

The Development of Halal Supply Chain Research in Indonesia: A Comparative Study

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ABSTRACT

Halal products uphold the principles of halal throughout the entire supply chain, making managing the halal supply chain (HSC) crucial, especially for Muslim communities. Despite the importance of this topic, existing literature on halal supply chains remains limited, with most studies concentrating on the food industry. Notably, there is a significant research gap regarding the development of HSC research in Indonesia, the country with the largest Muslim population. This study aims to address this gap by conducting a comparative analysis of HSC research in Indonesia and globally. Utilizing Scopus as the data source, 355 studies on halal supply chains published between 2008 and 2024 were analyzed. A comparative study was then conducted to evaluate the development of HSC research in Indonesia based on various categories, including the number of publications, subject areas, authors, keywords, citations, paper quartiles, institutional affiliations, research objects, methods, and themes. The findings reveal that while Indonesia has made significant progress in HSC research, the research is still tiny compared to its Muslim population. These results highlight the need for further investment and focus on HSC research in Indonesia to match its global potential.



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1. Introduction

The concept of halal holds significant importance in Islamic law, as every Muslim must consume halal (permissible) and toyyib (wholesome) products. Consequently, every Muslim is responsible for ensuring that products meet halal standards. The global preference for halal products has been increasing in line with the rapid growth of the Muslim population, which reached 1.9 billion in 2019, driving substantial growth in the global halal product industry. Interestingly, this demand is not limited to Muslim-majority



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countries; non-Muslim nations have also shown interest in halal products due to their reputation for safety, hygiene, and health benefits [1].

Halal products must adhere to halal principles throughout production, from sourcing raw materials to delivering finished goods. Therefore, managing the halal product supply chain is crucial to ensuring compliance with these standards [2]. The supply chain refers to the integration of business processes that coordinate the flow of products and information across various stages of production and distribution [3]. Effective coordination among supply chain actors is vital, particularly when maintaining the integrity of halal products [4]. Additionally, Islamic law imposes strict guidelines, with zero tolerance for ambiguity or contamination with haram (forbidden) substances. As a result, halal consumers demand transparency and assurance that products are entirely free from haram elements.

Despite the increasing attention given to halal supply chain (HSC) research in various academic platforms, including Scopus, a significant research gap remains. While numerous studies on HSC have been published, the specific focus on Indonesia, the country with the largest Muslim population, is still lacking. This gap is critical, as Indonesia plays a central role in the global halal industry. If this issue is not addressed, the halal supply chain's potential to meet domestic and global demand may be compromised, limiting the country's contribution to the rapidly growing global halal economy [5]. The absence of comprehensive research on Indonesia's HSC limits the ability of stakeholders, including policymakers, industry players, and scholars, to make informed decisions. Without addressing this gap, the risk of inefficiencies, mismanagement, and missed economic opportunities within Indonesia's halal supply chain will persist. Furthermore, given Indonesia's substantial Muslim population and its strategic position in the halal industry, the lack of attention to this issue could hinder its efforts to become a global leader in the halal market [6]. Thus, there is an urgent need to conduct thorough research on Indonesia's HSC. This research is crucial for strengthening Indonesia's role in the global halal supply chain and ensuring the country can meet the growing demand for local and international halal products.

Several studies have conducted comprehensive literature reviews on the halal supply chain (HSC). For instance, [7] focused on the halal food supply chain (HFSC), mapping its research development based on themes and methodologies. This study highlighted that HFSC management is the most frequently discussed topic in the literature. Similarly, [8] categorized HFSC research according to publication year, paper sources, research methodologies, food product types, authors, affiliations, and keywords, identifying six promising clusters for future research. Additionally, [9] reviewed papers related to HFSC, organizing them into five clusters: halal food and the role of certification, halal food and awareness, halal food production and quality, halal food in tourism management, and halal food and supply chains. Further, [10] integrated the use of the Internet of Things (IoT) in the HFSC, presenting the current state of IoT research in this field, categorized by publication year, country of origin, keywords, and research methods. This study also highlighted the advantages and challenges of IoT implementation within HFSC. Moreover, [11] utilized Google Scholar to map HSC research according to theoretical perspectives, methodologies, industry sectors, and countries of origin, dividing the topics into three main categories: food issues, supply chain and halal issues, and supporting system issues. From another perspective, [12] explored HSC research focusing on operations and sustainability. This study provided a taxonomy of the literature based on publication year, country, paper of publication, supply chain coverage, decision level, research object, and sustainability considerations. These reviews offer valuable insights

into the existing research landscape of HSC and reveal significant opportunities for further study.

