A bibliometric of halal supply chain: Food performance mapping of micro, small, and medium enterprises in Indonesia

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Abstract. The performance of micro, small, and medium enterprises (MSMEs) is influenced by both internal and external factors. In the food MSME sector, internal factors include organizational culture, competitive advantage, and the halal supply chain (HSC). This study conducted a systematic review and bibliometric analysis to analyze trends and research focuses on the application of HSC in food MSMEs. Literature was identified using the Scopus electronic database (Harzing's Publish or Perish) for 2015–2025. Selection was based on Inclusion/Exclusion criteria (PRISMA), accessibility, and keywords: halal AND supply chain, as well as food MSMEs. Fifteen relevant articles were obtained. Citation metric analysis showed an average of 5.05 papers per author and 3.87 authors per paper. VOSviewer bibliometric analysis found three main thematic areas. The first theme relates to the digitalization of the halal supply chain technology. The second focuses on organizational performance and capabilities. The third emphasizes consumer behavior and halal awareness. The findings underscore the importance of integrating the dimensions of technology, organization, and human behavior to establish a sustainable halal supply chain ecosystem that enhances efficiency, transparency, and consumer trust. This study helps map research areas, identify literature gaps, and offers strategic recommendations for sustainable food MSMEs.

1 Introduction

Supply Chain Management (SCM) encompasses a wide range of critical activities related to the movement of products from origin to final destination. This study spans a wide range of sectors, including healthcare, agriculture, and information technology [1][2]. One rapidly growing area is the study of halal, an Arabic term meaning "permissible" or "lawful" according to Islamic law [3].

Halal Supply Chain (Halal SCM/HSC) is defined as a process-oriented approach that manages the flow of materials, information, and capital, and coordinates stakeholders to ensure the principles of Halal & Toyyib (good and pure) are maintained from upstream to downstream [4]. This specific objective differentiates HSC from conventional SCM, making it a very critical research area.

Numerous studies have explored Halal SCM—including bibliometric analyses and literature reviews [5][6][7]. However, in the Halal food supply chain, literature specifically examining sustainability aspects, including trends and research related to the implementation of HSC in the Micro, Small, and Medium Enterprises (MSMEs) sector, is still inadequate. Given that the performance of MSMEs, especially in the food sector, is heavily influenced by internal factors such as halal supply chain governance, there is an urgent need to understand how HSC implementation has been researched in this domain [8][9][10][11][12].

This study conducted a systematic review and bibliometric analysis of 12 scientific publication journals focusing on the implementation of Halal Supply Chain (HSC) in food MSMEs. This investigation aims to: analyze publication trends and citation metrics related to HSC in food MSMEs; map key research clusters that demonstrate the relationship between HSC, sustainability, digital technology, and MSME performance; identify literature gaps and provide strategic recommendations for the integration of HSC and organizational culture to increase consumer trust and support sustainable food MSMEs.

The research questions related to the SCM field of this halal study are as follows:

1. What are the publication trends and citation metrics of HSC studies on food MSMEs from 2015 to 2025?
2. Who are the most influential authors/journals/countries publishing on HSC and MSME performance factors?
3. What are the main research themes (clusters) formed from keywords related to HSC, performance factors, and food MSMEs?
4. What are the literature gaps and strategic implications for sustainable food MSMEs?

2 Methodology

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2.1 Systematic review and bibliometric analysis

This research methodology combines a Systematic Literature Review (SLR) with Bibliometric Analysis to provide a comprehensive understanding of the development of Halal Supply Chain Management research in the food sector of MSMEs. A Systematic Review was used to systematically and structuredly identify, evaluate, and synthesize relevant literature, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. This approach ensures transparency, replicability, and minimizes bias in the article selection process, as in the study by Readi and Sudarmiatin [13].

Bibliometric analysis was applied to map knowledge structures, identify research trends, and uncover intellectual relationships between publications [2][6][7]. This method allows for the visualization of collaboration networks, mapping the evolution of research themes, and identifying the most influential contributors in the domain of Halal Supply Chain Management and organizational performance in food MSMEs.

