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Implementing Blockchain Technology in Halal Certification: A Systematic Literature Review of Opportunities and Challenges

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ABSTRACT

Purpose: This study aims to identify trends, key themes, opportunities, and challenges in the application of blockchain technology in halal certification activities.

Design/Method/Approach: This study used a systematic literature review (SLR) following PRISMA guidelines. Data were collected from Google Scholar using the Publish or Perish (PoP) software.

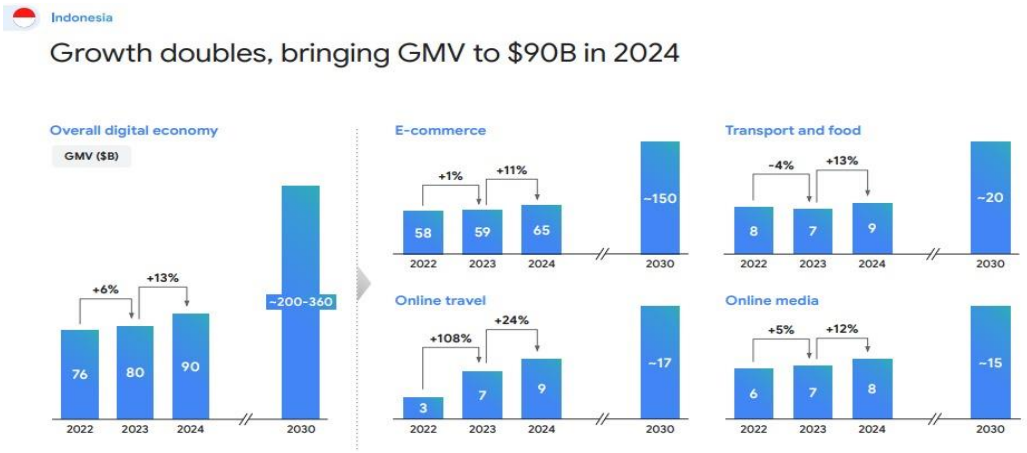
Findings: The research found that blockchain has significant potential to enhance transparency, efficiency, traceability, and accountability in halal certification through features such as smart contracts and decentralized storage. However, considerable challenges remain, including infrastructure readiness, human resource limitations, the absence of global standards, and potential ethical gaps. Publication trends indicate an increase in academic interest in this topic.

Originality/Value: This research contributes by mapping the latest literature and filling the research gap on the opportunities and challenges of blockchain applications, specifically in halal certification.

INTRODUCTION

At the beginning of the twenty-first century, a significant technological and scientific revolution affected the financial, banking, retail, education, and social sectors.[1] Digital transformation promotes efficiency, transparency, and inclusivity,[2] Making technology play a strategic role in human life.[3] The e-Conomy SEA 2024 report projects that Indonesia's digital economy will reach US$90 billion in 2024, up 13% from the previous year.[4]

Figure 1. List of Forecasts for Indonesia's Digital Economy



Technological developments in the economic sector.[5] Blockchain is one technology that has been widely discussed. It is a distributed ledger-based network system that permanently and transparently records and tracks transactions.[6] This technology operates as a distributed database that stores transaction data in an encrypted, mutually agreed-upon, tamper-proof manner to ensure data integrity.[7]

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[1] Sukaesih Sri, 'Sri+Sukaesih', *Prosiding Semnas Biologi XI Tahun 2023 FMIPA Universitas Negeri Semarang*, 2023.

[2] Ayu Widiana and others, *Dampak Digitalisasi Keuangan Terhadap Stabilitas Sistem Keuangan Global*, 2024.

[3] Ahmad Fuad, 'Ekonomi Moneter Syariah Dalam Perkembangan Zaman', *Jurnal Syariah*, 8.1 (2020), 1–24 <www.freepik.com>.

[4] E- conomy-SEA, *E- Conomy - SEA*, 2024.

[5] Deutsche Bank, *Deutsche Bank*, 2021.

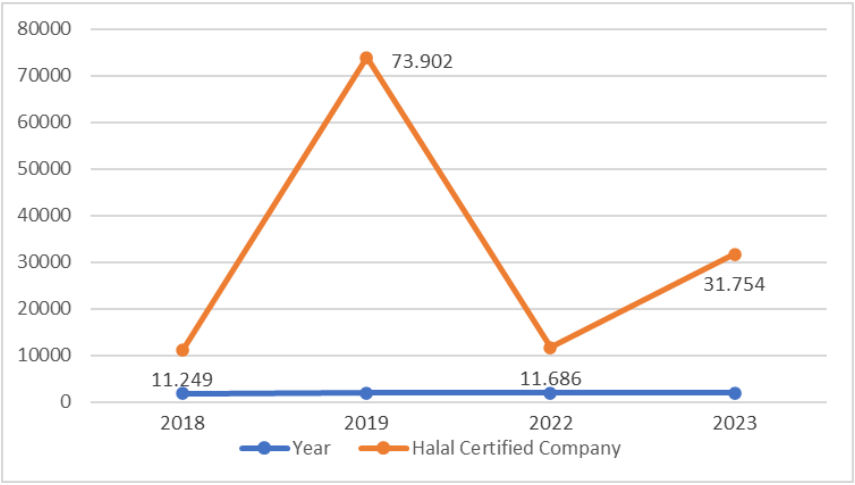
[6] Winda Fitri, *Kajian Penerapan Smart Contract Syariah Dalam Blockchain: Peluang Dan Tantangan*, 2023, XXXVIII <https://dsnmui.>.