Despite the growing body of literature on the halal supply chain (HSC), significant gaps remain, particularly about the development of HSC research in Indonesia, which is crucial for the halal industry [13]. As noted by [7], most existing HSC studies focus primarily on the food sector, concentrating on case studies from Malaysian industries. However, these industries differ from the unique context of Indonesia's halal supply chain. Furthermore, much of the existing research on HSC has focused on countries with minority Muslim populations, such as the United Kingdom, the Netherlands, and Thailand [14]. The volume of HSC research indexed in Scopus from Indonesia is still significantly lower than Malaysia despite Indonesia having the largest Muslim population in the world. This imbalance highlights a critical research gap, as no studies have comprehensively mapped the development of HSC research in Indonesia itself. Addressing this gap is essential for understanding the current state of HSC research in Indonesia and informing future research efforts. This study aims to analyze halal supply chain research development in Indonesia and compare it to global HSC research. By identifying the gaps in Indonesia's HSC research, this study aims to provide recommendations for future research directions. The findings of this study are expected to contribute to the broader understanding of HSC in Indonesia and to guide policymakers, academics, and industry stakeholders in advancing the halal supply chain sector.

2. Methods

2.1 Research Methods

The research method employed in this study follows the approach outlined by Putri and Hisjam [15]. The research involves several key stages, including selecting a suitable database source for collecting halal supply chain (HSC) research publications. The primary database used in this study is Scopus, a highly reputable indexing database recognized for its comprehensive curation of scientific literature across multiple disciplines.

a. Database Source Selection

An indexing database is crucial for cataloging scientific literature metadata, enabling more accessible access to and citation of research [16]. There are three general categories of indexing databases: highly reputable, medium reputable, and low-reputable. Highly reputable indexing databases include Scopus and Web of Science, both known for their stringent content selection and high academic standards. Medium reputable databases include the Directory of Open Access Journals (DOAJ), PubMed, Proquest, and Ebsco. Lastly, low-reputable databases include platforms like Google Scholar, Portal Garuda/IPI, Mendeley, and CiteULike, often criticized for lacking rigorous content control [17].

Unlike publishers, who are responsible for the publication of scientific literature, indexing databases serve as repositories where scientific literature metadata is recorded and stored [18]. Publishers such as Elsevier, Springer, Wiley, and Taylor & Francis produce a limited scope of content while indexing databases like Scopus aggregate content from multiple publishers, making them a more extensive source of academic material [19]. For this study, Scopus was selected as the primary indexing database for several reasons, including its reputation, rigorous editorial curation, and comprehensive search functionalities, which are crucial for this research.

Scopus, a product of Elsevier, is recognized as one of the leading databases for scientific literature due to its meticulous selection and curation process, overseen by subject-matter experts. Research indexed in Scopus typically holds a high degree of academic legitimacy as it undergoes a robust review and selection process. Scopus also provides advanced tools for tracking citations, journal rankings, and other research metrics, making it a valuable resource for evaluating the development of halal supply chain research [5]. Furthermore, Scopus is a critical resource in global university rankings, and its indexing system is acknowledged to cover a wide range of unique scientific literature compared to other databases like Google Scholar or Web of Science [20].

Compared to the Web of Science, Scopus offers a broader range of indexed literature, a more intuitive user interface, and superior impact indicators, reducing the potential for data manipulation. Additionally, while both Scopus and Web of Science are commercial databases, Scopus allows free access to certain bibliographic information. In contrast, Web of Science generally requires a subscription for access [21]. The research by [22] suggests that Scopus is more widely recognized and utilized by researchers in Indonesia than the Web of Science. It may explain why more papers from Indonesia are indexed in Scopus [22].

The quality and reliability of papers indexed in databases other than Scopus, particularly those offering free access, remains questionable. For instance, Google Scholar provides access to vast scientific literature but lacks advanced search tools, and its bibliographic data is often unreliable, with frequent metadata errors [20]. In contrast, Scopus maintains stringent quality control over the accuracy of its bibliographic data, which is crucial for this study as accurate bibliographies are essential for categorising and analysing halal supply chain papers. The consistent quality assurance offered by Scopus, particularly in terms of metadata accuracy, makes it the most appropriate choice for this research.

The halal supply chain research articles were collected by accessing the Scopus database until March 2024. The data from Scopus includes information on publication years, paper sources, author affiliations, keywords, research methods, and thematic categories related to halal supply chain management. This comprehensive dataset will be used to map the development of halal supply chain research in Indonesia and to compare it with global trends. The rigorous selection of Scopus as the indexing database ensures that the research included in this study meets high academic standards and provides a reliable basis for the analysis.

b. Time Horizon

The time horizon for this study was used to assess the development of halal supply chain (HSC) research over different periods. The research timeline was divided into three distinct periods: 2008-2009, 2010-2019, and 2020-2024. This division allows for a detailed analysis of how HSC research has evolved, highlighting trends and shifts in research focus across the decades.

c. Document Selection

The halal supply chain research articles from Scopus were selected by searching "Halal Supply Chain." Initially, 375 articles were identified globally. However, after filtering out duplicates and excluding irrelevant studies, 355 articles were deemed suitable for further analysis. The selection process followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram, as shown in Figure 1. This systematic approach ensured that only high-quality, relevant studies were included in the research, ensuring the reliability of the findings.