The combination of these two approaches provides two complementary perspectives: in-depth qualitative analysis through SLR and objective quantitative analysis through bibliometrics, resulting in more robust and comprehensive findings [13].

2.2 Data search

This study uses Harzing's Publish or Perish (PoP). The primary source of data retrieval with several strategic considerations, including its broad global coverage as one of the largest abstract and citation databases covering 1,000 peer-reviewed journals from various disciplines, quality indexing through strict journal selection criteria to ensure the quality of indexed publications, analytical capabilities that provide tools to support complete metadata searches for bibliometric analysis, and data compatibility that can be easily exported and analyzed using bibliometric software such as VOSviewer [14].

The time period selected for the literature search was 2015–2025. This time span was chosen based on several key considerations, namely to capture the development of literature in the last decade when the issue of Halal Supply Chain and MSMEs has increasingly received academic attention, ensure the relevance of the findings to the contemporary halal business and regulatory context, and provide a long enough duration to comprehensively identify trends and patterns of research evolution [2][15].

The search string used was TITLE-ABS-KEY (("halal supply chain*") AND ("organizational performance*") AND ("organizational culture*") AND ("food*") AND ("SME*")), designed to capture relevant literature comprehensively. Components of the search string included "halal supply chain" to obtain terminology variations such as halal supply chain management and halal supply chain practices; "organizational performance" which encompasses organizational performance, firm performance, and business performance; "organizational culture" which encompasses organizational culture, corporate culture, and organizational values; "food" which encompasses food industry, food sector, food products, and food manufacturing; and "SME" which encompasses variations such as SMEs, small and medium enterprises, and small medium enterprise. The Boolean operator "AND" was applied to ensure that all key concepts appear together in the search results, thereby focusing on articles that discuss the interactions between these variables simultaneously.

The search parameters used include the Scopus database through Publish and Perish, with search fields for Title, Abstract, and Keywords, a time range of up to 2025, the English language, Journal source type, and Article and Review document types. Harzing's Publish or Perish (PoP) is used to retrieve data from Scopus, facilitating the extraction of publication metadata, such as title, author, year, journal, citations, and abstract. It also provides basic metrics, including h-index, total citations, and average citations per year. Meanwhile, VOSviewer (version 1.6.18) functions as bibliometric network visualization software for keyword co-occurrence analysis, creating thematic cluster and network collaboration visualization maps, and identifying structural relationships between publications, authors, and institutions.

2.3 PRISMA selection criteria and procedures

In this systematic literature review, articles were selected for analysis based on strict inclusion criteria to ensure relevance and quality. Articles were included if they met the following requirements: publication type: academic journal articles or peer-reviewed review papers; publication language: English; industry context focused on the food sector; company scale emphasizing Small and Medium Enterprises (SMEs) or Micro, Small, and Medium Enterprises (MSMEs); content addressing at least two of the three main variables: Halal Supply Chain Management, Organizational Performance, and Organizational Culture; full-text availability; and publication in a Scopus-indexed journal to ensure quality standards. Conversely, articles were excluded if they met any of the following exclusion conditions: publication type: conference proceedings, book chapters, dissertations, or working papers; industry focus on non-food sectors, such as pharmaceuticals, cosmetics, or halal tourism; an exclusive emphasis on large enterprises without discussion of SMEs; journals that are not categorized as scientific, such as trade magazines; the presence of duplicate articles in different search results; the lack of access to or full text of journals; publication languages other than English; and journals that are not indexed in Scopus.

