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Review

Traceability System in Halal Procurement: A Bibliometric Review

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Abstract: *Background:* The increasing Muslim population worldwide will increase the Islamic market share in the future. Thus, the higher demand for halal food has caused the food industry to pay attention to the quality control system for the ingredients used. This paper aims to review the previous literature regarding the traceability system for halal suppliers in the food supply chain to achieve the specified halal standards. It discusses the literature review as a method for conducting research and offers an overview of different types of reviews, as well as some guidelines to both conduct and evaluate a literature review. *Methods*: The method uses a sample of about 200 articles from the structured literature study period in 2007–2021. We use Perish application to identify journals, articles, citations, authors, and keywords. *Results:* The analysis reveals five research topic clusters: traceability, halal supply chain, food supply chain, halal logistics, and halal lifestyle. There is a strong relationship between procurement and traceability. Procurement is related to the food industry and halal traceability. The food product traceability system provides transparency in food manufacturing, enabling customers to trust halal product claims. The results show that food supply chain information systems can enable traceability and transparency. *Conclusions:* The review of this analysis is related to the supplier traceability system in the halal-food-production supply chain, which can help explore halal supplier issues and trends. For future research, technology can be used within a traceability system in the halal food industry, such as data interchange, radio frequency identification, and blockchain.

Keywords: traceability; procurement; halal; halal suppliers; halal logistics

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1. Introduction

The increasing Muslim population in the world will affect the future Islamic market. The demand for food, beverages, and cosmetics is growing, but consumers are also more careful about the halalness of products. The role of cosmetics for women is important as they can affect their daily appearance. On the other hand, halal food production requires a very scrupulous understanding throughout the supply chain, especially if a product has a complex set of ingredients (i.e., animal and plant sources) and processing aids [1]. For an unsullied halal food supply, chain integrity and monitoring are necessary to apply to each partner in the supply chain, from suppliers to end-users, so that users can be satisfied with the authenticity of the halal products [2]. Therefore, a traceability system is necessary to ensure that the handling process of halal food conforms with Islamic Sharia. According to Zulfakar, et al. [2], traceability can also track the halal status of certain food products in each stage of the supply chain, increase halal transparency, and strengthen halal integrity.

In recent years, many researchers have explored various green procurement studies. In 1989–2005, the literature related to the concept of halal procurement was still scarce. It can be concluded that this period was the initial stage of publishing the idea of halal procurement. As Soosay and Hyland [3] discussed, operational performance faces quality, speed, and efficiency challenges. Meanwhile, Goldsmith, et al. [4] discussed the structural changes in or turbulence of logical incrementalism in the halal global food system. In the same year,

Alreck and Settle [5] researched a system to check the life of food products online at the time of purchase, whereas, Weatherspoon, et al. [6] researched the supermarket supply chain battle in sub-Saharan Africa: challenges and opportunities for agri-food suppliers. Saqib and Taneja [7] examined India's non-tariff and export barriers: the cases of ASEAN and Sri Lanka were studied.

Traceability can be interpreted by different perceptions, such as from legislation, organizations, and research literature points of view. The International Organization for Standardization (ISO) defines traceability as "the ability to follow the movement of a product through certain stages of production, processing, and distribution" [8]. According to Olsen and Borit, traceability is "the ability to access any or all information relating to what is being considered, throughout its life cycle, using recorded identification" [9]. The implementation of traceability systems has been remarkable in the industry to provide brand-protection guarantees from counterfeiting and ensure that the deliveries are safe and secure [10]. This traceability system requires all supply chain participants to know who will supply to the company and to whom the product will be delivered so that every participant can access information about upstream and downstream products [11].

The procurement of goods involves various parties, such as suppliers, manufacturers, and logistics. By implicating some parties, it is necessary to conduct *traceability* so that the halalness of a product can be maintained. Suppliers provide raw materials to food manufacturers, who supply ingredients to retailers and wholesalers before being distributed to end-users [10]. In the halal industry, suppliers must ensure that the raw materials they supply meet the provisions of Islamic Sharia. Suppliers are responsible for ensuring that any slaughter process, packaging, and logistics operator they choose follows Sharia guidelines and halal requirements. Producers have the most critical role as they need to understand the entire supply chain and production flow [12]. Food manufacturers must trace raw materials to prevent unsafe and non-halal products from entering the production process or the entire supply chain [10]. Manufacturers are responsible for ensuring and identifying food ingredients that are obtained from suppliers. Talib, et al. [13] explained that halal logistics is managing the procurement, movement, storage, and handling of materials, spare parts, livestock, and semi-finished or finished supplies of food and non-food, including any related information and documentation flow through the organization and supply chain under the general principles of Sharia. This definition shows that halal logistics traceability involves every aspect of the supply chain, from upstream to downstream [13]. In addition, the flow of incoming vehicles, i.e., trucks and containers, must be monitored to avoid mixing halal and non-halal products. Furthermore, separation is required in case there are non-halal and halal products in the same container or warehouse.