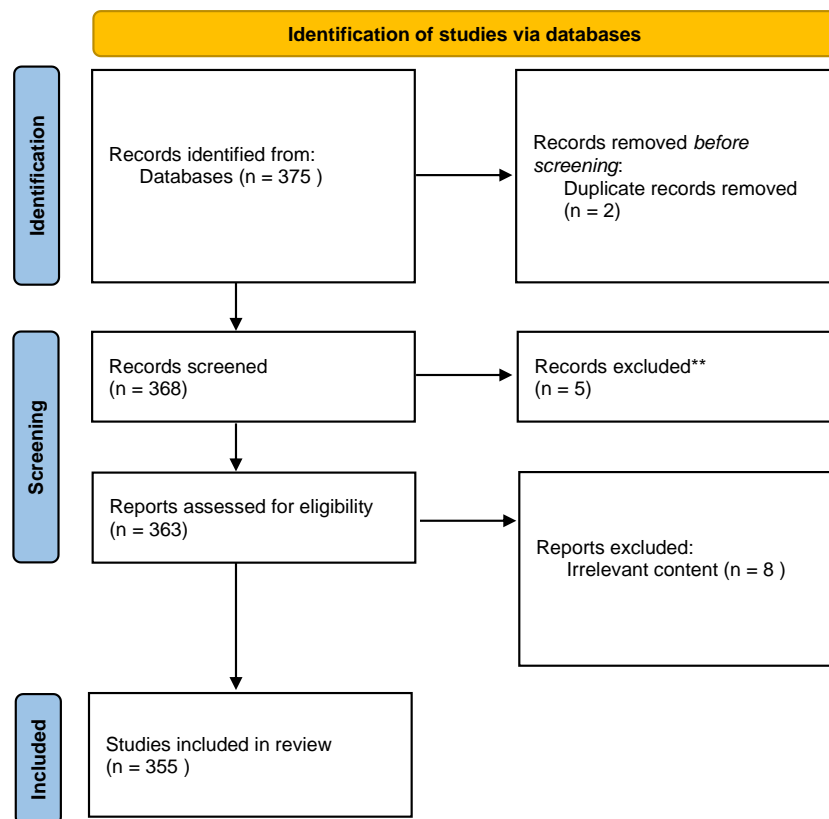


Figure 1. PRISMA Diagram for Document Selection

d. Analysis

The selected halal supply chain literature was classified into clusters based on various categories, including the year of publication, subject area, authors, keywords, institutional affiliations, research objects, research methods, and research themes. This classification was then used to conduct a comparative analysis of HSC research in Indonesia against global research trends, specifically with Malaysia, as Malaysia has been a significant player in halal supply chain research. This analysis provides insights into the current state of HSC research in Indonesia. It helps identify gaps and opportunities for future research.

2.2 Procedures

This study followed a structured process from data collection to conclusion, with the following steps:

a. Data Collection

This study utilized two types of data: primary and secondary. The primary data consisted of the bibliographic information obtained through the Scopus database. Secondary data were gathered from various sources, including published studies on halal supply chains found in papers, books, and conference proceedings.

b. Searching for papers Using the "Halal Supply Chain" Keyword

The first step in the data collection process involved searching for relevant papers in Scopus. The search was conducted by entering the keyword "Halal Supply Chain" in the search fields, which included the article title, abstract, and keywords. The search was performed on March 18, 2024, yielding 375 paper articles on halal supply chains. The results were exported in CSV format, with the following information selected for export:

author(s), document title, year of publication, source title, citation counts, source and document type, DOI, and affiliations.

c. Selecting papers

After the initial search, 375 papers were identified. However, 355 papers were selected for further analysis after filtering out irrelevant studies and duplicates. Eight papers were excluded due to irrelevance (e.g., conference names mistaken for paper titles), and five were removed due to duplication. The selection criteria focused on papers that addressed halal supply chain topics, were indexed in Scopus, and were written in English.

d. Literature Study

A comprehensive literature review was conducted to collect relevant information from the selected halal supply chain papers. This review helped to identify key findings and trends that could be analyzed in the study.

e. Creating an article classification

The selected papers were categorized according to several criteria, which helped to illustrate the development and trends in halal supply chain research. These classification criteria included year of publication, subject area, researchers, keywords, institutional affiliations, research objects, research methods, and research themes. The classification approach was based on previous research conducted by [9], [23], [7], and [15].

f. Comparative Analysis

After classifying the papers, a comparative analysis was conducted to assess the development of halal supply chain research in Indonesia compared to global trends. This comparison aimed to identify gaps and opportunities in the research landscape of Indonesia's halal supply chain sector.

g. Conclusion

The final step involved drawing conclusions based on the research objectives: to analyze the development of halal supply chain research globally and in Indonesia and to provide recommendations for future research directions in this field.