[7] Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, 2008 <www.bitcoin.org>.

Blockchain technology was first introduced as the foundation of encrypted digital currency transaction systems, such as Bitcoin. These systems enable direct interaction between users without the need for a central institution or bank as an intermediary. Bitcoin transactions are managed by a network that focuses on security, transparency, and decentralization.[8] This technological development has attracted attention as a potential solution to improve data transparency and integrity in various sectors, including halal certification systems. In Indonesia, the halal certification process remains plagued by complex procedures, lengthy bureaucracy, and a lack of supply chain transparency. These issues can hinder the growth of the halal industry and reduce consumer confidence.[9]

The growing number of halal-certified products indicates increased industry-wide awareness. In 2018, 11,249 companies registered for halal certification. This number increased to 13,951 in 2019, resulting in a total of 1,002,413 halal-certified products.[10] As illustrated by the data on halal certification growth by company, this trend is expected to continue through 2023.

Figure 2. Growth of Halal Certification by Company



[8] Palupi Lindiasari Samputra and Septia Zul Putra, 'Transaksi Cryptocurrency Perspektif Hukum Ekonomi Syariah', *Jejak*, 13.1 (2020), 188–202 <https://doi.org/10.15294/jejak.v13i1.23099>.

[9] Rini Idayanti, *Mengeksplorasi Potensi Hilirasi Blockchain : Peluang Dan Tantangan Transformasi Industri LogistikK Halal*, 2024.

[10] Warto Warto and Samsuri Samsuri, 'Sertifikasi Halal Dan Implikasinya Bagi Bisnis Produk Halal Di Indonesia', *Al Maal: Journal of Islamic Economics and Banking*, 2.1 (2020), 98 <https://doi.org/10.31000/almaal.v2i1.2803>.

Halal certification in Indonesia has been around for years. Through Law No. 33 of 2014 concerning the Guarantee of Halal Products,[11] The government strives to ensure the halal status of products by covering the processes of raw material selection, processing, and distribution in accordance with LPPOM MUI standards. Blockchain technology is believed to accelerate halal certification by providing transparent, efficient, and accountable verification and auditing, thereby reducing the risk of fraud.[12] Despite its significant potential, blockchain technology remains relatively new to halal certification in Indonesia, and many processes are still manual, making them prone to errors and data manipulation.[13]

Blockchain's transparent, immutable, and decentralized characteristics are considered to align with Sharia principles, particularly those of clarity and honesty in transactions.[14] Additionally, smart contracts automate processes based on initial agreements, increasing efficiency and trust between parties.[15]

Several countries have utilized blockchain technology for halal certification. For example, Indonesia's PT Sreeya Sewu Indonesia Tbk uses it to produce halal chicken.[16] Brazil has a halal supply chain tracking platform.[17] The United Arab Emirates and Malaysia use it to enhance transparency and efficiency.[18] Malaysia launched a pilot program in 2022 to digitally track the origin of imported meat in collaboration with JAKIM.[19] The researchers'

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[11] JPH, *UU RI No. 33 Tahun 2014 Tentang Jaminan Produk Halal*, 2014.

[12] Irfan Bahar Nurdin, 'Ad-Deenar: Jurnal Ekonomi Dan Pemanfaatan Teknologi Blockchain Untuk Meningkatkan Kualitas Keterjaminan Halal Pada Produk Makanan Dan Minuman Di Indonesia', 2024 <https://doi.org/10.30868/ad.v8i01.6469>; Idayanti.

[13] Muhammad Rafi and Indah Fitriana Sari, *Sosialisasi Dan Pendampingan Sertifikasi Halal Produk Pelaku Usaha Mikro Kecil Dan Menengah (UMKM) Kabupaten Sumbawa Nusa Tenggara*, 2024, 06.

[14] Etikah Karyani and others, 'Intention to Adopt a Blockchain-Based Halal Certification: Indonesia Consumers and Regulatory Perspective', *Journal of Islamic Marketing*, 15.7 (2024), 1766–82 <https://doi.org/10.1108/JIMA-03-2023-0069>.

[15] Bahar Nurdin.

