

Towards Halal 5.0: A Conceptual Model of Technological Innovation and Quality Governance for Global Halal Ecosystems

Mohammadtahir Cheumar¹, Norhayati Binti Abdullah²

¹Universiti Islam Antarabangsa Sultan Abdul Halim Mu'adzam Shah (UniSHAMS), 09300 Kuala Ketil, Kedah, Malaysia, ²Universiti Kuala Lumpur (UniKL) Malaysian Spanish Institute (MSI), 09000 Kulim, Kedah, Malaysia

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Abstract

The convergence of Industry 5.0 technologies and halal governance represents a paradigm shift in how halal industries achieve efficiency, traceability, and sustainability. Building upon Hidayati et al. (2024), this paper develops the Halal 5.0 Framework, emphasizing human–technology synergy, quality governance, and sustainability. The model conceptualizes how AI, blockchain, IoT, and big data analytics collectively enhance halal integrity and stakeholder collaboration in a global context. In addition, this study highlights the ethical dimension of digital transformation, ensuring that technological advancements remain aligned with *maqasid al-shariah* (the objectives of Islamic law). By embedding moral consciousness, inclusivity, and sustainability into technological innovation, Halal 5.0 aims to create a balanced ecosystem that supports economic development while upholding Islamic ethical values. The framework provides a new direction for policymakers, industries, and researchers to evaluate technological readiness and governance alignment for halal assurance. Ultimately, the proposed model offers a blueprint for a globally integrated and ethically guided halal ecosystem that promotes trust, transparency, and universal well-being.

Keywords: Halal 5.0, Halal Governance, Sustainability, Ai, Blockchain, Halal Ecosystem, Industry 5.0

Introduction

The halal industry's evolution toward Halal 5.0 integrates human-centered innovation with smart technologies to promote trust, efficiency, and sustainability. Despite global progress, disparities in halal certification, data interoperability, and governance hinder holistic adoption (Hidayati et al., 2024). The emergence of Industry 5.0 emphasizes the fusion of advanced digital systems with human values, empathy, and shared prosperity—moving beyond automation toward ethical collaboration between humans and machines. Within this context, Halal 5.0 proposes a paradigm that redefines halal governance by incorporating technological integrity with moral accountability.

In a rapidly digitalizing global economy, the halal industry must respond not only to market demand but also to societal expectations regarding transparency, sustainability, and ethical compliance. Integrating artificial intelligence, blockchain, and the Internet of Things (IoT) enables traceability and predictive analytics, ensuring that halal products remain authentic and trustworthy throughout the supply chain. At the same time, adherence to *maqasid al-shariah* ensures that innovation serves public benefit (*maslahah*) and prevents harm (*mafsadah*). Therefore, Halal 5.0 does not merely represent a technological leap but a holistic transformation that fuses technological advancement with Islamic ethics and global sustainability objectives. This study thus seeks to conceptualize a comprehensive Halal 5.0 model that bridges technology, governance, and spirituality within the modern halal ecosystem.

Literature Review

From Halal 4.0 to Halal 5.0

The transition from Halal 4.0 to Halal 5.0 reflects a significant paradigm shift in the evolution of the halal industry. While Halal 4.0 emphasized digital automation, cloud computing, and data analytics to enhance operational efficiency and traceability, it remained largely technology-driven without fully integrating ethical or human dimensions (Fernando et al., 2021). In contrast, Halal 5.0 introduces *human-centric innovation* that prioritizes empathy, inclusivity, and shared prosperity, ensuring that technological progress aligns with Islamic ethical principles (Sulaiman & Azmi, 2024; Abbas, 2025). This approach reflects the spirit of *Industry 5.0*, which recognizes that true progress combines intelligent systems with human creativity and moral consciousness. The integration of *maqasid al-shariah* within Halal 5.0 ensures that innovation serves the greater public good (*maslahah*), balancing economic advancement with ethical responsibility. Thus, Halal 5.0 redefines technological growth not as an end in itself, but as a means of achieving equitable, sustainable, and spiritually guided industrial development.

Governance in Halal Ecosystems

Effective governance is the backbone of a credible halal ecosystem. Unified halal governance structures, certification harmonization, and policy integration play essential roles in enhancing transparency, trust, and efficiency across global halal markets (Rahim et al., 2023). Inconsistent halal standards among different countries often lead to duplication, trade barriers, and confusion among consumers and producers alike. The movement toward harmonized certification, mutual recognition, and digital verification systems can address these disparities, fostering cross-border cooperation and compliance. According to Rizki et al. (2023), the future of halal governance requires an integrated approach that combines institutional alignment, digital governance tools, and collaborative oversight. This holistic model not only strengthens the integrity of halal assurance systems but also reflects the Islamic principles of *'adl* (justice) and *amanah* (trust), reinforcing accountability and fairness throughout the halal value chain.