3. Results and Discussion

3.1 The Development of Halal Supply Chain Research in the World

According to the data collected from Scopus, 355 research articles on halal supply chains (HSC) have been published worldwide. These articles have been classified based on several criteria, including year of publication, subject area, researcher, keywords, number of citations, paper quartiles, institutional affiliations, research objects, research methods, and research themes. The articles are further divided into three time horizons, 2008-2009, 2010-2019, and 2020-2024, to track the evolution of HSC research over time.

Figure 2 illustrates the global distribution of halal supply chain papers by decade. The term "halal supply chain" first appeared in Scopus in 2008, with only 3 paper articles published during 2008-2009. This number grew significantly in the second decade (2010-2019), with 133 articles published. In the third decade (2020-2024), 219 articles were identified, although the full scope of this period is still ongoing. These trends suggest that halal supply chain research has seen substantial growth in the number of indexed papers over the years.

Table 1 provides a detailed classification of halal supply chain research by country affiliation, subject area, researcher, keywords, number of citations, paper quartiles, institutional affiliations, research objects, research methods, and research themes. Malaysia has consistently contributed the most to global halal supply chain research across all three decades, followed by Indonesia. This is largely because both countries have significant Muslim populations, which has driven the development of research related to

Islamic issues, particularly halal supply chains [24]. This study also compares the development of halal supply chain research in Indonesia with that of Malaysia, given Malaysia's substantial contribution to the field.

In terms of subject areas, computer science was the dominant field in the first decade. However, business, management, and accounting emerged as the leading subject areas in the second and third decades, indicating a shift in focus towards managing halal supply chains. It reflects the evolving scope of HSC research over time. Notably, researchers such as Bonne, K. and Verbeke, W. from Belgium, and Belkhatir, N. from France were key contributors during the first decade. Ali, M.H. from Malaysia, was the most prolific researcher in the second decade. In contrast, in the third decade (2020-2022), Haleem, A. from Pakistan emerged as a leading contributor.

The most frequently used keyword in HSC research during the first decade was "supply chain." In the second decade, "halal" became the dominant keyword. In contrast, the "halal supply chain" was the most common in the third decade. This progression highlights the increasing focus on halal-specific supply chain issues and the broadening scope of keywords used in HSC research over time. Additionally, the number of citations for halal supply chain papers has steadily increased across the three decades, indicating that these articles are becoming increasingly crucial as reference materials in subsequent research [25].

Regarding paper quartiles, Table 1 shows that during 2008-2009, HSC research appeared in one Q1 paper, one Q3 paper, and one with an undefined quartile. In the second and third decades, most papers were in the Q2 category or had undefined quartiles. The undefined quartiles are often due to the inclusion of conference papers or papers discontinued by Scopus, leading to the absence of paper rankings in the Scimago database. From an institutional affiliation perspective, the first decade saw significant contributions from institutions in Belgium, such as Hogeschool Ghent and Ghent University and the LIG-IMAG Laboratory in France. In the second and third decades, Malaysian institutions, particularly Universiti Teknologi MARA, became dominant contributors to halal supply chain research.

In terms of research objects, food has consistently been the primary focus of HSC research over the first two decades. It can be attributed to the essential role of food in daily life and the growing awareness of halal food standards [10]. In the third decade, the scope of research objects expanded to include food and other sectors such as meat, food and beverages, tourism, cosmetics, pharmaceuticals, hotels, beverages, and fashion. This diversification of research objects reflects the broader application of halal supply chain principles across different industries.

Regarding research methods, the classification was based on prior studies, such as [26]. During the first decade, conceptual studies were the most common, focusing on developing theories and frameworks for the halal supply chain. In contrast, the second and third decades saw a shift towards review-based methodologies, with researchers focusing on synthesizing existing literature. Table 1 illustrates the evolution of research methodologies used in HSC research globally over time.

Finally, regarding research themes, earlier studies focused on halal integrity, conceptual frameworks for HSC, and halal certification [7]. Over time, these themes have expanded, with the second and third decades witnessing an increased focus on Halal Supply Chain Management (HSCM), reflecting the growing importance of managing halal supply chains systematically and structured.