[16] Cut Nahra Putri Rizqya, *Potensi Rantai Pasok Makanan Halal Berbasis Teknologi Blockchain: A Systematic Literature Review*, 2024.

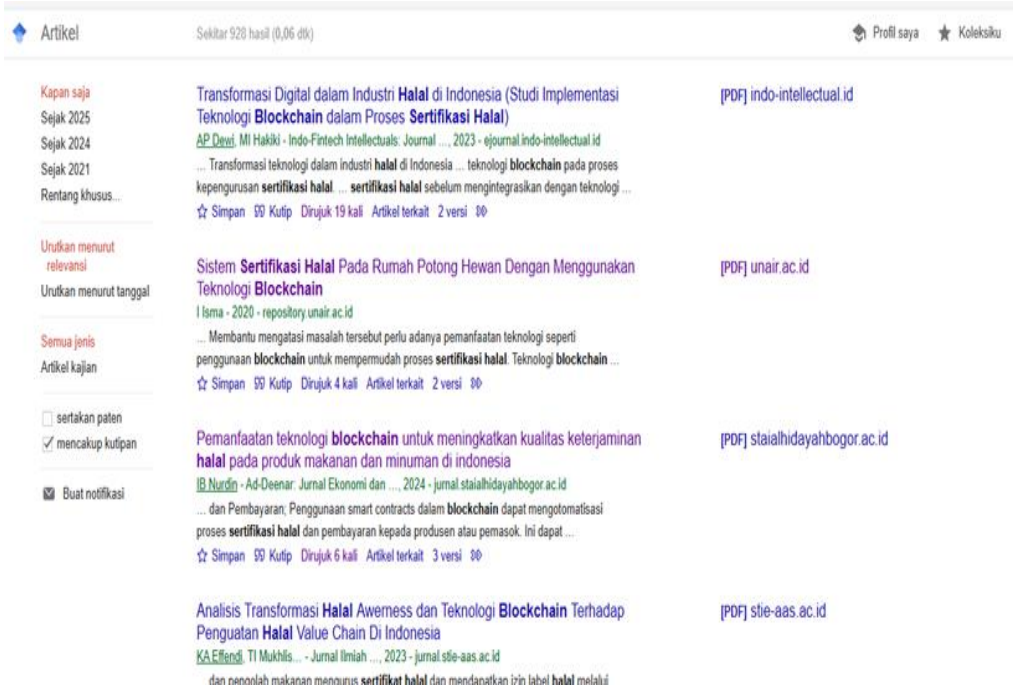
[17] Fajar Azhari Julian and Elsa Ameliana, 'Barriers to Blockchain Technology Adoption in the Halal Supply Chain: Insights from Manufacturers and Regulatory Authorities', *SocioHumania: Journal of Social Humanities Studies*, 1.2 (2024), 83–97 <https://doi.org/10.70063/sociohumania.v1i2.48>; Tamer Mansour, 'Brasil Hampir Menyelesaikan Proyek Blockchain Dalam Ketertelusuran', *Euromeatnews*, 2020.

[18] Mahmoud Alsakhnini and Yazeed Almoaiad, 'A Review of Applications of Blockchain Technology in the Middle East', 12.1 (2024), 2051–4883 <https://doi.org/10.58262/ks.v12i1.008>.

[19] Desty Anggie Mustika, *Transformasi Hukum Bisnis Dalam Industri Makanan: Inovasi Regulasi Halal Berbasis Blockchain Di Indonseia Dan Malaysia Sebagai Pendorong Persaingan Global*, 2023, x.

findings reinforce the idea that blockchain technology has the potential to strengthen the halal certification system. There is evidence of more than 928 documents containing the keywords "blockchain halal certification" on Google Scholar. These findings suggest a significant opportunity to optimize halal certification in Indonesia using blockchain technology, aligning with global trends and the evolving needs of the halal industry.

Figure 2. Google Scholar Database search results



Researchers' interest in blockchain technology for halal certification activities. Several studies have found that blockchain technology positively impacts the halal value chain and promotes innovative regulation in Indonesia and Malaysia.[20] Blockchain technology can improve the quality of halal products by increasing transparency and efficiency in the certification process, simplifying tracking, and ensuring production continuity through integration with the Halal Assurance System.[21] Additionally, improved accountability and traceability in

[20] Ibnu Habib Wahyudi, Imsar, and Muhammad Ikhsan Harahap, 'Blockchain Strategy in Improving Transaction Security in The Sharia Capital Market', *Jurnal Manajemen Bisnis*, 11.2 (2024), 958–69 <https://doi.org/10.33096/jmb.v11i2.862>.