Technology-Driven Integration

Technological innovation serves as the key enabler in realizing the vision of Halal 5.0. Emerging technologies such as Artificial Intelligence (AI), blockchain, and the Internet of Things (IoT) collectively transform how halal industries manage traceability, quality assurance, and supply chain transparency (Hidayati et al., 2024). Blockchain ensures

immutable records of halal compliance, AI enables predictive analytics and fraud detection, while IoT facilitates real-time monitoring from production to consumption (Attarbashi et al., 2024; Abbas et al., 2025). Big data analytics further enhance decision-making by providing insights into consumer behavior, logistics optimization, and risk management. The integration of these tools supports the development of a *smart halal ecosystem* that is not only efficient but also trustworthy and ethically compliant. As digital technologies evolve, their alignment with Islamic ethical values becomes increasingly vital to ensure that technological sophistication continues to uphold the principles of *ihsan* (excellence) and *siddiq* (truthfulness), forming the technological foundation of the Halal 5.0 Framework.

Conceptual Framework

The proposed Halal 5.0 Conceptual Model (see Figure 1) presents an integrated framework that unites technological innovation, governance harmonization, ethical consciousness, and sustainability under the principles of *maqasid al-shariah*. This model builds upon the convergence of Industry 5.0 technologies with Islamic ethical imperatives, proposing a human-centered, technology-empowered halal ecosystem designed to ensure trust, transparency, and long-term sustainability. The framework positions human–technology synergy, governance harmonization, smart quality management, and sustainability orientation as the four foundational pillars that collectively drive the formation of a Holistic Halal 5.0 Ecosystem, ultimately leading to Global Halal Sustainability.

At the core of this conceptual model lies the belief that technological innovation must serve humanity, guided by moral values and divine accountability. The human–technology synergy component emphasizes the responsible and ethical use of emerging technologies—such as artificial intelligence (AI), blockchain, the Internet of Things (IoT), and big data analytics—to enhance halal assurance and stakeholder collaboration. These technologies function not as replacements for human judgment, but as tools that amplify *itqan* (excellence) and *amanah* (trustworthiness) within halal operations.

Governance harmonization acts as the regulatory backbone of the model. It promotes global cooperation among halal certification bodies, ensuring consistency in standards, mutual recognition, and the reduction of bureaucratic overlap. When embedded in digital governance structures, this alignment strengthens institutional credibility and enhances cross-border halal trade efficiency.

Smart quality management integrates digital traceability systems and predictive analytics to safeguard halal integrity across production and distribution processes. It operationalizes *ihsan* (excellence) and *siddiq* (truthfulness) through smart auditing mechanisms and transparent data verification, minimizing the potential for fraud or human error.

The sustainability orientation dimension extends the model's impact beyond industrial efficiency to include environmental stewardship (*khilafah*) and social welfare (*maslahah*). It advocates for circular economic practices, resource efficiency, and eco-conscious innovation consistent with the Qur'anic principles of balance (*mīzān*) and moderation (*wasatiyyah*).

All four dimensions converge into the Halal 5.0 Ecosystem, which represents an ethically guided, technologically empowered, and globally connected halal framework. The ecosystem

seeks to establish *Global Halal Sustainability*—a vision where the halal industry becomes a universal model for ethical innovation, environmental care, and equitable growth, reflecting Islam’s universal message of *rahmatan lil-‘alamin* (mercy to all creation).

