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Halal science as an emerging academic field: Examining its academic and epistemological foundation

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Abstract

Halal science refers to the use of scientific and technological principles in halal research, production, and innovation, and is becoming crucial to the global halal industry, yet its definition, scope, and scholarly foundations remain vague. This review evaluates whether halal science meets accepted hallmarks of an academic discipline by analysing peer-reviewed studies, educational texts, and authoritative reports. Evidence shows a rising presence in universities and research, hinting at disciplinary status. However, gaps persist: no standardised frameworks, limited institutional backing, and weak integration of religious and scientific paradigms. To mature, halal science must clarify its interdisciplinary nature, build stronger theoretical models, and gain wider academic recognition. The information gathered pointed towards its emergence as an academic discipline. A clearer disciplinary profile is vital for designing structured curricula and producing skilled professionals who can sustain the halal industry's expanding needs.

1. Introduction

The sustainability of the global halal industry, a rapidly expanding sector with a projected market value reaching trillions of dollars annually, fundamentally relies on a comprehensive halal ecosystem. This intricate ecosystem inherently encompasses diverse disciplines, ranging from the foundational principles of *Shari'ah* (Islamic law) to crucial aspects of modern management and cutting-edge scientific innovation. The strategic integration of science and technology, in particular, has proven instrumental in enhancing the development of halal products, ensuring the unwavering integrity of halal certification processes, and driving innovation to find ethical and permissible alternatives to *haram* (unlawful according to Islamic law) or *shubhah* (doubtful) ingredients. As consumer demand for transparent and verifiable halal products continues to surge worldwide, the role of scientific rigour in upholding halal standards has become paramount, making a clear conceptualisation of 'Halal Science' increasingly urgent.

Despite its demonstrable practical relevance and widespread application within the industry, the term 'Halal Science' largely remains a loosely defined concept within academic discourse. It is often broadly employed to encompass various applied scientific methods within halal-related fields, yet it frequently lacks the precise theoretical grounding and clear methodological boundaries characteristic of established academic disciplines. This absence of a formalised scholarly definition creates a significant conceptual void, leading to

limited in-depth scholarly discussion on its true scope, foundational framework, and specific epistemological underpinnings (Hashim *et al.*, 2022). Such conceptual ambiguity not only impedes its maturation into a recognised academic discipline but also poses a substantial challenge to the systematic development of specialised human capital and tailored curricula essential for the sustained growth and integrity of the halal industry.

Recognition and formalisation of a field as an academic discipline are not merely semantic exercises but critical for systematically generating, disseminating, and applying knowledge. A well-defined discipline provides a structured framework for research methodologies, fosters specialised communities of scholars, establishes standardised curricula, and ensures the quality and credibility of its outputs (Trench & Bucchi, 2010; Krishnan, 2009). Without such a clear academic identity, 'Halal Science' risks fragmentation, inconsistent development, and a struggle for global academic acceptance, despite its profound societal and economic impact.

Consequently, this review is designed to address these definitional and foundational gaps. This study aims to examine the established characteristics that typically define an academic discipline and then critically evaluate the extent to which 'Halal Science' currently fulfills these criteria. By undertaking this analysis, this review seeks to contribute to a clearer conceptualisation and academic legitimisation of Halal Science. This thereby fostering a more structured approach to its research, education, and professional development.

2. Methodology

This article adopts a narrative review approach to explore the emergence of halal science as an academic discipline. Given halal science's complex, interdisciplinary, and evolving nature, the narrative review methodology was chosen for its flexibility and interpretive depth. As Sukhera (2022) outlined, narrative reviews are particularly suited for topics that require critical reflection, contextual sensitivity, and the integration of diverse sources of knowledge. Unlike systematic reviews, which focus on exhaustive coverage and rigid inclusion criteria, narrative reviews allow for thoughtful synthesis and thematic exploration. These characteristics make them ideal for conceptual fields like halal science.

The review began with a clear justification for the chosen approach and a defined scope of inquiry. It explored whether halal science fulfils the characteristics typically used to determine an academic discipline. These characteristics, drawn from Trench & Bucchi (2010) and Krishnan (2009), include a bounded field of study, shared terms and concepts, theoretical grounding, international reach, academic programs, scholarly publishing, and organised scholarly communities.