[21] Karyani and others; Ariza Qanita, Laila Maghfuroh, and Zaydan Muhammad, 'Integration Of HAS With Blockchain As Halal Sustainability In Maqashid Sharia Perspective', *Journal of Halal Product and Research*, 7.1 (2024), 40–51 <https://doi.org/10.192501/jhpr.vol.7>.

halal supply chains have been highlighted, as has blockchain's ability to build consumer trust[22] and accelerate halal product verification for SMEs.[23]

Other studies have discussed the opportunities and challenges of implementing blockchain technology in halal certification systems.[24] As well as its role in driving digital transformation in the halal industry.[25] However, little research has been conducted on the systematic review of the literature on the implementation of blockchain in halal certification. Some existing studies discuss integrating the Halal Assurance System with blockchain from a maqashid syariah perspective, as well as the challenges of implementing sharia smart contracts.[26] Meanwhile, Arwani & Priyadi's (2024)[27] Research focuses on Islamic financial transparency, and Bandaso's[28] Research reviews it from an Islamic accounting perspective. These studies indicate that previous research has emphasized supporting aspects, such as halal logistics, Islamic finance, and accounting, rather than the halal certification process itself.

Based on the above discussion, there appears to be a research gap that needs to be addressed, particularly in summarizing the developments in the literature from 2020 to 2025 on halal certification blockchain in depth, to understand the opportunities and challenges of its implementation. Therefore, this study aimed to evaluate the implementation of blockchain technology in halal certification activities.

RESEARCH METHOD

This study uses a qualitative descriptive method by presenting data obtained directly. The author uses secondary data obtained through a literature review,

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[22] Leny Megawati, Cecep Wiharma, and Asep Hasanudin, *Peran Teknologi Blockchain Dalam Meningkatkan Keamanan Dan Kepastian Hukum Dalam Transaksi Kontrak Di Indonesia* (Online, 2023), IX <https://jurnal.unsur.ac.id/jmj>; Mr Yasir and D G Ingale, 'IJIRID International Journal of Ingenious Research, Invention and Development Blockchain for Transparent Charity Donations', 2024 <https://doi.org/10.5281/zenodo.14137474>.

[23] Sulasi Rongiyati, *Pemberlakuan Kewajiban Sertifikasi Halal Bagi UMKM*, April 2024.

[24] Anak Agung and others, *Smart Contract and IPFS Decentralized Storage for Halal Certification Process*, 2024 <www.joiv.org/index.php/joiv>.

[25] Kharisya Ayu Effendi and others, 'Analisis Transformasi Halal Awerness Dan Teknologi Blockchain Terhadap Penguatan Halal Value Chain Di Indonesia', *Jurnal Ilmiah Ekonomi Islam*, 9.3 (2023), 3275 <https://doi.org/10.29040/jiei.v9i3.10383>.

[26] Effendi and others; Fitri, XXXVIII; Qanita, Maghfuroh, and Muhammad.

[27] Agus Arwani and Unggul Priyadi, 'Eksplorasi Peran Teknologi Blockchain Dalam Meningkatkan Transparansi Dan Akuntabilitas Dalam Keuangan Islam: Tinjauan Sistematis', *Jurnal Ekonomi Bisnis Dan Manajemen*, 2.2 (2024), 23–37 <https://doi.org/10.59024/jise.v2i2.653>.

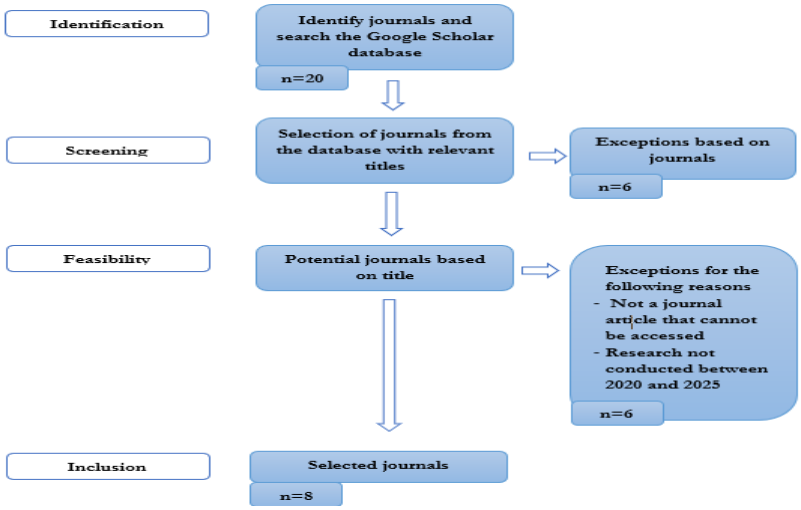
[28] Trinita Imelda Bandaso and others, 'BlockchainTechnology: Bagaimana Menghadapiya? - Dalam Perspektif Akuntansi', *Accounting Profession Journal (APAJI)*, 4.2 (2022).

which is relevant and available in books, journals, and online sources related to Islamic banking.