The article selection process in this study followed the PRISMA stages, which include four systematic steps [13]. In the first stage (identification), an initial search in the Scopus database yielded 1,000 records using a predetermined search string, covering the time period 2015-2025; this stage included complete metadata extraction using Harzing's Publish or Perish software, exporting results to a VOSviewer-compatible format, and documenting search parameters to support research replication. The second stage (Screening) screened 233 records after removing duplications and checking accessibility, with 767 records excluded (including 26 inaccessible journals and 12 duplicates); screening criteria included title and abstract examination for thematic relevance, verification of full access, and identification and removal of duplicates, resulting in 195 full-text articles being assessed for eligibility, of which 140 records were excluded because they did not fall into the journal article category or were not indexed by Scopus; The evaluation at this stage also involved a search for the keywords "halal" AND "Supply Chain" AND "FOOD", an assessment of the content's suitability to the inclusion/exclusion criteria, and an assessment of the quality of the research methodology. The third stage (eligibility) screened 55 records based on inclusion criteria emphasizing the topic of SMEs, with 40 records excluded for not meeting the exclusion criteria related to SMEs, leaving 15 full-text articles for eligibility through thorough reading for final verification, structured data extraction, and assessment of the quality and strength of the evidence. In the fourth stage (inclusion), 12 records were included in the analysis, where the final articles met all established criteria and had undergone a multi-step verification process.

To ensure the integrity of the included articles, a systematic quality assessment was conducted using the following criteria: clarity of research objectives, namely whether the research questions or objectives were stated explicitly; methodological suitability, namely whether the research methods were aligned with the formulated objectives; validity and reliability, namely whether the data collection instruments and data analysis met adequate standards; clarity of findings, namely whether the research results were presented clearly and supported by empirical data; and academic contribution, namely whether the article contributed new insights to the existing literature.

2.4 Data analysis methods

Descriptive analysis and citation metrics were conducted through several systematic stages to measure the productivity and impact of publications in a research domain. The first stage involves a publication trend analysis that calculates the distribution of publications per year from 2015 to 2025, aiming to identify patterns of research growth. This analysis includes calculating the annual number of publications, cumulative publication growth, and average annual growth rate to identify key periods with significant increases in academic interest in the research topic. Next, an author productivity analysis is performed, measuring the average number of articles per author using the formula: total articles divided by the number of unique authors. This analysis helps identify the most productive researchers in this domain. This analysis also calculates the average number of authors per article as an indicator of the level of research collaboration, using the formula total authors divided by the total number of articles. Additionally, it analyzes the percentage of articles with a single author versus multiple authors to identify collaboration trends within the research domain.

A citation impact analysis was conducted to measure the academic influence of the identified publications [5][8][16]. The aggregate total citations of all included articles were calculated as an indicator of the overall impact of the research field. The average number of citations per article was calculated using the formula "total citations divided by total articles" as a benchmark for identifying high-impact articles. This study also calculated the average citations per year since publication using the formula "total citations divided by the difference between the current year and the year of publication" to identify articles with sustained impact. An h-index analysis was conducted to measure citation productivity and impact, where the h-index equals h if there are h articles each cited at least h times. The ten most cited articles were identified to analyze the general characteristics of high-impact articles and to extract key findings and methodologies that are most influential in shaping the research domain.

Journal analysis was conducted to identify the publication sources that contribute most to this research domain [11][17]. The distribution of publication sources was analyzed to determine the journals that publish the most articles related to the research topic, including identifying the top ten journals based on the number of publications, journal impact factor, and quartile ranking. A geographic distribution analysis was conducted to map the distribution of publications by author country, identify regional research centers, and examine patterns of international collaboration in developing knowledge within the research domain.

A bibliometric analysis was conducted using VOSviewer software through three main approaches [2][6][7]. The first approach is keyword co-occurrence analysis, which aims to map the intellectual structure and identify key themes in the halal supply chain management literature for micro, small, and medium enterprises in the food sector. The analysis procedure begins by importing Scopus data into VOSviewer and extracting author keywords and index keywords with a minimum occurrence threshold of three to five keywords adjusted to the dataset size. The data was then cleaned through normalization of terminology variations, such as the unification of the terms "SME", "SMEs", and "small medium enterprises", the removal of uninformative generic keywords, and the merging of synonyms and abbreviations. The VOSviewer clustering algorithm was used to group related keywords by identifying the optimal number of clusters, typically ranging from three to seven. Each cluster was then named based on the dominant theme that emerged. Network map visualization was performed through three types of displays: network visualization to display relationships between keywords, overlay visualization to display temporal evolution where relevant, and density visualization to indicate areas of research concentration.