Table 1. World Paper Classification Results

		2008-2009	2010-2019	2020-2024		
		Quantity	Quantity	Quantity		
Country Affiliati	Malaysia	2	Malaysia	88	Malaysia	105
	Belgium	1	Indonesia	16	Indonesia	78
	Prancis	1	United Kingdom	15	India	15
Subject Area	Computer Science	2	Business, Management and Accounting	78	Business, Management and Accounting	92
	Agricultural and Biological Sciences	1	Computer Science	46	Decision Sciences	37
	Decision Sciences	1	Engineering	35	Computer Science	35
Author	Bonne, K.	1	Ali, M.H.	9	Haleem, A.	10
	Verbeke, W.	1	Tieman M.	8	Khan, M.I.	10
	Belkhatir, N.	1	Tan K.H.	6	Khan, S.	10
Keyword	Supply chain	3	Halal	44	Halal supply chain	37
	Actor-Network theory	1	Halal supply chain	28	Halal	36
	Conventions theory	1	Halal logistics	19	Supply chain	20
Citation	Citation Counts	184	Citation Counts	2127	Citation Counts	367
	Cited Papers	3	Cited Papers	114	Cited Papers	79
Paper Quartile	Q1	1	Undefined	70	Undefined	80
	Q3	1	Q2	32	Q2	64
	Undefined	1	Q1	16	Q3	28
			Q3	11	Q4	24
			Q4	4	Q1	19
Institution Affiliation	Hogeschool Ghent	1	Universiti Teknologi MARA	22	Universiti Teknologi MARA	12
	Ghent University	1	Universiti Kebangsaan Malaysia	12	Universiti Kuala Lumpur	10
	LIG-IMAG Laboratory	1	Universiti Utara Malaysia	12	Universiti Putra Malaysia	8
Research Objects	Food	2	Food	66	General	90
	Meat	1	General	36	Food	81
			Meat	17	Meat	35
			Food and beverages	6	Food and beverages	6
			Tourism	3	Fashion	4
			Cosmetics	2	Tourism	2
			Hotel	1	Pharmaceutical	1
			Pharmaceutical	1		
			Beverages	1		
Research Methods	Conceptual	2	Review	40	Review	68
	Framework	1	Survey	29	Survey	56
			Interview	21	Conceptual	24
			Case study	21	Interview	9
			Conceptual	10	Multi-method	17
			Modelling	5	Case study	16
			Framework	3	Framework	14
			Experiment	2	Experiment	5
			Multi-methods	2	Modelling	9
			Prototype	1	Prototype	1
Research Themes	Halal integrity	1	HSCM	45	HSCM	69
	Conceptual framework in HSC	1	Halal logistic	23	Adoption of technology in HSC	35
			Conceptual framework in HSC	17	Risk management	24
	Halal certification	1	Risk management	11	Halal integrity	24
			Halal certification	10	Conceptual framework in HSC	22
			Halal integrity	9	Halal logistic	21
	Adoption of technology in HSC	9	Traceability	12		
	Traceability	6	Halal certification	6		
	CSF in HSC	3	CSF in HSC	6		

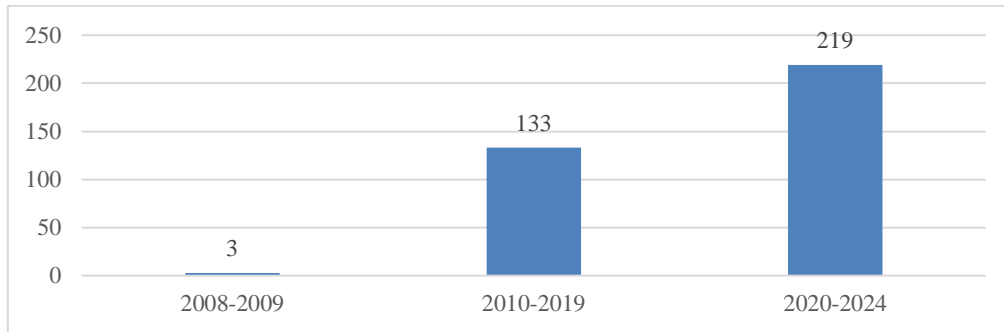


Figure 2. Distribution of Publication Year of World Papers

3.2 The Development of Halal Supply Chain Research in Indonesia

The analysis of Scopus-indexed publications revealed 94 research articles related to the halal supply chain (HSC) in Indonesia. These articles were classified according to various criteria to assess the development of HSC research in Indonesia. Figure 3 shows the distribution of HSC publications in Indonesia by year of publication. According to Figure 3, HSC research in Indonesia first appeared in Scopus during the second decade (2010-2019), with 16 paper articles. In the third decade (2020-2024), this number increased to 35 papers, indicating a growing interest and development in halal supply chain research in Indonesia.

The most popular subject area in Indonesia during the second decade was engineering, but this shifted to business, management, and accounting in the third decade. This shift reflects the expanding scope of HSC research in Indonesia, aligning with global trends. In terms of contributing researchers, Saleh, C. from the Islamic University of Indonesia was the most prolific during 2010-2019, while in the period from 2020-2022, Masudin I. from the University of Muhammadiyah Malang emerged as the leading contributor. This growth in the diversity of researchers signifies the increasing involvement of Indonesian scholars in HSC research.