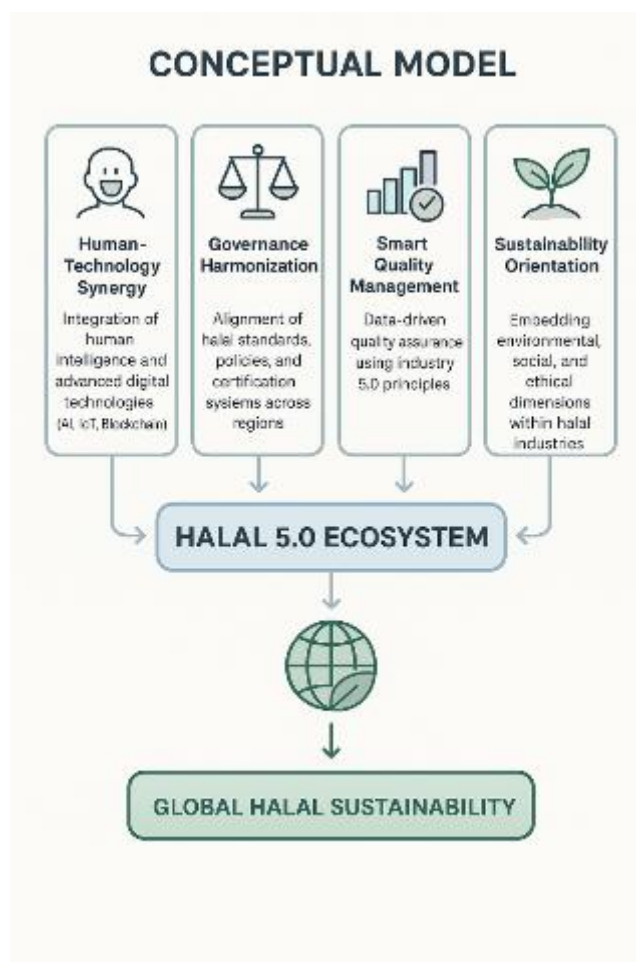


Figure 1: Conceptual Model

Discussion

The Halal 5.0 Framework aligns technological transformation with *maqasid al-shariah* principles, ensuring both efficiency and ethics. It envisions a globally connected halal ecosystem underpinned by smart, compassionate governance. Each component is described as followings:

Human–Technology Synergy

The Human–Technology Synergy component highlights the balanced relationship between technological advancement and human moral consciousness. Islam encourages the pursuit of knowledge (*‘ilm*) and innovation as long as it serves humanity within the boundaries of Shariah. The Qur’an reminds mankind that technological ability is a divine trust (*amanah*) that must be used responsibly:

قَدْ جَعَلَ اللَّهُ لَكُمْ مِمَّا خَلَقَ ظِلَالًا وَجَعَلَ لَكُمْ مِّنَ الْجِبَالِ أَكْنَانًا وَجَعَلَ لَكُمْ سَرَابِيلَ تَقِيكُمُ الْحَرَّ وَسَرَابِيلَ تَقِيكُمُ بَأْسَكُمْ
 “Allah has made for you shelter from what He created, and garments to protect you from heat and war.” (Surah al-Nahl, 16:81)

This verse symbolizes the use of human intellect to innovate for well-being. The Prophet ﷺ said:

إِنَّ اللَّهَ يُحِبُّ إِذَا عَمِلَ أَحَدُكُمْ عَمَلًا أَنْ يُتْقِنَهُ

"Indeed, Allah loves that when one of you does something, he does it with excellence." (Al-Bayhaqi, *Shu'ab al-Iman*, no. 5311)

Thus, technological tools such as AI, blockchain, and IoT should serve the higher ethical purpose of *itqan* (excellence) and *maslahah* (public benefit), ensuring that digital progress in the halal industry remains guided by ethical wisdom and human supervision.

Governance Harmonization

Governance Harmonization refers to the alignment of halal standards, certification procedures, and institutional governance across regions. The Qur'an commands justice and unity in managing community affairs:

إِنَّ اللَّهَ يَأْمُرُكُمْ أَنْ تُؤَدُّوا الْأَمَانَاتِ إِلَىٰ أَهْلِهَا وَإِذَا حَكَمْتُمْ بَيْنَ النَّاسِ أَنْ تَحْكُمُوا بِالْعَدْلِ

"Indeed, Allah commands you to render trusts to whom they are due and when you judge between people, to judge with justice." (Surah al-Nisa', 4:58)

Harmonized halal governance ensures justice (*'adl*) and fairness in certification, trade, and regulation. The Prophet ﷺ emphasized unity and cooperation:

الْمُؤْمِنُ لِلْمُؤْمِنِ كَالْبُنْيَانِ، يَشُدُّ بَعْضُهُ بَعْضًا

"A believer to another believer is like a building, each part supporting the other." (Sahih al-Bukhari, no. 481)

Through collaborative halal governance, diverse authorities can support one another to achieve consistency, transparency, and global trust within the halal ecosystem.

Smart Quality Management

The Smart Quality Management component reflects the Islamic principle of *ihsan* (excellence) and *amanah* (trust). Managing halal quality using smart technologies like AI-based monitoring or blockchain certification ensures that processes remain transparent and reliable. The Qur'an emphasizes precision and fairness in trade:

وَأَوْفُوا الْكَيْلَ وَالْمِيزَانَ بِالْقِسْطِ

"Give full measure and weight with justice." (Surah al-An'am, 6:152)

And the Prophet ﷺ warned against fraudulent practices:

مَنْ غَشَّائَنَا فَلَيْسَ مِنَّا

"Whoever cheats us is not one of us." (Sahih Muslim, no. 101)

By employing smart technologies, halal industries can minimize human error, prevent manipulation, and uphold the Islamic obligation of *siddiq* (truthfulness) in every transaction, ensuring that halal integrity is preserved from production to consumption.