The output generated from this keyword co-occurrence analysis is six main thematic clusters that map the research landscape, namely: Cluster 1 (Halal Supply Chain Management): This cluster focuses on the core concepts of the halal supply chain, with dominant keywords such as halal supply chain, halal logistics, halal industry, halal production, HSCM, and technology. Cluster 2 (Innovative Digital Technology): This cluster emphasizes the integration of modern technology in the halal domain, encompassing key terms such as blockchain, artificial intelligence, the Internet of Things, big data analytics, 3D printing, augmented reality, digital twins, the metaverse, and robotics. Cluster 3 (Integrity and Performance of Halal MSMEs): This cluster focuses on aspects of quality, safety, and business performance, encompassing keywords such as food safety, food quality, food integrity, halal food, SME performance, and supply chain integration. Cluster 4 (Supply Chain Resilience and Policy): This group discusses supply chain structure and resilience more broadly, with keywords such as: food supply chain, circular transition, supply chain resilience, blockchain technology, and supply chain policy barriers. Cluster 5 (Organizational Capabilities of MSMEs): This group explores internal organizational factors that support performance, including SMEs, organizational performance, IT capability, absorptive capacity, and organizational learning. Cluster 6 (Performance and Competitive Advantage): This group focuses on business outcomes and excellence, represented by keywords such as competitive advantage, financial performance, and frozen food. The linkage strength analysis from VOSviewer can then be used to identify keywords with the strongest relationships as central concepts and areas with low connectivity as potential research gaps.

The second approach is co-citation analysis, which aims to identify the most influential documents, authors, and foundational theories within the research domain [7][14]. The procedure begins with extracting reference lists from all included articles and identifying the most frequently cited references, with a minimum citation threshold of three to five. Author co-citation analysis is conducted to identify often co-cited fundamental authors, demonstrating intellectual influence and theoretical foundations, and mapping emerging schools of thought or research paradigms. Document co-citation analysis is undertaken to identify key seminar articles or studies that form the foundation of the domain and serve as the core literature, providing primary references. Co-citation network construction is performed through clustering to identify theoretical sub-streams and central node analysis to identify the most influential works. The resulting output includes the ten to twenty most influential articles that form the theoretical foundation, key authors whose works serve as fundamental references, dominant theoretical frameworks used, such as the resource-based view, stakeholder theory, and institutional theory, and the evolution of ideas from foundational articles to contemporary research.

The third approach is bibliographic tie analysis, which aims to identify topical similarities between articles based on the similarity of cited references [16][17][18]. The analysis procedure involves calculating the strength of ties by counting the number of identical references cited by two documents, where the more identical references, the stronger the tie. Grouping based on ties is performed to group articles with high reference similarity and identify sub-themes or research streams. Current research analysis is conducted to identify emerging themes and contemporary research directions, as opposed to co-citation, which looks at past influences. The resulting output encompasses various research streams within the same domain, modern themes that are currently being actively researched, and interdisciplinary connections with other research domains.

Thematic content analysis was conducted through systematic coding and categorization with a data extraction framework for each included article. Data extraction included bibliographic information such as author, year, journal, and title; the research context including the country of study, specific industry, and sample size of micro, small, and medium enterprises; the research objectives in the form of research questions or hypotheses; the theoretical framework used; the methodology including research design (quantitative, qualitative, and mixed methods); data collection methods; and analysis techniques. Key variables extracted included the dimensions of halal supply chain management studied, the organizational performance indicators measured, and the aspects of organizational culture analyzed. Extraction also included key findings and conclusions; research gaps identified by the authors; and practical implications in the form of managerial recommendations. Thematic synthesis was conducted in three phases: a free coding phase through repeated readings for in-depth familiarization with the content and inductively recording emerging themes; a structural coding phase through organizing codes into broader categories and developing a coding framework; and an analytical themes phase through cross-article synthesis to identify consistent findings, conflicting results, and research gaps. A synthesis table was created to present a summary of the research methodology used, the geographic and industry context, a matrix of findings showing the relationship between variables and outcomes, and a mapping of the use of the theoretical framework.