This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[29]With a descriptive approach, where data are collected from journal articles relevant to the research topic. With a method implemented in a structured manner following the research steps established by PRISMA, the identification, selection, and inclusion of articles are carried out systematically.

A Systematic Literature Review (SLR) is designed systematically to collect, evaluate, integrate, and present findings from various research studies on a given topic.[30]. The emphasis on the word 'systematic' here indicates that the review process follows well-structured, documented stages, from the formulation of the research to the synthesis of its findings, to minimize bias and increase the validity of the results. One objective is to present an overview of the existing literature within the selected research scope, thereby providing a strong basis for decision-making or further research. Data was retrieved from Google Scholar using the Publish or Perish software.

Figure 3. Prisma Flow Process



Source: Data processed by researchers

[29] David Moher and others, 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement', *International Journal of Surgery*, 8.5 (2010), 336–41 <https://doi.org/10.1016/j.ijsu.2010.02.007>.

[30] M. Nurs & Tim Nursalam, *Pedoman Penyusunan Skripsi-Literature Review Dan Tesis-Systematic Review Sosialisasi Panduan Systematic Dan Literature Review*, 2020.

1. Determine keywords for searching research objects through the Google Scholar database with the help of Publish or Perish (PoP). The keywords used are "Blockchain Halal Certification" and "blockchain Halal Certification."
2. Screen journals that meet the research criteria. The criteria for selecting these journals have been determined, which include:
   a. The selected articles are online journals that are accessible to the public and are not theses.
   b. The articles contain relevant keywords in the title, abstract, conclusion, or main content;
   c. The articles discuss "Blockchain Halal Certification" and "Blockchain Halal Certification."
3. Classifying relevant articles. The researcher organized the articles found in the previous stage. In the article selection process, the researcher evaluated the article titles, abstracts, and keywords. If the information on "blockchain Halal Certification" was considered adequate, the article was downloaded and read thoroughly. The initial classification was performed using Microsoft Excel.

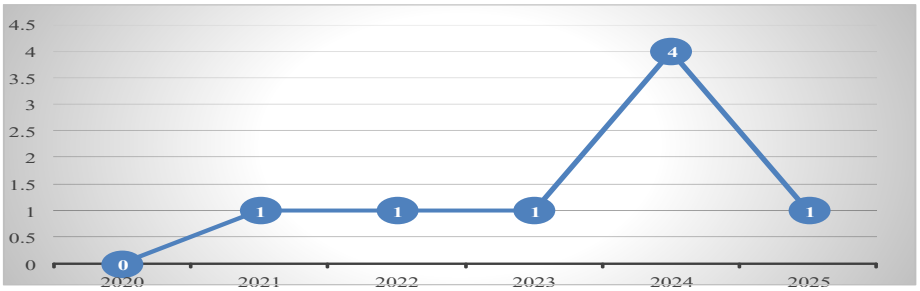
RESULT AND DISCUSSION

Trends and Conditions in Literature Related to *Blockchain* Halal Certification

Distribution of Articles by Year of Publication

Using the PRISMA framework, a literature review identified eight journal articles on blockchain in halal certification published between 2020 and 2025. See the graph below for the results.

Graph 1. Distribution of Articles Based on Year of Publication



Publication of blockchain halal certification from 2020 to 2025. In 2020, no articles discussing this topic were found. One article emerged in 2021, Mahirah & Razali, followed by one in 2022, Sim & Abdullah, and one in 2023 addressing blockchain technology transformation in halal certification, Dewi & Hakiki[31]. In 2024, there was a significant increase, with four articles addressing this topic.[32]

In 2025, the topic of blockchain halal certification gained renewed attention through an article by Ahmad Ridho.[33] The graph generally shows an upward trend, though it is not consistent year to year. Technological developments, industry needs, and growing awareness of the importance of credible, modern halal certification likely influence these fluctuations.

Distribution of Articles Based on Document Type

Currently, research on halal certification blockchain exists in the form of articles, conference papers, proceedings, and other written works. This makes it easier for interested readers to find relevant research. The distribution of halal certification blockchain research based on document type is shown in the diagram below. Based on the diagram in 1, the number of studies documented in journal format was 6, and in proceedings 2. Thus, research on halal certification *blockchain* during the 2020-2025 period was predominantly conducted in journal format.

