus on interpretation and reasoning rather than data collection. AI should be viewed as a supportive tool rather than a replacement for human scholars. The use of AI in fatwa issuance must be under strict scholarly supervision to ensure that the rulings align with Islamic principles. Scholars must critically evaluate AI-generated insights and ensure that they adhere to the ethical and legal frameworks of Sharia.

The integration of AI in fatwa issuance requires collaboration between Islamic scholars, AI researchers, ethicists, and community stakeholders. Scholars provide the necessary religious and ethical context, while AI researchers contribute technical expertise in developing and implementing AI systems. Ethicists play a crucial role in addressing the ethical implications of using AI in religious contexts. They can help establish guidelines to ensure that AI applications respect Islamic values and principles, preventing potential misuse or misinterpretation of technology.

Involving community stakeholders is essential to ensure that the use of AI in fatwa issuance reflects the needs and concerns of the community. Engaging with the public can foster trust and acceptance of AI-assisted rulings, ensuring that they are relevant and applicable to contemporary issues. The collaboration among these diverse groups allows for continuous learning and adaptation. As AI technology evolves, scholars and researchers can work together to refine AI tools, ensuring they remain effective and aligned with Islamic jurisprudence. Collaborative efforts can lead to the establishment of comprehensive frameworks that govern the use of AI in fatwa issuance. These frameworks can outline best practices, ethical guidelines, and protocols for integrating AI into the decision-making process.

While AI can significantly assist in the fatwa issuance process by providing data analysis and organization, it cannot replace the nuanced understanding and reasoning of human scholars. The successful integration of AI into this domain relies on collaborative efforts among Islamic scholars, AI researchers, ethicists, and community stakeholders. This interdisciplinary approach ensures that AI applications are ethically sound, contextually relevant, and aligned with Islamic principles, ultimately enhancing the fatwa issuance process while maintaining the integrity of Sharia.

Harmonize Technological Integration

The use of AI and blockchain in halal verification systems can automate compliance checks, identify irregularities, and facilitate risk management. AI technologies can automate the process of compliance checks in halal verification systems. By analysing data from various sources, AI can quickly assess whether products meet halal standards, reducing the time and effort required for manual inspections. This automation enhances efficiency and accuracy in verifying compliance. AI algorithms can be trained to detect anomalies or irregularities in the supply chain, such as discrepancies in ingredient sourcing or processing methods. By continuously monitoring data, AI can flag potential issues that may compromise halal integrity, allowing for timely interventions. The integration of AI in halal verification systems enables proactive risk management. By analysing historical data and trends, AI can predict potential risks associated with halal compliance, helping stakeholders to implement preventive measures and mitigate issues before they arise.

Blockchain offers an ideal platform for tracking product provenance, ensuring trust and confidence among consumers. Blockchain technology provides a decentralized and immutable ledger that is ideal for tracking halal products throughout the supply chain. Each transaction or movement of a product can be recorded on the blockchain, ensuring transparency and traceability from source to consumer. The combination of AI and blockchain fosters greater trust among consumers and stakeholders. With blockchain's transparent records, consumers can verify the halal status of products, while stakeholders can hold each other accountable for maintaining compliance with halal standards. Blockchain can streamline the certification process by providing a secure platform for storing and sharing certification documents. This reduces the administrative burden on certifying bodies and enhances the efficiency of the certification process.

AI assurance approaches, including impact assessment, audit, and certification procedures, can provide evidence that AI systems are legal, ethical, and technically robust, addressing deployment and individual harms. Regular audits of AI systems are essential to ensure that they operate as intended and adhere to ethical and legal standards. Auditing can involve reviewing algorithms, data sources, and decision-making processes to identify any biases or inaccuracies that may affect halal verification. Establishing certification procedures for AI systems can provide evidence that these technologies are legally compliant, ethically sound, and technically robust. Certification can involve third-party evaluations to assess the performance and reliability of AI systems used in halal verification.

AI assurance approaches emphasize the importance of transparency and explainability in AI systems. Stakeholders should be able to understand how AI algorithms make decisions, ensuring that the processes align with halal principles and ethical considerations. It is not a one-time process; it requires continuous monitoring and improvement. Regular updates and evaluations of AI systems can help adapt to changing regulations, consumer expectations, and technological advancements.

The integration of AI and blockchain in halal verification systems enhances compliance checks, identifies irregularities, and facilitates risk management, while blockchain provides a reliable platform for tracking products. Additionally, AI assurance approaches, including impact assessments, audits, and certification procedures, ensure that AI systems are legal, ethical, and technically robust. Together, these technologies and assurance methods harmonize to create a more efficient, transparent, and trustworthy halal verification process, ultimately benefiting consumers and stakeholders alike.

Conclusion

Halal forensic in Artificial Intelligence has a significant role to ensure the integrity of halal products towards the best nation and global peace. The role of halal forensics as a scientific medium that supports transparency, justice and integrity in the halal verification system are enhancing traceability and transparency, addressing non-compliance issues, supporting Halal Assurance Systems (HAS), building consumer trust, legal and regulatory support and quality assurance and continuous improvement. The role of AI technology in ensuring integrity of halal products are ensuring halal compliance and integrity, promoting ethical and sustainable practices, building consumer trust and supporting national and global peace. The integration of halal forensics and AI technology would improve the efficiency of halal monitoring in real-time, strengthening consumer trust, positioning Malaysia as a leader in global halal

innovation and ensures integrity of halal products. Scientific approach in halal verification system support sharia in facing the technology of artificial intelligence by ensure halal food safety, assist fatwa issuance and harmonize technological integration.

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