Quality and rigor were assessed through a critical appraisal process that included evaluating the methodological quality of each article, identifying its strengths and limitations, and considering the risk of bias in the research. The synthesis approaches employed included narrative synthesis for qualitative findings, tabular synthesis for quantitative comparisons, and visual mapping for identifying trends and patterns in the literature.

Research validity and reliability were maintained through transparency and replicability, including complete documentation of search strings and parameters used, a flowchart of the reporting procedures for selected items for systematic reviews and meta-analyses to track article selection, and an explicit coding protocol. Inter-rater reliability was maintained whenever possible through the use of two independent reviewers for screening and data extraction, as well as discussions to resolve disagreements, and the calculation of Cohen's Kappa coefficient to measure the level of agreement between reviewers. Triangulation was achieved through a combination of quantitative bibliometric analysis and qualitative content analysis, with validation of findings across multiple analytical perspectives to ensure the robustness and credibility of the research results.

3. Results and discussion

3.1 General description of research results

This study focuses on a bibliometric analysis of Halal Supply Chain Management in micro, small, and medium enterprises (MSMEs) in the food sector. Based on the selection process depicted in the flowchart (Figure 1), data searches were conducted using the Publish or Perish database, with the primary source being Scopus-indexed journals, and a time span starting from 2015. Initial results identified 1,000 articles. Following a screening process and application of inclusion-exclusion criteria, 12 articles were selected based on their feasibility for analysis.

Inclusion criteria included access to journals, absence of duplication of documents, and relevance to topics containing the keywords "halal," "supply chain," and "food." The next screening stage selected articles based on their focus on MSMEs and suitability to scientific journal categories. Of the initial 233 articles, 195 were deemed to meet the basic requirements, but 140 were excluded because Scopus did not index them or were not journal articles. The final results left 12 articles, which served as the basis for the bibliometric and thematic analysis of this study.

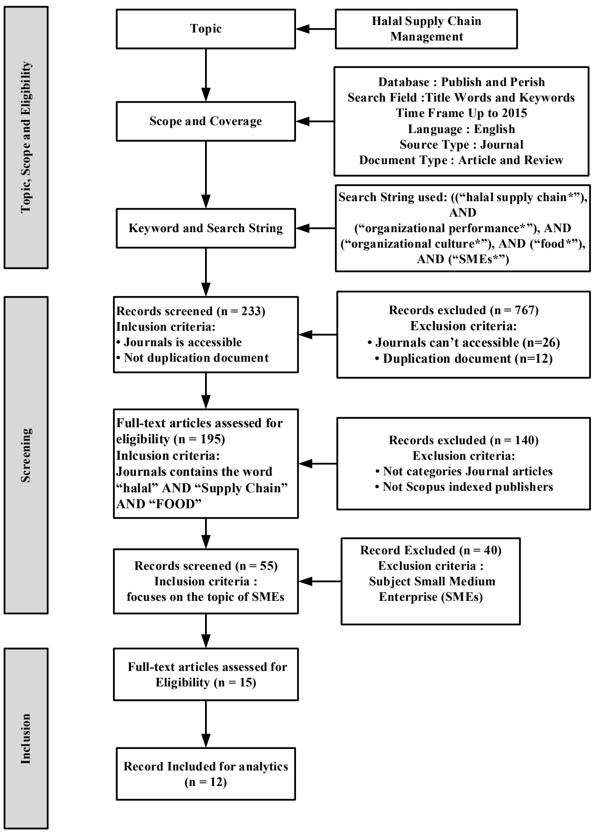

Fig. 1. Systematic review.