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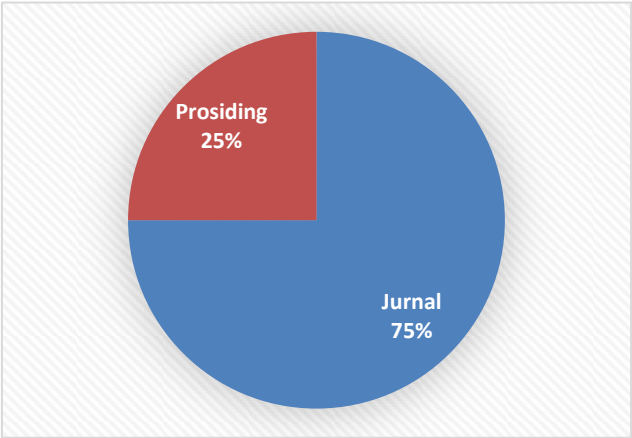
[31] Arlinta Prasetian Dewi and Mohammad Ichsan Hakiki, 'Transformasi Digital Dalam Industri Halal Di Indonesia (Studi Implementasi Teknologi Blockchain Dalam Proses Sertifikasi Halal)', *Indo-Fintech Intellectuals: Journal of Economics and Business*, 3.2 (2023), 360–70 <https://doi.org/10.54373/ifijeb.v3i2.240>.

[32] Agung and others; M., Santoso, H. B., & Prasetyo, A. Isman, 'Challenges in Halal Certification Process: A Case Study of Indonesian SMEs. Journal of Islamic Marketing', 2024; Karyani and others; Qanita, Maghfuroh, and Muhammad.

[33] Ahmad Ridho, 'Integrating Artificial Intelligence and Blockchain to Improve the Accuracy of Halal Certification', 2025.

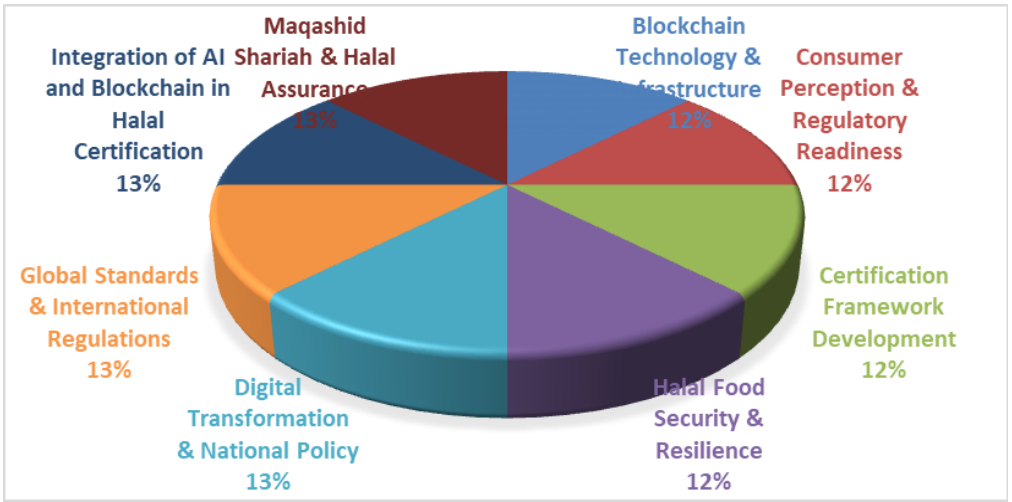
Figure 4. Distribution of Journal Articles Based on Document Type



Distribution of Articles Based on Research Topic Clusters

A systematic literature review (SLR) method was used to compile this research. Eight scientific articles were purposely selected based on inclusion criteria and relevance to the central theme: the implementation of blockchain technology in halal certification activities. These articles were then analyzed in depth and grouped by common themes or research focuses to identify the topics discussed by researchers. This process yielded several topic clusters that represent dominant themes in the reviewed literature. The researchers have attached the corresponding diagram below.

. Distribution of Journal Articles Based on Topic Clusters



Research on blockchain in halal certification during the 2020–2025 period is divided into four main clusters: technology and infrastructure; social and institutional; the development of a digital halal certification framework; and normative and global dimensions. The technology and infrastructure cluster emphasizes the use of smart contracts and decentralized storage, such as IPFS. For example, Agung et al.[34] modeled an automated halal certification system based on Ethereum. The social and institutional cluster addresses user and institutional readiness. For instance, Karyani et al.[35] identified technical and human resource limitations in implementing institutions. Mahirah and Razali[36] represent the digital halal certification framework cluster, emphasizing the integration of information systems, governance, and cryptographic hash-based certification validation. Sim and Abdullah[37] also represent this cluster, highlighting the role of blockchain in maintaining food security during the pandemic.

In the national context, Dewi and Hakiki[38] Assess the technical and educational challenges of digitizing halal certification in Indonesia. Qanita et al.[39] Take a normative approach by integrating the Halal Assurance System (HAS 23000) and *maqashid syariah*. Meanwhile, Ashari Ashshidiq et al.[40] Discuss opportunities to integrate blockchain into global halal standards despite the gap between international norms and local practices. Overall, these studies indicate that the discourse on blockchain implementation in halal certification encompasses technology, society, norms, national policies, and global dynamics. This provides a basis for developing strategic recommendations for a transparent, efficient, and Islamically compliant system.