Regarding keywords, "supply chain" was the most commonly used term in Indonesian HSC research from 2010-2019. However, from 2020-2022, "halal supply chain" became the dominant keyword. While there has been significant development in the variety of keywords used, the terms "halal" and "supply chain" remain central to much of the research. Regarding paper quartiles, most Indonesian HSC research is published in papers that either fall into the undefined quartile or are classified as Q2. The leading institution contributing to this research over the two decades was Universitas Islam Indonesia, with 18 paper articles.

In terms of research objects, food and meat have been the primary focus of HSC research in Indonesia over the past two decades. Numerous studies, such as those by [27], [28], [29], [30], and [31], have focused on food, while others, like [32], [33], [34], [35], and [36], have concentrated on meat. Some studies explore more diverse objects, such as tourism [37], [38], fashion [39], [40], and food and beverages [41], [42]. While food remains the dominant research object, the range of topics in Indonesian HSC research is gradually expanding.

In terms of research methodology, the most widely used approach in Indonesian HSC research is the review method, as seen in studies by [35], [43], [44], and [45]. Over time, there has been a gradual shift in methodologies, with other approaches such as surveys [46], [47], modeling [48], [49], [50], conceptual methods [51], [52], and frameworks [53], [54] also gaining popularity. Furthermore, studies employing multi-method



approaches [34], [55], case studies [56], [57], interviews [58], [59], and experiments [60] are becoming more prevalent, reflecting a diversification of research methods in Indonesian HSC research.

Table 2. Indonesian Paper Classification Results

		2008-2009	2010-2019	2020-2024	
		Quantity	Quantity	Quantity	
Subject Area		Engineering	9	Business, Management and Accounting	36
		Business, Management and Accounting	8	Engineering	20
		Materials Science	6	Decision Sciences	16
Author		Saleh, C.	3	Masudin I.	6
		Akbarizan	2	Ardi, R.	4
		Lestari, F.	2	Hendayani, R.	4
Keyword		Supply chain	3	Halal supply chain	18
		Supply chains	3	Halal	11
		Halal food	2	Supply chain	9
Citation	Citation Counts	Citation Counts	74	Citation Counts	114
	Cited Papers	Cited Papers	11	Cited Papers	29
Paper Quartile		Undefined	13	Undefined	18
		Q2	3	Q2	9
				Q1	4
				Q3	3
				Q4	1
Institution Affiliation		Universitas Islam Indonesia	7	Universitas Islam Indonesia	11
		UIN Sultan Syarif Kasim	1	Telkom University	9
		National Land Agency	1	Universitas Indonesia	6
Research Objects		Food	6	Meat	22
		Meat	4	Food	30
		General	2	General	19
		Tourism	2	Fashion	2
		Beverages	1	Food and beverages	3
		Food and beverages	1	Tourism	2
Research Methods		Review	7	Review	23
		Case study	4	Survey	17
		Interview	2	Case study	10
		Conceptual	1	Multi-method	10
		Framework	1	Modelling	7
		Modelling	1	Conceptual	4
				Interview	4
Research Themes		HSCM	6	HSCM	32
		Conceptual framework in HSC	4	Risk Management	14
		Risk management	2	Adoption of technology in HSC	13
		Halal logistic	2	Conceptual framework in HSC	5
		Traceability	1	Traceability	4
		CSF in HSC	1	Halal logistic	3
				CSF in HSC	3
				Halal integrity	2
				Halal certification	2

Halal Supply Chain Management (HSCM) has emerged as the most researched theme in Indonesian HSC papers, as evidenced by studies such as [61], [62], [8], [63]. However, Table 2 shows that the research themes have diversified in the second and third decades. Topics such as halal integrity [64], [60], risk management [65], [66], [67], [33], and the adoption of technology in HSC [68], [69], [70] have gained prominence. Other notable themes include conceptual frameworks in HSC [71], [72], critical success factors (CSF) in HSC [73], [74], halal logistics [35], [48], [49], halal certification [75], and traceability [76], [77].

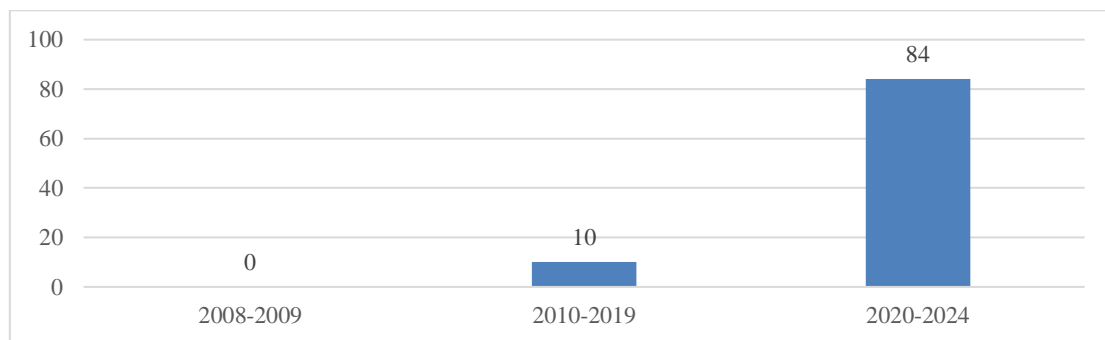


Figure 3. Distribution of Publication Year of Indonesian papers

3.3 Comparison of the Development of Halal Supply Chain Research in Indonesia with the World

This section presents a comparison between halal supply chain (HSC) research in Indonesia and globally. This comparison aims to assess the progress of HSC research worldwide, with Indonesia serving as the largest Muslim-majority country. The comparative analysis results are summarized in

Table 3.