Sustainability Orientation

Sustainability Orientation integrates Islamic environmental ethics and socio-economic justice into halal production and consumption. Islam teaches balance (*mīzān*) and stewardship (*khilāfah*) over the Earth:

وَلَا تُفْسِدُوا فِي الْأَرْضِ بَعْدَ إِصْلَاحِهَا

"Do not cause corruption on the earth after it has been set in order." (Surah al-A'raf, 7:56)

هُوَ أَنشَأَكُمْ مِّنَ الْأَرْضِ وَاسْتَعْمَرَكُمْ فِيهَا

"He produced you from the earth and settled you upon it." (Surah Hud, 11:61)

The Prophet ﷺ also said:

إِنْ قَامَتِ السَّاعَةُ وَفِي يَدِ أَحَدِكُمْ فَسِيلَةٌ، فَلْيَغْرِسْهَا

"If the Hour comes while you have a seedling in your hand, plant it." (Ahmad, Musnad, no. 12491)

These texts encourage responsible resource use, waste reduction, and social inclusivity—principles central to sustainable halal industries. *Halal 5.0* promotes eco-conscious production, circular economy models, and ethical labor practices consistent with *tayyib* (wholesome) values.

Halal 5.0 Ecosystem

The Halal 5.0 Ecosystem synthesizes human values, technological innovation, good governance, and sustainability into a unified framework. It embodies the *maqasid al-shariah* (objectives of Islamic law), which aim to protect faith, life, intellect, wealth, and environment. Allah reminds believers to act collectively for righteousness:

وَتَعَاوَنُوا عَلَى الْبِرِّ وَالتَّقْوَىٰ وَلَا تَعَاوَنُوا عَلَى الْإِثْمِ وَالْعُدْوَانِ

"Cooperate in righteousness and piety, and do not cooperate in sin and aggression." (Surah al-Ma'idah, 5:2)

In practice, this ecosystem integrates halal assurance with AI-driven traceability, digital governance, and sustainable innovation, ensuring that every component of the halal economy contributes to collective ethical progress.

Global Halal Sustainability

The Global Halal Sustainability outcome envisions a future where halal industries lead in global ethical development, innovation, and environmental responsibility. This aligns with the Qur'anic objective of establishing balance and justice across nations:

وَكَذَلِكَ جَعَلْنَاكُمْ أُمَّةً وَسَطًا لِتَكُونُوا شُهَدَاءَ عَلَى النَّاسِ

"And thus We have made you a just community that you will be witnesses over mankind." (Surah al-Baqarah, 2:143)

This verse underlines the Muslim community's role as a model of moderation (*wasatiyyah*) and ethical leadership. Through *Halal 5.0*, global halal sustainability promotes equitable trade, trust, and social welfare—realizing the prophetic vision of mercy to all creation:

وَمَا أَرْسَلْنَاكَ إِلَّا رَحْمَةً لِّلْعَالَمِينَ

"And We have not sent you, [O Muhammad], except as a mercy to the worlds." (Surah al-Anbiya', 21:107)

Hence, the model culminates in a system that is not only economically viable but also spiritually uplifting and globally inclusive.

Conclusion

Halal 5.0 represents a transformative shift from compliance-based approaches to a comprehensive, value-driven model that integrates ethics, technology, and sustainability within the global halal ecosystem. It goes beyond digital automation by promoting a human-centric philosophy where technology serves the higher objectives of *maqasid al-shariah*—protecting faith, life, intellect, wealth, and the environment. Through the synergy of artificial intelligence, blockchain, Internet of Things (IoT), and big data analytics, Halal 5.0 enhances transparency, traceability, and governance across the halal value chain while preserving human moral consciousness as its guiding principle.

This framework underscores the importance of *ihسان* (excellence) and *amanah* (trust) in managing halal production and certification, ensuring that technological advancement aligns

with ethical integrity. It envisions a globally connected halal ecosystem grounded in compassion, accountability, and sustainability—values deeply rooted in Islamic teachings. By embedding these moral and environmental dimensions into digital innovation, the Halal 5.0 model provides policymakers, industries, and scholars with a strategic blueprint for shaping future halal development.

Future empirical studies are encouraged to operationalize this conceptual framework, testing its practical applications across regions and sectors. Ultimately, Halal 5.0 aspires to position the halal industry as a global leader in ethical innovation, where technological progress harmonizes with divine guidance to achieve holistic and sustainable prosperity for humanity.

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