Opportunities and Challenges of Blockchain Technology in Halal Certification Activities

Opportunities for Blockchain Implementation in Halal Certification Activities

The application of blockchain technology in halal certification activities opens up various strategic opportunities to strengthen the halal product system in terms of transparency, efficiency, and data integrity. One of the main

[34] Agung and others.
[35] Karyani and others.
[36] Mahirah and Razali.
[37] Sim and Abdullah.
[38] Dewi and Hakiki.
[39] Qanita, Maghfuroh, and Muhammad.
[40] Ahmad Ashari Ashshidiq, Farida Arianti, and Yusuf Rahmat Yanuri, 'Implentation of the Global Halal Standard Based on Blockchain Technology', *Journal of Law & Governance*, 7.1 (2024), 11–28.

opportunities is the immutability of blockchain, which guarantees that data cannot be altered or manipulated. In the context of halal certification, this maintains consumer trust in the authenticity of a product's halal status. With automatic, permanent recording, the blockchain serves as authentic proof that the certification process has been conducted in accordance with procedures.[41]

The next opportunity is the ease of self-verification by the public. This technology allows consumers to verify the authenticity of halal certificates directly and in real time, for example, by scanning QR codes or accessing open platforms. This is a solution to the prevalence of fake certificates in the traditional system, while also reducing dependence on a single institution for validation.[42] Accountability also increases because all parties, such as auditors, producers, and certification bodies, are recorded within the digital network, fostering a sense of collective responsibility. Additionally, the decentralized system enhances security because data is not stored on a single server but distributed across multiple nodes in the network. This reduces the risk of cyberattacks and data loss due to data center failures.[43]

In addition, blockchain technology helps maintain sharia values, such as shiddiq (honesty) and amanah (trust), through high levels of transparency and traceability. Traceability from upstream to downstream is one of its main strengths. Blockchain records every stage of the halal supply chain, from raw materials to the final product, to ensure that no violations of halal principles occur. [44] The innovative contract feature enables automatic validation and audits by consumers and regulatory bodies. This supports the value of hifdz ad-din (preserving religion) within the objectives of Sharia law. The author has attached a table outlining opportunities to implement blockchain technology in halal certification activities.

Table 1. Opportunities for Blockchain Implementation in Halal Certification Activities

Research Topic	Opportunities	Solutions	Author (s) (Year)
Immutability & Transparency	Ensures permanent and tamper-proof records that enhance consumer trust in halal	Implementing blockchain to create immutable transaction ledgers for halal product	Qanita et al. (2024)

[41] Qanita, Maghfuroh, and Muhammad.
[42] Agung and others.
[43] Dewi and Hakiki.
[44] Sim and Abdullah; Qanita, Maghfuroh, and Muhammad.

	authenticity.	certification.	
Real-Time Verification & Public Access	Enables consumers to verify halal certificates directly, reducing dependence on central authorities.	Developing open-access blockchain platforms with QR code integration for real-time verification.	Agung et al. (2024)
Distributed Accountability	Strengthens collective responsibility among auditors, producers, and regulators through shared data records.	Recording every stakeholder's activity on the blockchain to ensure transparency and traceable decision-making.	Karyani et al. (2024)
System Resilience	Improves data security and minimizes the risk of system failure or cyberattacks through decentralization.	Using a distributed ledger architecture to store halal certification data across multiple nodes.	Dewi & Hakiki (2023)
Traceability & Audit	Guarantees full traceability from raw materials to finished products, increasing audit reliability.	Applying smart contracts that automatically flag or stop certification when non-halal inputs are detected.	Sim & Abdullah (2022); Qanita et al. (2024)
Shariah Ethics & Maqashid Shariah	Integrates Islamic ethical principles such as hifdz ad-din, shiddiq, and amanah into halal digital systems.	Designing blockchain frameworks that embed Shariah-compliant values and promote ethical behavior in certification processes.	Qanita et al. (2024)

Source: Data processed from journal article findings

Table 1 shows how blockchain technology plays a vital role in maintaining the integrity of the halal supply chain, both technically and spiritually. One of the main advantages of blockchain is its ability to record and track every stage of the halal supply chain, from raw materials to finished products. This is crucial to ensure that there is no contamination or violation of halal principles throughout the distribution chain.[45] Blockchain offers a solution by creating a permanent digital record for each stage of the process[46].