Table 3 provides a detailed comparison of Indonesian and global HSC research, classified by year of publication, subject area, researcher, keywords, institutional affiliation, research object, research method, and research theme. From the perspective of publication years, global HSC research began earlier than in Indonesia. While the world began exploring HSC topics in 2008-2009, Indonesia's involvement in HSC research did not start until 2010-2019. Despite annual growth in research output, Indonesia still lags behind the rest of the world in terms of the number of HSC studies despite being home to the largest Muslim population [78]. It indicates that HSC research in Indonesia remains underrepresented in global academic publications and Scopus indexing.

The most popular subject areas in Indonesia and globally are business, management, and accounting. This similarity can be attributed to the importance of efficient and effective supply chain management in enhancing organizational profitability and long-term sustainability [79]. However,

Table 3 also shows that no Indonesian researchers are listed among the most productive researchers globally. Most top contributors to HSC research are from Malaysia, reflecting Malaysia's more vital participation in this research field than Indonesia.

There has been a shift over time in Indonesia and globally regarding keyword usage. However, the keywords "halal" and "supply chain" remain dominant in both contexts, representing the core focus of HSC research. This trend underscores the consistency of HSC-related topics across different regions. In terms of institutional affiliations, the participation of institutions in HSC research has shown steady growth in



both Indonesia and globally, with more institutions becoming actively involved in this area of study.

Table 3. Comparison of Indonesian Papers with the World

Year	2008-2009		2010-2019		2020-2024	
	Indonesia 0	World 3	Indonesia 16	World 134	Indonesia 35	World 126
Subject Area		Computer Science	Engineering	Business, Management and Accounting	Business, Management and Accounting	Business, Management and Accounting
		Agricultural and Biological Sciences	Business, Management and Accounting	Computer Science	Engineering	Decision Sciences
		Decision Sciences	Materials Science	Engineering	Decision Sciences	Computer Science
Author	Bonne, K. Verbeke, W. Belkhatir, N.	Saleh, C. Akbarizan Lestari, F.	Ali, M.H. Haleem, A. Tieman, M.	Masudin I. Ardi, R. Hendayani, R.	Haleem, A. Khan, M.I. Khan, S.	
Keyword		Supply chain	Supply chain	Halal	Halal supply chain	Halal supply chain
		Actor-Network theory	Supply chains	Halal supply chain	Halal	Halal
		Conventions theory	Halal food	Halal logistics	Supply chain	Supply chain
Institution Affiliation		Hogeschool Ghent	Universitas Islam Indonesia	Universiti Teknologi MARA	Universitas Islam Indonesia	Universiti Teknologi MARA
		Ghent University	UIN Sultan Syarif Kasim	Universiti Kebangsaan Malaysia	Telkom University	Universiti Kuala Lumpur
		LIG-IMAG Laboratory	National Land Agency	Universiti Utara Malaysia	Universitas Indonesia	Universiti Putra Malaysia
Research Objects		Food Meat	Food Meat General Beverages	Food General Meat Food and beverages	Meat Food General Fashion Food and beverages	General Food Meat Food and beverages
			Tourism	Tourism	Food and beverages	Fashion
			Food and beverages	Cosmetics	Tourism	Tourism
				Hotel Pharmaceutical Beverages		Pharmaceutical
Research Methods		Conceptual Framework	Review Case study Interview Conceptual Framework Modelling	Review Survey Interview Case study Conceptual Framework Modelling Experiment Multi-methods Prototype	Review Survey Case study Multi-method Modelling Conceptual Framework Interview Experiment	Review Survey Conceptual Interview Multi-method Case study Framework Experiment Modelling Prototype
		Halal integrity Conceptual framework in HSC	HSCM Conceptual framework in HSC	HSCM Halal logistic	HSCM Risk Management	HSCM Adoption of technology in HSC
Research Themes		Halal certification	Risk management	Conceptual framework in HSC	Adoption of technology in HSC	Risk management
			Halal logistic	Risk management	Conceptual framework in HSC	Halal integrity
			Traceability CSF in HSC	Halal certification	Traceability Halal logistic Adoption of technology in HSC	Conceptual framework in HSC Halal logistic Traceability
				Traceability CSF in HSC	Halal integrity Halal certification	Halal certification CSF in HSC

Food has been the most extensively researched object for Indonesia and the world over the past three decades. This is largely due to the rapid growth of the halal food industry, which is driven by the increasing Muslim population worldwide [1]. However,

the scope of research remains broader globally, with studies covering pharmaceuticals, cosmetics, and hotels—areas that have yet to be explored extensively in Indonesia.