3.2 Data analysis and bibliometric mapping

Keyword co-occurrence analysis, conducted using VOSviewer software, generated a visual map of relationships between concepts, illustrating the interconnectedness of research topics within the halal supply chain. Based on the mapping results (Table 1), nine main thematic clusters were identified, indicating intercorrelated research areas. The color and distance between nodes reflect the intensity of the relationship and the frequency of keyword occurrence.

Cluster 1 is dominated by themes related to the halal supply chain, halal logistics, the halal industry, and innovative digital technology, reflecting the research focus on implementing technology-based halal supply chain management practices. Cluster 2 encompasses topics related to blockchain, big data analytics, artificial intelligence, and the Internet of Things, reflecting the adoption of digital technology within the halal ecosystem. Cluster 3 highlights food integrity and safety (food safety, food quality, halal supply chain integrity), while Cluster 4 relates to the circular supply chain, resilience, and policy barriers, indicating a research orientation toward supply chain sustainability and resilience.

Meanwhile, Clusters 5 and 6 focus on the organizational and performance aspects of MSMEs, encompassing absorptive capacity, organizational learning, financial performance, and competitive advantage. Clusters 7–9 expand the study's dimensions to include social and consumer behavior, such as halal awareness, purchase intention, and the millennial generation, as well as analytical methodological approaches, including DEMATEL, ISM, and MICMAC (Cluster 8).

The mapping results show that the keywords "halal supply chain," "blockchain," and "food supply chain" have the highest total link strength, indicating their central position as links between research themes. The red cluster (Cluster 1) centers on the term "halal supply chain," which is closely related to halal logistics, halal industry, halal production, and technology. This indicates that initial research has focused heavily on operational efficiency and the application of technology to halal supply chain systems. All clusters are described in Figure 2.

The green cluster (Cluster 2), centered on "blockchain" and "halal," highlights the integration of digital technologies, including big data analytics, artificial intelligence, the Internet of Things, 3D printing, and digital twins. This cluster illustrates that current research is shifting toward the complete digitization of halal supply chain systems to ensure product transparency and traceability.

The blue cluster (Cluster 3), with its key words "supply chain integration" and "food integrity," demonstrates a focus on halal food safety and quality (food safety, halal food, herbal-based food). This suggests that the topic of the halal supply chain is increasingly being associated with product quality and consumer trust.

Meanwhile, the yellow cluster (Cluster 4) focuses on the “food supply chain,” “circular transition,” and "supply chain resilience," indicating the direction of research towards the sustainability and adaptability of the halal supply chain amid global change.

Table 1. Keywords and main themes from keyword analysis.

Main Theme	Keywords	Occurrences	Total link strength
Cluster 1 (12 items)	halal industry	1	9
	halal logistics	1	9
	halal production	1	9
	halal supply chain	2	12
	halal supply chain management	1	9
	halal value chain	1	9
	hscm	1	9
	innovative digital technology	1	9
	slaughter house	1	3
	systematic review	1	9
	technology	1	9
	tracebility system	1	3
Cluster 2 (10 items)	3d printing	1	9
	artificial intelligence	1	9
	augmented reality	1	9
	big data analytics	1	9
	blockchain	2	12
	digital twins	1	9
	halal	2	12
	internet of things	1	9
	metaverse	1	9
	robotics	1	9
Cluster 3 (9 items)	food integrity	1	4
	food quality	1	4
	food safety	1	4
	halal food	1	4
	halal supply chain integrity	1	4
	herbal-based food	1	4
	human capital	1	4
	smes' performance	1	4
	supply chain integration	2	8
Cluster 4 (7 items)	blockchain technology	1	3
	circular supply chain	1	5
	circular transition	2	8
	food supply chain	2	8
	structural modeling	1	5
	supply chain policy barriers	1	5
	supply chain resilience	1	5
Cluster 5 (6 items)	absorptive capacity	1	5
	it capability	1	5
	knowledge transfer effectiveness	1	5
	organizational learning	1	5
	organizational performance	1	5
	smes	2	8
Cluster 6 (6 items)	competitive advantage	1	5
	financial performance	1	5
	frozen food	1	5
	halal certification	1	5
	halal supply chain resilience	1	5
	sem-pls	1	5
Cluster 7 (5 items)	food industry	1	4
	halal food supply chain integrity	1	4
	halal industry environmental factors	1	4
	halal product	1	4
	halal traceability system	1	4
Cluster 8 (4 items)	dematel	1	3
	halal sustainable scm	1	3
	ism	1	3
	micmac	1	3
Cluster 9 (4 items)	halal awareness	1	3
	halal supply chain knowledge	1	3
	millennial generation	1	3
	purchase intention	1	3