This research, related to the supplier traceability system in the halal food supply chain, is required for exploring halal suppliers, producers, and logistics. The following three broad research questions are addressed in our study: 1. What is the current state of research on halal supply chain traceability? 2. In the existing literature, what research contexts and themes are explored in this domain? 3. What avenues or themes can the future research address?

This study presents a brief review of the bibliometrics of the previous literature to understand the past trends of traceability systems in halal procurement. The bibliometric method measures the literature using a statistical approach to quantify it [14]. The bibliometric analysis uses both Vosviewer and its cited applications to identify the articles or journals needed. In the previous research on the traceability of the halal procurement system, 997 articles were published from 1858 to 2021. The screening was conducted on the related reports and identified 200 articles published between 2007 and 2021. This paper aims to explain the previous literature review regarding the traceability system used for halal suppliers in the food supply chain to achieve the specified halal standards. The paper discusses the literature review as a methodology for conducting research and offers an overview of different types of reviews, as well as some guidelines to conduct and evaluate

a literature review. This study aims to help researchers understand the research related to halal traceability procurement.

2. Literature Review

2.1. Traceability System

The increase in the world's Muslim population, estimated to reach 2.2 billion people, has increased the market share of halal products [15]. Halal products are critical benchmarks in the safety, cleanliness, and quality assurance of what the Muslim community consumes daily [16]. Food is a basic need for the community, so consumers highly consider its taste and halalness. The halal symbol indicates that the product has met the requirements set by Sharia law to be suitable for consumption. For non-Muslims, the halal logo represents a symbol of cleanliness, quality, purity, and safety [17].

Traceability and traceability system (TS) definitions in the literature can be very broad or strict. This can be observed in prior studies, for example, in the studies conducted by Karlsen, et al. [18], Bosona and Gebresenbet [19], and Olsen and Borit [20]. However, they all refer to the ability to guarantee that products "moving" along the food supply chain (FSC) are tracked and traced. Tracing is the capacity to discover the origin and features of a specific product by referring to data stored upstream in the supply chain [21]. Tracking is the ability to track the downstream course of a product along the supply chain. The capacity to track the history of a food product, gathering all information connected to its movement along the supply chain in a strictly structured manner, is critical for modern businesses. It deals with the compliance to mandatory regulations; international standards and certification requirements; the implementation of marketing strategies and programs; the attestation of product origin, identity, and quality; and, most importantly, the need for effective methods to respond to the spread of sanitary outbreaks. This final point is becoming increasingly important as the frequency of food-safety disasters increases. This necessitates increasingly effective traceability systems that require a full-reassessment of the goals and objectives of food supply chain management [22].

Traceability is regarded as a critical concern for all stakeholders in the food supply chain. The most significant factor is the growing social desire to ensure good food quality and provenance [23,24]. Consumers want to know that those food items are safe, healthy, sustainable, and of high and consistent quality since they cannot know in detail what processes are utilized in the food manufacture process and what components or resources are employed in these procedures. The ongoing series of food disasters has necessitated large-scale product recalls, sometimes even on a European scale, emphasizing the need for assurance. The social concern over food safety has resulted in many regulations, such as the requirement for traceability in the European General Food Law, Article 18 [25]. Food firms must adhere to customer needs as well as regulations. Furthermore, they aim to keep expenditures and image harm to a minimum during events. On the other hand, traceability improves business operations throughout the supply chain to enhance efficiency, minimize lead times, and eliminate food waste, among other things [26].

Traceability is the ability to determine a product's current location and trace it back to its origin and manufacturing procedures [24]. Traceability is datum that may inform stakeholders about the location of certain (physical) goods or products, their history, dynamic features, content, and interactions with other products [27]. Traceability is strongly connected to the broader notion of supply chain transparency, which is described as "...the extent to which all of its stakeholders have a common understanding of, and access to, the product-related information that they seek, without loss, noise, delay, or distortion" [28].