Regarding research methodologies, the review method is the most popular approach in Indonesia and global HSC research. However, Indonesia has yet to adopt more diverse methodologies, such as prototype methods, which are more commonly used in global research. It suggests that Indonesian HSC research could benefit from employing a more comprehensive range of research methodologies to enhance the depth of analysis.

Similarly, the research themes in Indonesia closely mirror global trends, with Halal Supply Chain Management (HSCM) emerging as a dominant theme. It includes supply chain management, supplier selection, performance optimization, HSC development strategies, challenges and opportunities, and consumer perspectives on HSC and logistics. Despite these similarities, global HSC research covers a broader range of themes. It offers more profound insights into various halal supply chain aspects than Indonesia.

3.4 Analysis of Findings

Based on the search and selection process of halal supply chain research papers indexed in Scopus. Scopus began indexing research on the halal supply chain in 2008, starting with two papers. The first, by Bonne, K. and Verbeke, W., titled *Religious Values Informing Halal Meat Production and The Control and Delivery of Halal Credence Quality*, was published in Belgium [80]. The second paper, from Malaysia, by Lam, Y., and Alhashmi, was titled *Simulation of Halal Food Supply Chain with Certification System: A Multi-Agent System Approach* [81]. In contrast, Indonesia's involvement in halal supply chain research only began in 2016, with a paper titled *Managing Halal Foods Through Power Collaboration Between Supply Chain Actors*, co-authored by Akbarizan, Lestari, F., Azwar, B., and Nazar, H., along with two researchers from Malaysia [82]. It demonstrates that Indonesia started halal supply chain research later than Malaysia and other parts of the world.

The most prolific researchers in halal supply chain research are Ali, M.H. from Malaysia, and Haleem, A. from Pakistan, each contributing 13 studies. Universiti Teknologi MARA in Malaysia is the institution that has contributed the most to HSC research globally. In Indonesia, the leading contributor is Masudin I. from the University of Muhammadiyah Malang, who has 7 papers. The institution with the most published HSC research in Indonesia is the Islamic University of Indonesia, which has contributed 18 papers.

In terms of countries, Malaysia leads the field with 153 papers, followed by Indonesia with 51 papers. The most popular subject areas in halal supply chain research are business, management, and accounting. Furthermore, the keyword "halal" is the most frequently used in these studies. The dominant research object is food, as the globalization of the food supply chain has led to increased complexity and more significant contamination risks [83]. The review method is the most widely used research methodology, with researchers frequently synthesizing previous literature. The most common research theme is Halal Supply Chain Management (HSCM).

In addition to the findings from Scopus, this research utilized VOSviewer and Publish or Perish for co-word analysis. Co-word analysis examines the co-occurrence of keywords within research papers, helping to identify research trends and gaps [84]. This study used co-word analysis to compare trends in Scopus-indexed halal supply chain papers with those from other databases. Using Publish or Perish, metadata for 909 papers

quartiles, institutional affiliations, research objects, research methods, and research themes. Over time, the scope and variety of HSC research in Indonesia have expanded, reflecting a growing interest in this field. When comparing the development of HSC research in Indonesia with global trends, many similarities were identified, particularly in the use of subject areas, keywords, research objects, methodologies, and themes. However, Indonesia still needs to develop its HSC research further regarding the number of publications, the diversity of research objects, and the adoption of more varied research methodologies. Expanding these areas is crucial for Indonesia to match global standards and contribute more significantly to the field. A comparison between Indonesia and Malaysia, a leading country in HSC research, revealed differences in research methodologies. While both countries share similar trends in subject areas, keywords, and research themes, Indonesia must increase the quantity and diversity of its HSC research to compete with Malaysia. It includes broadening research objects and methodologies to enhance the depth and relevance of Indonesian studies in the halal supply chain domain.

This study is limited by focusing on HSC papers indexed only in Scopus and using specific keywords for paper collection. It is possible that other relevant HSC research was not included due to these constraints. Future studies should consider expanding the scope of the database and employing more comprehensive and diversified search methods to capture a broader range of HSC research. Future research should explore under-researched industries in Indonesia, such as cosmetics, pharmaceuticals, and hospitality, to further enrich the understanding of the halal supply chain in these sectors. Additionally, as Indonesia's halal industry grows, future research must employ more empirical methods, such as surveys, case studies, and other methodologies, to provide practical insights and contribute to developing a robust halal supply chain framework.

Declarations

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