Challenges of Implementing Blockchain in Halal Certification

Despite its many advantages, the implementation of blockchain in halal certification also faces challenges. One of them is the traditional certification system, which has not been fully digitized, posing a risk of data manipulation and the issuance of fake certificates.[47] In addition, dependence on a single institution as the validation authority also makes it difficult for the public to obtain information quickly and independently. On the other hand, although the blockchain system is technically robust, the potential for human error remains a barrier. The lack of digital literacy among halal business operators can lead to inaccurate or even manipulative data input. Errors or malicious intent in operating the system can still damage the digital integrity that has been built.[48] The author has attached a table of the challenges of implementing blockchain technology in halal certification activities.

Table 2. The author has attached a table of the challenges of implementing blockchain technology in halal certification activities.

Research Topic	Opportunities	Solutions	Author(s) (Year)
Lack of Transparency in Traditional Systems	Blockchain can create permanent and verifiable digital trace records to eliminate fake halal certificates and increase public trust.	Implement blockchain-based halal certification systems using immutable ledgers and public verification.	Agung et al. (2024)

[45] Sim and Abdullah.

[46] Qanita, Maghfuroh, and Muhammad.

[47] Masyarakat Jombang Studi Kasus Lembaga Sosial Pesantren Tebuireng and others, *Implementasi Pengelolaan Dana Infaq Dalam Meningkatkan Kesejahteraan 'LSPT')*, 321AD <https://ejournal.feunhasy.ac.id/jies>.

[48] Karyani and others.

Dependence on a Single Authority	The decentralized nature of blockchain enables independent access and verification of halal information by the public.	Develop open-access blockchain networks with multi-stakeholder governance to reduce reliance on a single institution.	Agung et al. (2024)
Human Error, Ethics, and Manipulation Risks	Increases awareness of ethical responsibility and digital literacy among business actors while promoting transparency in all processes.	Conduct training programs for halal industry actors and integrate smart contract validation to minimize human error and unethical practices.	Karyani et al. (2024)

Source*: Data processed from journal article findings*

Table 2 above shows that the development of a blockchain-based halal certification system requires not only technological readiness but also social readiness, regulations, and ethical education in accordance with sharia principles, so that this system can be implemented optimally and sustainably.

Further Research Directions Based on SLR Findings

Based on the synthesis of the eight main articles in this study, research on the implementation of blockchain technology in halal certification activities has developed in various directions, ranging from technical and social to institutional and normative aspects of Sharia. After reviewing the literature from 2020 to 2025 available on Google Scholar using the keywords 'blockchain halal certification' and 'blockchain halal certification,' eight top literature sources were identified that are accessible and have been discussed in this study. From these eight literature sources, the direction for future research was determined in light of previous studies. The following table summarizes earlier researchers' recommendations for future research.

Table 3. Table of Future Research Directions Based on SLR

Future Research Topic	Author(s)
End-to-end evaluation of blockchain-based halal certification processes Integration model of HAS and blockchain based on maqashid sharia	Qanita et al. (2024)
Development of smart contracts for halal certification based on fiqh	Fitri (2023)
Study on the implementation of digital halal audit using blockchain technology	Karyani et al. (2024)
Design of halal logistics systems with blockchain and enhancement of digital literacy	Idayanti (2024)
Transparency and security of Sharia financial data based on blockchain	Arwani & Priyadi (2024)
Validation of Sharia accounting data authenticity in the digital halal ecosystem	Bandaso et al. (2022)
Development of a decentralized halal value chain model based on blockchain technology	Effendi et al. (2023)

Source: Data processed from journal article findings.

CONCLUSION

Based on a systematic review of eight scientific articles, it can be concluded that the implementation of blockchain technology in halal certification shows a significant upward trend in both academic and practical fields. Blockchain is considered capable of addressing various limitations inherent in conventional systems, particularly in terms of transparency, efficiency, accountability, and traceability of halal products across upstream and downstream supply chains. The analyzed research shows increasingly rapid development, with a peak in publications in 2024, underscoring the urgency of modernizing halal certification to keep pace with the global halal industry's growth. Most of the research is not only theoretical but also directed at developing real-world implementations through case studies, prototypes, and integration with the Halal Assurance System (HAS). These findings confirm the feasibility of blockchain as a solution aligned with sharia principles and *maqashid shariah*.

However, the implementation of this technology still faces several complex challenges, ranging from infrastructure limitations, high adoption costs, low digital literacy among industry players, to the lack of regulations governing the application of blockchain in halal certification. This shows that successful adoption depends not only on technical aspects but also on the ecosystem's readiness and adequate policy support. Therefore, the application of blockchain in halal certification holds promising prospects. Still, to achieve it effectively and sustainably, a holistic strategy is needed that encompasses infrastructure development, clear regulations, and multi-stakeholder collaboration. Therefore, the government and halal certification bodies need to formulate adaptive policies to ensure that blockchain implementation proceeds without administrative obstacles. For the next study, researchers are encouraged to expand their studies, particularly through interdisciplinary research and cross-country comparisons, to strengthen both the theoretical and practical foundations of the digital halal ecosystem. ■

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