The core concept of traceability is the capacity to monitor where an object is situated and trace its history (Figure 1):

- Tracking: determining the current position of products as they move through the supply chain [24].
- Tracing: the capacity to know a specific item's past whereabouts, time spent at each site, record of ownership, packing configurations, and environmental storage condi-

tions [29]. Tracing tries to define an item's composition and the treatment received throughout the product's life cycle [24]. Chain upstream (backward) tracing is used to establish the history of products and the cause of a problem with a faulty item. The goal of chain downstream (forward) tracing is to determine the location of things made utilizing, for example, a contaminated batch of raw materials.

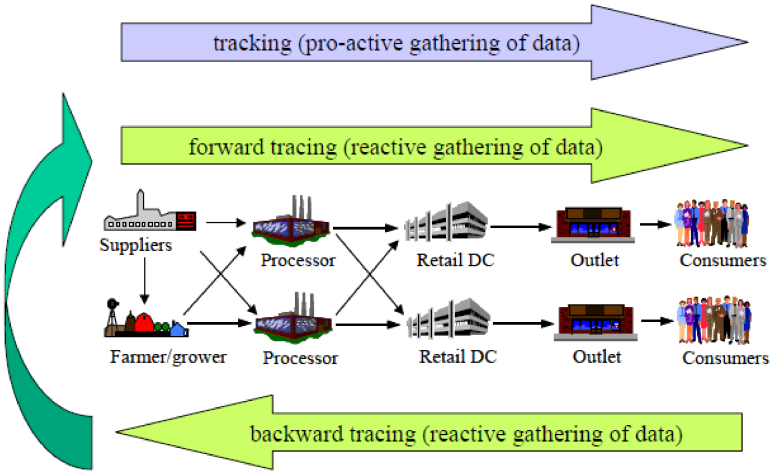

Figure 1. Tracking and tracing [27].

2.2. Halal SCM

Halal foods have several distinguishing characteristics, such as careful material selection, stringent hygiene standards, and a focus on nutrition and health, which meet today's increasing demands for food safety [30]. Halal foods are not only popular among Muslims, but also non-Muslims [31]. The Islamic term halal refers to food in two ways: the food materials must be permissible under Islamic Sharia laws and the food must be prepared in a halal manner, or it is not halal [32]. Traceability has been regarded as one of the most reliable measures for ensuring food safety and protecting consumers' legal rights and interests [33]. It is also an efficient way to ensure the safety of halal foods and respond to the growing demand for supply chain information [34]. Although the traditional labeling system is an economical way of keeping information for individuals and plays a critical role in food safety, it is easy to produce inconsistencies between the carcass and the corresponding individual, and it is difficult to confirm the authenticity of the product's traceability information.

Traceability systems are widely used in the food supply chain, cold supply chain, and fish supply chain, among other places [35]. Similar to these supply chains, the Halal Supply Chain (HSC) prioritizes traceability systems to ensure the halalness (or halal status) of products to customers. An effective traceability system can help reduce the risks associated with halal products (risk of contamination, non-halal raw material, and non-halal process). Halal is determined not only by the final product, but also by the ingredient/raw material, procurement, manufacturing process, packaging, transportation, storage, handling, distribution, and retailing of the product. The halal status of a product is maintained by ensuring complete product integrity from origin to consumption [36]. According to the research, implementing traceability is beneficial to maintaining halal integrity (HI) [37]. Thus, traceability is critical to the success of halal supply chain management (HSCM). Furthermore, it effectively identifies product attributes, process attributes, logistic information, participant node attributes, and marketing attributes in the supply chain both upstream and downstream. This information is recorded and stored in the database at each node.

The halal supply chain (Halal SCM) aims to ensure that halal product quality is maintainable throughout the supply chain [38]. Good procurement strategies are beneficial to find out the source, access, and resources needed. Halal procurement involves many parties managing halal food products to meet customer needs and requirements (halal and

non-halal) [2]. Halal traceability is an activity that tracks the halal status of food products from upstream to downstream supply chains [39]. The production process from upstream to downstream supply chains is well-recorded to clarify the effect of halalness [40].