Sources were gathered using targeted keyword searches such as "halal science," "academic discipline," "Islamic science," and "tauhidic epistemology." Materials included peer-reviewed articles, academic program descriptions, institutional policy documents (such as the MQA Program Standard), and official records from research centres and scholarly journals focusing on halal-related topics. The selection of sources was guided by relevance to the thematic focus of the article, rather than exhaustive coverage, in line with saturation logic often applied in narrative reviews. Emphasis was placed on conceptual relevance and institutional significance rather than methodological uniformity.

An analytical framework was applied to map the reviewed literature against the discipline-defining characteristics. Each characteristic was then assessed and discussed based on the presence or absence of supporting evidence. The findings were synthesised into a tabular format (Table 1), which guided the interpretive discussion presented in the body of the article.

This approach also incorporated reflexivity, acknowledging the authors' positionality and interpretation in synthesising a diverse and sometimes ambiguous body of literature. While subjective judgment is inherent in narrative reviews, transparency in reasoning and alignment with established frameworks help ensure academic rigour and relevance. By combining empirical data, policy structures, and epistemological debates, this review provides a holistic understanding of halal science's current and potential status as a recognised academic field.

3. Defining halal science

Despite its use in the halal industry, the term halal science did not emerge in scholarly work in empirical pure or applied science related to halal research conducted between 1996 and 2020 (Hashim *et al.*, 2022). However, definitions of halal science, albeit scarce, do exist in scholarly literature that attempt to decipher the term and its concept. The earliest definition, proposed by researchers at Universiti Putra Malaysia's Halal Product Research Institute (HPRI), describes halal science as the application of scientific approaches to support matters governed by shari'ah (Islamic law) principles (Mat Hashim *et al.*, n.d.). Another researcher defined halal

science as a multidisciplinary scientific framework rooted in halal concepts (Ahmad *et al.*, 2011). Similarly, Akademi Sains Malaysia (2019) and Azman & Ben (2017) described halal science as the systematic study of natural phenomena related to halal practices through observation and experimentation.

In contrast, some scholars challenge the validity of halal science as an independent discipline. Tariqur Rahman (2021) contends that halal science is limited in its ability to produce new scientific knowledge because it is rooted in Islamic scriptures rather than empirical hypothesis testing. This raises questions about whether it can be considered a scientific and academic discipline. In a more recent work, Hashim *et al.* (2023) listed the various definitions and concepts of halal science proposed by researchers. However, it is observed that the definitions and concepts have similar keywords or fall into the same broad scope of 'science and technology' and 'science approach', suggesting a potentially unified understanding of the term 'halal science'.

4. Evaluating halal science as an academic discipline

There are no universally accepted criteria for defining an academic discipline. However, Trench & Bucchi (2010) suggest that a discipline should exhibit at least some of the following characteristics, i) a bounded field of study, ii) shared interests, terms, and concepts, iii) significant presence in higher education teaching and research, iv) international reach, v) specialist scholarly publishing, vi) organized communities or networks of scholars, and vii) a theoretical foundation supporting empirical research. While emerging disciplines may not satisfy all these criteria, the more characteristics they fulfil, the more established they become (Krishnan, 2009). The term halal science has been used in the nomenclature of academic programs, the names of research centres or institutions and halal-related journals, suggesting that the term is aligned with the recognition of being an academic discipline (Hashim *et al.*, 2021). This section attempts to expand the evaluation of halal science based on these characteristics to determine its disciplinary recognition further. Table 1 shows the mapping of the characteristics and the justification of halal science as an academic discipline.

The increased number of specialist scholarly publications related to halal research is evident from the list below, which has 28 titles in total. Indonesia led the list with 18 titles (Table 2). These journals serve as a platform to disseminate research in halal studies, including halal science. However, the quality, frequency, and indexing of these journals are beyond the scope of this work. Other journals that publish halal-related research in Malaysia include the Journal of Fatwa Management and Research and the Malaysian Journal of Shariah and Law.

5. Methodological and epistemological foundations of halal science

Halal science shares similarities with other scientific disciplines such as biomedical and food sciences, particularly in its reliance on empirical research, laboratory testing, and technological advancements. Like food science, it involves the study of ingredients, processing methods, and safety assessments to ensure compliance with halal standards. Similarly, its connection to biomedical sciences is evident in areas like halal pharmaceuticals and nutraceuticals. However, halal science's integration of religious principles sets halal science apart, requiring scholars to balance scientific methodologies with Islamic jurisprudence (*fiqh*). Unlike conventional sciences that operate purely on empirical