Based on the results of mapping the author collaboration network, visualized using VOSviewer software, an interesting pattern of relationships can be observed between researchers active in the field of Halal Supply Chain Management (HSCM) related to Micro, Small, and Medium Enterprises (MSMEs) and other related topics. Each node on the map represents an author, while the connecting lines (links) indicate collaborative relationships in the same scientific publications. The thicker the lines and the closer the distance between nodes, the stronger the collaboration between authors (Figure 3).

The blue cluster shows strong collaboration between researchers [19][20], who frequently co-author publications. This cluster focuses on the impact of supply chain integration on the integrity and quality of halal food supply chains. It also develops sustainable blockchain frameworks for the halal food supply chain in Malaysia. The high relationship density indicates that they are actively engaged in projects and support each other's work. Research in this cluster explores how millennial consumer awareness affects halal meal purchase intentions and develops integrated models for sustainable halal supply chain management in MSMEs [21]. This reflects a multidisciplinary approach to consumer behavior and sustainability [22].

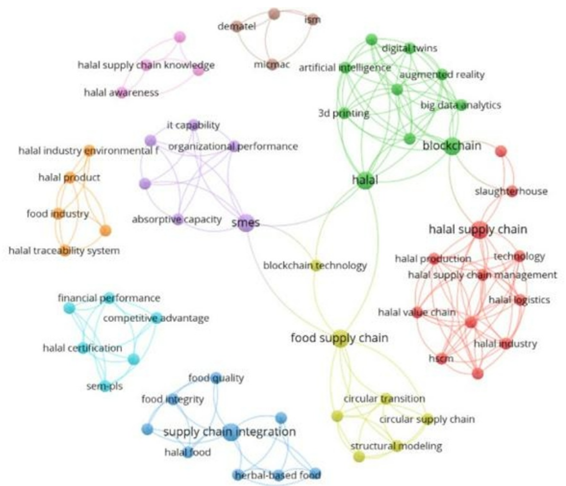

Fig. 2. Co-occurrence visualization.

Fig. 3. Co-authorship visualization.

The red cluster shows strong collaboration. It focuses on the influence of IT capabilities and organizational learning on the performance of halal food MSMEs. The density in this cluster reflects a clear focus on innovation and internal capacity building within the halal sector [16]. Meanwhile, research in the yellow cluster examines the use of digital technologies in the 4.0 era. These include blockchain, RFID, IoT, and halal fintech in the halal supply chain. This cluster demonstrates a strong interest in technological innovation to enhance company performance within the halal context [23].

The brown cluster, although smaller, shows a clear relationship between its authors. Their research focuses on how environmental factors influence the adoption of halal traceability systems in the Malaysian halal food supply chain [24]. Meanwhile, the purple cluster focuses on applying Industry 4.0 technologies, such as AI, blockchain, and AR, to enhance transparency and efficiency in the halal meat supply chain. This highlights efforts to address challenges like contamination and fraud in the industry [8].