The halal supply chain is the most recent developing enterprise to attain notice worldwide. It has not only attracted practitioners in the food industry to perform and comply with the halal concept, but also other sectors, such as cosmetics, pharmaceuticals, and healthcare products. Moreover, it has come to the attention of academicians and researchers from institutions of higher learning who need to know and understand the halal supply chain to support the integrity of the halal products. According to Ngah and Zainuddin [41], the operations in the halal supply chain are The operations in the supply chain, according to Ngah and Zainuddin [39], are the warehousing, sourcing, shipping, handling, and the delivery of halal items; inventory management; and other company management systems, such as lean management and value-based management. Halal supply chain management is the process of managing the procurement, movement, storage, and handling of materials, parts, livestock, and semi-finished inventory, food and non-food, and related information, as well as the documentation passes through the organization that adheres to Sharia law's general principles [42]. Furthermore, the halal supply chain follows the traditional supply chain, but with Sharia law criteria applied to it. Therefore, implementing Islamic principles in supply chain management serves as the fundamental prerequisite for a Sharia-based halal management process: everything must be halal (permissible) and *tayyib* across the whole chain [43].

3. Methods

A literature review (also known as a critical review essay) is a method that summarizes and evaluates a collection of writings on a particular topic [44]. This literature review uses a bibliometric analysis to systematically and objectively identify, determine, map, and evaluate the references against the scientific literature on traceability systems in procuring halal goods. Bibliometric analysis, which is sometimes referred to as scientometrics, is part of the research evaluation methodology. A bibliometric approach could be a possible way to conduct bibliometric analysis using distinct methods [45].

Bibliometric mapping would benefit both the scientific community and the public in general as it can help convert publication metadata into a map or visualization. Therefore, managing big data to attain more beneficial insights is easier, for example, visualizing keywords to identify the research themes or clusters in particular disciplines, mapping the authors of a certain journal to identify the geographical scope of the authors and journals, and mapping institutional and international collaborations as part of a framework for identifying emerging technologies [46]. Figure 2 shows the protocol for a systematic literature review.

3.1. Defining Terms

The first step was to define the terms or keywords used in the current study related to the traceability system for halal food procurement. The keywords used must be informative, and it was necessary to pay attention to derivatives and synonyms of the words. We extracted the data from Harzing's Publish or Perish application, which is associated with www.schoolar.google.com (accessed on 30 October 2021). We combined the keywords in this study with "Traceability*" OR "Halal*" OR "Procurement*".

3.2. Search Results

The second stage was collecting and storing journals or articles relevant to the research topic. Article searches were based on title, content, and keywords using Harzing's Publish and Perish as the search engine for the papers related to halal procurement in the food industry. Journal consideration only covered English-language journals, excluding corrective, editorial, and review papers. Figure 3 shows the data plotted after a search obtained 997 documents published from 1858 to 2021.