Table 1. Evaluation of halal science as an academic discipline

Characteristics	Discussion/Justification	Meet the requirement?
A bounded field of study	The existence of program standards and frameworks to guide curricula development: The Malaysian Qualification Agency (MQA) Program Standard for Halal Studies (2021) outlines the knowledge required for halal studies. This is generally categorised into halal standard core courses (for all fields of study) and specific core courses for management and applied science (Malaysia Qualification Agency, 2021). The Department of Skills Development oversees the National Skill Certificate (Sijil Kemahiran Malaysia, SKM) under the Ministry of Human Resources. 2021 the department introduced the Halal Industry Occupational Framework, outlining job structures, descriptions, and skill demands. These insights were integrated into the revised National Occupational Skills Standard (NOSS) Registry (May 2023), which lists NOSSs approved by the National Skill Development Council to guide industries and training providers.	Partial (Emerging but limited scholarly discourse)
Shared interests, terms, and concepts,	Much interest in the concept and practice of 'halal science'. However, there are various understandings of the terms (including definitions) and concepts (Hashim et al, 2023)	Partial (high interest but lack of standard terms with an ambiguous concept)
Significant presence in higher education teaching, research and services to the industry	The increasing use of the term 'halal science' in academic institutions and research initiatives suggests its emergence as a distinct field. For instance: Several universities offer academic programs incorporating 'halal science' in their titles, such as the <i>Master of Science in Halal Industry Science</i> (INHART, IIUM) and the <i>Master of Science in Halal Products Science</i> (UPM). Halal science centres, such as the <i>Halal Science Centre at Chulalongkorn University, Thailand</i>, and the <i>Halal Science Centre at IPB University, Indonesia</i>, conduct scientific research on halal-related issues and provide services to the halal industry. The <i>Journal of Halal Science and Research</i> (Universitas Ahmad Dahlan, Indonesia) and the <i>Journal of Halal Science and Technology</i> (UNISSA, Brunei) are dedicated to publishing research on halal-related scientific topics (Hashim et al., 2024)	Yes
International reach	International presence and reach of the field can be seen in several scenarios as below: At the certificate and diploma level, the Osaka University International Certificate Program in Halal Science, Technology, and Innovation (OUICP-HaSTI) offers a structured curriculum covering halal science and technology, catering to international students seeking a professional understanding of halal practices. The Malaysian National Education Code (NEC-2020) under the purview of the Ministry of Higher Education (MoHE) follows the International Standard Classification of Education (ISCED) Fields of Education and Training 2013 (ISCED-F 2013) produced by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). This suggests that the curricula developed in the country are aligned with international standards. In the NEC-2020, halal management was	Partial (present but limited)

		recognised as one of the components of NECo414 Management and Administration. However, there is no specific mention of halal science (Hashim <i>et al.</i> , 2023)		
Specialist publishing	scholarly	Increasing number of homegrown journals, especially in Malaysia, Indonesia and Brunei. However, the journals are not indexed in internationally renowned scientific abstract and databases (see Table 2 for further details).	Partial (emerging)	
Organised communities or networks of scholars		Examples include Halal Development Corporation (HDC) Malaysia Community of Practice (COP) and Konsortium Institut Halal Malaysia (KIHIM) (<i>Malaysian Halal Institute Consortium</i>), which provides a platform for the Halal centres/institutes to carry out concerted efforts in halal research and education (currently inactive). There is also an active landscape of activities surrounding scientific conferences, congresses, seminars and halal science workshops organised by various entities. (Hashim <i>et al.</i> , 2024)	Partial (Present limited)	but
A theoretical supporting research	foundation empirical	Said & Hanapi (2019) argue that the philosophy of halal science is fundamentally Islamic, emphasising three key elements: <i>Tauhid</i> (Absolute Oneness of Allah) as the central pillar <i>Wahyu</i> (Divine revelation) is the primary source of knowledge <i>Khilafah</i> (human stewardship) in managing halal-related scientific advancements This framework differentiates halal science from conventional science, which relies exclusively on empirical data. In halal science, empirical research is subordinate to Islamic revelation. This distinction raises epistemological challenges, particularly in integrating halal science into conventional academic structures.	Partial (emerging)	