There is only one article in the orange cluster, which focuses on supply chain management, Islamic practices, and halal supply chain integrity among herbal food MSMEs in Malaysia [9]. The pink cluster examines the impact of halal certification on the financial performance, supply chain resilience, and competitive advantage of frozen food MSMEs in Indonesia [25].

This collaboration aims to develop a blockchain-based traceability system that enhances transparency and security in Indonesia's halal supply chain, with a focus on the meat production sector. The gray cluster shows the relationship between authors. It also highlights the trend toward technological solutions for integrity issues [26].

Finally, as a single node in the dark gray cluster, Emel Yontar presents independent research analyzing barriers to creating a resilient circular food supply chain [27]. Although no direct collaboration is visible in this visualization, it provides a perspective on regulatory, financial, and technological challenges in sustainable food systems.

3.3 Discussion of research findings

Bibliometric findings indicate that the direction of halal supply chain management research has shifted significantly from a focus on logistics efficiency and halal certification to the application of innovative technology and sustainability. Clusters 1 and 2 demonstrate that digitalization is a key foundation for halal supply chain transformation, with blockchain and IoT playing a crucial role in traceability systems and transparency in production processes.

Clusters 3 and 4 demonstrate an increased focus on food integrity, resilience, and the circular economy, signaling a shift in research toward resilient and environmentally friendly halal supply chain models. Clusters 5 and 6 emphasize the significance of organizational capabilities and internal learning in enhancing the performance of halal MSMEs, illustrating the connection between organizational learning, absorptive capacity, and financial performance.

Furthermore, Clusters 7 to 9 demonstrate dimensions of consumer behavior, particularly halal awareness and purchase intention among millennials, which are emerging issues in halal marketing research. This analysis reinforces the view that the success of a halal supply chain depends not only on internal management systems but also on consumer acceptance and perception of halal values.

3.4 Thematic analysis and conceptual synthesis

From the nine identified clusters, three major research themes can be concluded:

1. Digitalization and Halal Supply Chain Technology, which involves blockchain, AI, and IoT to ensure product traceability.
2. MSME Organizational Performance and Capabilities, which emphasizes organizational learning and competitive advantage.
3. Consumer Behavior and Halal Awareness, which links socio-cultural dimensions to halal product purchasing decisions.

These three themes demonstrate the integration between the dimensions of technology, organization, and human behavior as a sustainable halal supply chain ecosystem.

3.5 Theoretical and practical implications

Theoretically, the study enhances our understanding of the role of digitalization in halal supply chain sustainability. By integrating the resource-based view (RBV) and stakeholder theory, it shows how technological capabilities and organizational learning become strategic resources for MSMEs. Practically, MSMEs can utilize digital technologies to enhance efficiency, transparency, and consumer trust, while policymakers can leverage these findings to inform data-driven halal policies and quality assurance initiatives.

3.6 Limitations and recommendations

This study has limitations in terms of sample size (12 articles), a single data source (Scopus via Publish or Perish), and the analysis timeframe. Furthermore, this study focused on a bibliometric approach without empirical testing of the relationships between variables. Therefore, further research is recommended to:

1. Incorporate additional databases such as Web of Science and Dimensions to broaden the scope of the literature.
2. Conduct content analysis and meta-synthesis to examine the conceptual relationship between digital technology adoption, organizational performance, and consumer trust.
3. Develop an empirical model that tests the integration of Halal Supply Chain Governance, Organizational

Culture, and Technology-Driven Competitive Advantage in halal food MSMEs.

4. Conclusion

A review of 12 articles shows that research on Halal Supply Chain Management (HSCM) in food MSMEs has changed a lot between 2015 and 2025. The focus has shifted from adhering to rules and optimizing operations to leveraging innovative technology and enhancing supply chain sustainability. Using VOSviewer, nine main topics were found, including digital halal supply chains, MSME performance and learning, and consumer awareness. New trends, such as blockchain, big data, artificial intelligence, and the Internet of Things (IoT), support the shift to digital halal systems. Halal supply chain research now brings together technology, management, and consumer needs in one shared space.

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