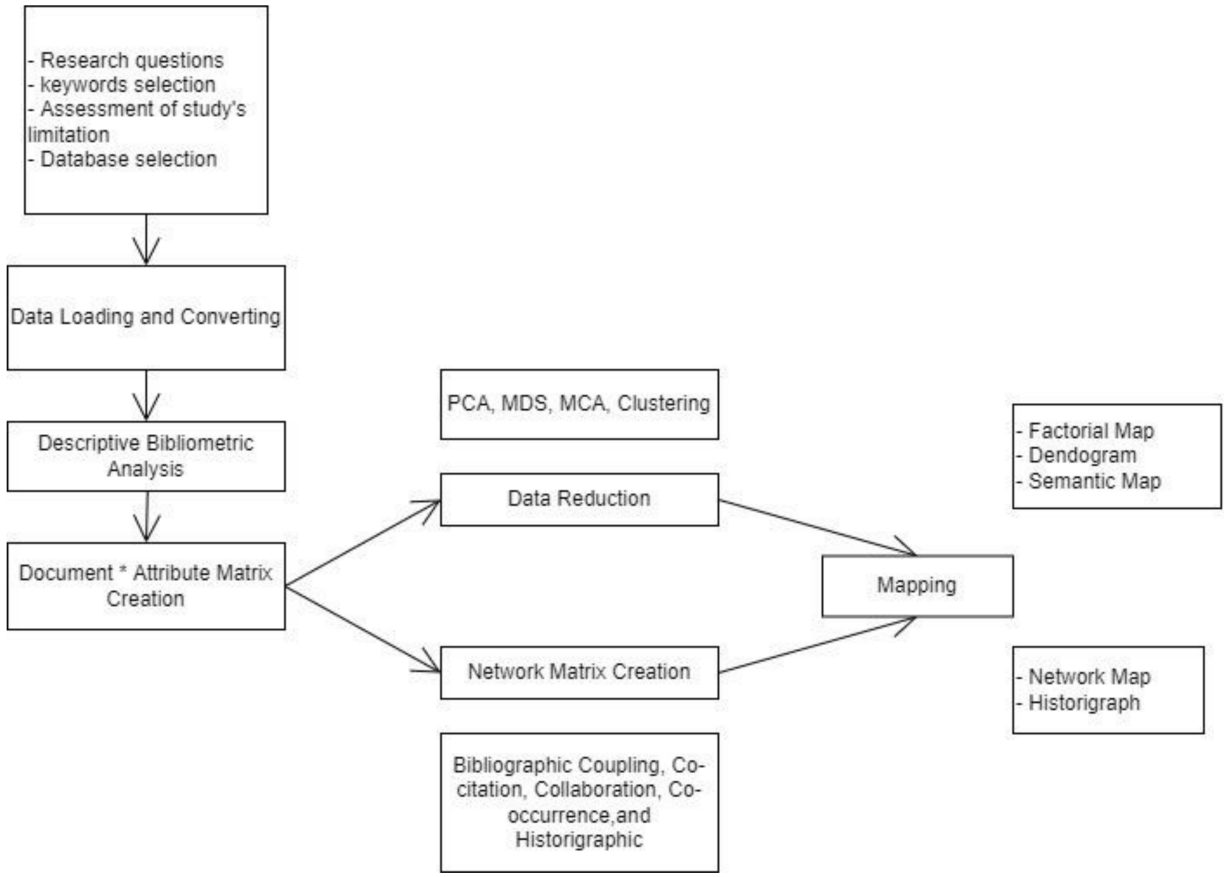

Figure 2. Protocol of a systematic literature review.

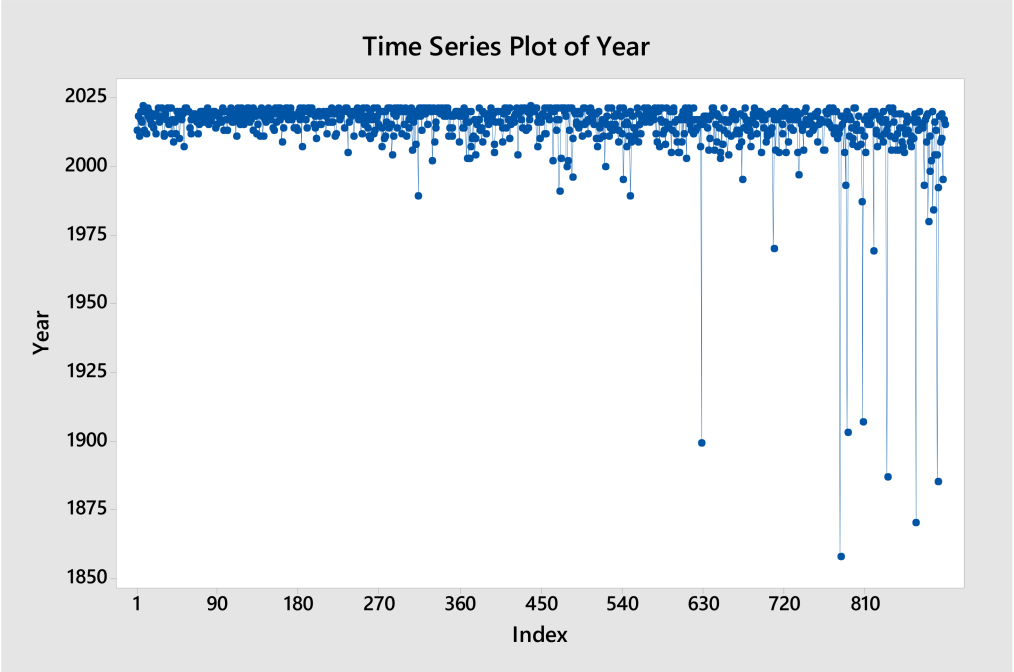

Figure 3. Journal search results (Time Series Plot of Year).

The initial search results in Harzing's Publish or Perish application were converted into a CSV format. It attaches the author's name, citation, document title, year, source title, volume, publication, page, number of citations, source, document type, DOI, bibliographic information (publisher affiliation), abstracts, keywords, and conference information.