Table 2: Halal-related journal

Journal	Date of first issue	Country
Journal of Halal Product and Research (JHPR)	21 November 2018	Indonesia
Indonesian Journal of Halal Studies (IJHS)	11 December 2018	
Indonesian Journal of Halal Research (IJHAR)	28 February 2019	
Journal of Industrial Engineering and Halal Industries (JIEHIS)	1 June 2020	
Nusantara Halal Journal	June 2020	
Halal Research Journal (HRJ)	18 February 2021	
International Journal of Halal System and Sustainability	1 January 2021	
International Journal of Mathla'ul Anwar of Halal Issues (IJMA)	1 March 2021	
Ar Rehlah Journal of Islamic Tourism, Halal Food, Islamic Travelling, and Creative Economy	1 May 2021	
Journal of Halal Research, Policy, and Industry (JHRPI)	31 July 2022	
Journal of Halal Industry Studies	7 May 2022	
The Journal of Business and Halal Industry	24 October 2023	
Halal Ecosystem Research Journal (HERJ)	1 April 2024	
Journal of Halal Sciences	25 March 2024	
Halal Studies and Society (HaSS)	31 January 2024	
Halal International Journal	3 July 2024	
JHR: Journal of Halal Review	25 January 2025	
The Journal of Shariah Economics and Halal Industry (JOSEHI)	January 2025	
Journal of Halal Industry and Services	24 November 2018	Malaysia
The Malaysian Journal of Halal Research (MJHR)	June 2019	
International Journal of Halal Research	1 December 2019	
The International Journal of Halal Ecosystem and Management Practices (IJHEMP)	12 December 2021	
Halalsphere	31 July 2022	

Journal of Halal Science and Technology (JHST)	June 2022	Brunei
The Halal Journal Human, Health and Halal Metrics (HHHM)	February 2019 November 2020	Iran
AP Journal of Halal Lifestyle (APJHLS)	30 June 2023	Türkiye
Journal of Halal Science, Industry, and Business (JHASIB)	31 May 2023	Thailand
Journal for Halal Quality and Certification	May 2023	Europe

evidence, halal science must also consider ethical, spiritual, and theological dimensions, making it a multidisciplinary and highly contextual field.

Islamic and tawhidic (absolute monotheism) epistemology plays a crucial role in shaping the framework of halal science, particularly through key concepts like *tawhid* (the absolute oneness of God), *wahyu* (divine revelation), and *khilafah* (human stewardship) (Said & Hanapi, 2018). The philosophy of halal science has been described to be composed of four elements, i) *wahyu* as the primary reference, *tawhid* is the core of the Islamic science (which is the umbrella for halal science), iii) humankind and nature are only creatures, and iv) Islamic science cannot be influenced by non-metaphysical presuppositions of modern science (Said & Hanapi, 2018).

Methodologically, halal science incorporates elements from both positivist and interpretivist paradigms—positivist in its use of scientific experimentation and verification, and interpretivist in its need to interpret religious texts and cultural contexts. This dual approach allows halal science to evolve as a scientific discipline and a field deeply rooted in Islamic knowledge. This is not new or impossible to comprehend and implement because the Golden Age of Islamic Science, which lasted from the 8th to 13th centuries of the common era, left a lasting legacy of the success of the dual approach.

6. Challenges and limitations in the development of halal science

The development of halal science faces significant challenges, particularly in standardising its curricula across different educational institutions. Given the diverse interpretations of halal regulations in various countries and Islamic schools of thought, creating a universally accepted curriculum is difficult. Some regions emphasise traditional religious teachings, while others incorporate modern scientific approaches such as food technology, biotechnology, and forensic analysis. The lack of standardisation can lead to inconsistencies in training, qualifications, and expertise among halal science professionals, ultimately affecting the credibility and reliability of halal certification processes worldwide.

Another major limitation is the ethical concerns and religious sensitivities in integrating scientific research with Islamic principles. Some scientific methods, such as research on controversial topics like pre-slaughter animal stunning methods or lab-grown meat, must be approached with caution to avoid conflicts with religious authorities and public perception. Scholars who are well-versed in Islamic jurisprudence and modern science must ensure that halal science progresses while respecting religious boundaries.

Securing funding, gaining publication opportunities, and achieving global academic recognition also present significant

obstacles for halal science researchers. Many funding bodies prioritise mainstream scientific research over niche fields like halal science, making it difficult for researchers to secure grants. Furthermore, publishing halal-related studies in high-impact scientific journals can be challenging due to the field's interdisciplinary nature, which combines religious, ethical, and scientific perspectives. The limited global recognition of halal science as an academic discipline further hinders collaboration, research advancement, and the establishment of dedicated institutions, slowing down its development.

7. The future of halal science: Pathways for academic recognition

To strengthen halal science as a recognised academic discipline, institutions must develop comprehensive and standardised curricula that integrate Islamic principles and scientific methodologies. While this may include establishing dedicated halal science departments and offering specialised degrees, careful consideration of the graduates' future career paths must be in place. The industry-specific needs for halal science must be scrutinised to ensure graduates are well equipped to contribute to the sector once graduated (Tukiran *et al.*, 2025).

An alternative perspective can be explored to pave the way for recognising halal science as an academic field. One of the potential ways is to foster interdisciplinary curriculum research that bridges fields like food science, biotechnology, pharmacology, and Islamic studies with a focus on halal. While interdisciplinary research is common, interdisciplinary curriculum is less prevalent. However, this mode of programming is possible. For instance, based on the Malaysian Qualification Agency (MQA) Program Standard for Halal Studies (2021), it is possible to establish a 'major-minor' undergraduate program where the main body of knowledge is a well-established academic discipline (for instance, major biotechnology) and halal science as a minor. This ensures fair graduate employability as they can venture to work in established fields while having a value-added knowledge in halal science. A double major program is also possible, where the bachelor's program offers two disciplines. At a higher level (Master's and PhD), a specialised degree in halal science is commendable as this will nurture halal talents in the scope of research, development and innovation towards generating new knowledge and providing solutions to the halal industry.

Additionally, universities should encourage academic discourse by hosting conferences, workshops, and research symposia focused on halal science. Several examples can be quoted, including the International Halal Science and Technology Conference (IHSATEC) in 2024, the International Halal Science Conference (IHASC) in 2023, the Virtual Halal Science Conference (ViHASC) in 2021 and the International Halal Congress 2024 in Türkiye

(<https://inthahalcongress.org/>). Promoting scholarly publications and establishing high-impact journals dedicated to halal research will also enhance the credibility and visibility of the field, attracting more students and professionals.

Policy and regulatory support are crucial for institutionalising halal science in higher education. Governments and academic bodies should continue working together to develop an effective curriculum structure for halal science programs, ensuring consistency and quality in education and research. Policymakers can also allocate funding for halal-related studies, support the development of research centres, and provide incentives for universities to incorporate halal science into their curricula. Furthermore, regulatory frameworks should facilitate collaboration between religious scholars, scientists, and industry experts to ensure that halal standards remain scientifically sound and religiously compliant.

International collaborations and interdisciplinary research can also significantly advance halal science on a global scale. Partnerships between universities, research institutions, and industry stakeholders from different countries can foster knowledge exchange and technological advancements in halal certification, food safety, and pharmaceutical developments. Additionally, interdisciplinary approaches combining fields such as artificial intelligence, blockchain technology, and biomedical research can lead to innovative halal verification and traceability solutions. Strengthening global networks and cooperation will ultimately contribute to halal science's widespread recognition and credibility as an essential academic and scientific discipline.

Notwithstanding the above strategies, the main effort should be to develop a clear concept and framework (body of knowledge) of halal science to ensure its wide and sustainable applicability.

8. Conclusion

This review affirms that Halal Science, when evaluated against the established characteristics of an academic discipline, is an emerging and increasingly important field within the broader halal ecosystem. Although its foundations are still developing, particularly its distinct epistemological framework that combines scientific methodology with Islamic principles, its expanding presence in higher education, research institutions, and scholarly publications reflects ongoing progress toward academic recognition.

The importance of Halal Science extends beyond the academic sphere. It plays a critical role in maintaining the integrity, authenticity, and global trust underpinning the halal industry, representing a multi-trillion-dollar sector. Halal Science supports key areas such as food safety, pharmaceutical development, and ethical consumer practices by ensuring compliance with scientific standards and *Shariah* principles.

To strengthen its academic standing, several areas require focused attention. First, there is a clear need for the standardisation of curricula and the establishment of a comprehensive body of knowledge that integrates scientific and Islamic foundations. Second, fostering interdisciplinary collaboration and encouraging contributions to high-impact academic journals will enhance its visibility and credibility. Third, sustained policy and regulatory support and international cooperation will be essential to ensure the field's continued growth. These efforts will also help develop a skilled professional workforce capable of supporting the long-term

sustainability of the global halal industry.

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10. Authors' contribution

Conceptualization, Y.Z.H-Y.H.; methodology, A.N.A.; formal analysis, N.K.; investigation, N.K. and N.S.; data curation, N.K.; writing—original draft preparation, N.S., Y.Z.H-Y.H.; writing—review and editing, H.M.S.; supervision, Y.Z.H-Y.H.; project administration, N.K. All authors have read and agreed to the published version of the manuscript.

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