3.3. Selecting Articles

The third stage was the selection process that aimed to ensure the relevance of the journals or articles used with the research objectives. The selection process was performed based on the field of study, namely, engineering, social sciences, management, and business. In the search stage, 997 were documents generated. The filtering of articles from the search results was performed by reading each record in the abstract section, determining the paper feasibility according to the topic used, and obtaining 200 articles published from 2007 to 2021.

3.4. Analyze Results with Harzing's Publish and Perish, Vosviewer, Minitab

This research was conducted by visually analyzing bibliometric data using mapping tools to obtain an overview of and information on the topic developments. According to Eck and Waltman [47] not all databases support every type of analysis. The differences between data structure and policies and databases mean that only certain analysis types are available for each database. For example, the following table shows that the Pubmed database does not or has not yet supported citation, bibliographic pair, and co-citation analyses. Vosviewer is used for network analysis that has several types of mapping, namely:

1. Co-authorship maps containing information of the author, organization, and country.
2. Citation maps containing information on publications, organizational journals, and countries.
3. Co-citation maps containing information on publications, journals, and authors (first author only).
4. Bibliographic coupling maps containing information on publications, journals, authors, organizations, and countries.
5. Co-occurrence maps containing information of keywords and terms from titles and abstracts.

4. Findings and Discussions

In the Findings and Discussions Section, we presented and discussed the final results of the bibliometric analysis. We used certain software to assist in the data processing: Publish or Perish, Vosviewer, and Minitab. In addition, we used certain software to make it easier to perform the bibliometric analysis in this study. Grbić and Pöllabauer [48] stated that bibliometric analysis follows relevant scientific publications/literature data. The most necessary data can be used, such as identification sources (title of journal/literature, volume, and pages), author's name, address of institution/institution, references, document type, title, keywords, abstract, subject, and acknowledgment. Furthermore, the bibliometric analysis itself has several benefits, as explained by [49], namely:

1. Understanding the core problems in various disciplines.
2. Knowing the direction and trend of science in various disciplines.
3. Estimating whether the secondary literature is complete or not.
4. Knowing the subject or field of the discipline.

4.1. Annual Scientific Production

Figure 4 shows that journal articles published from 2007 to 2021 fluctuate. It is visible that an increase occurs in the 2015–2017 period by 14 articles; then, in the 2018–2019 period, it decreases by 5 articles. In 2020, there was a rapid increase of up to 9 works. Therefore, based on the data processing results using Minitab, it can be concluded that, in terms of the number of articles published, the selection of a traceability system for halal food procurement has begun to be of significant interest to researchers.

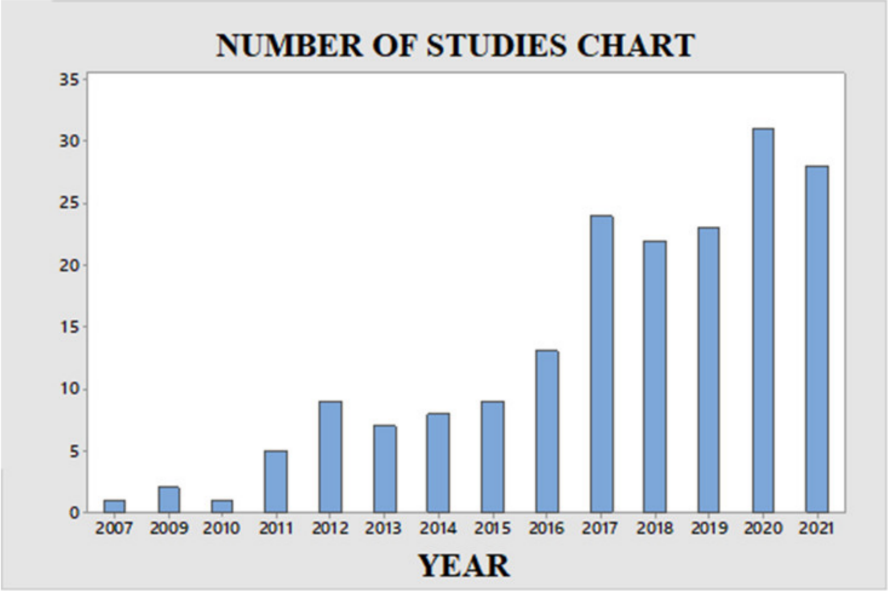

Figure 4. Journal search results (Number of studies chart).

The literature concerning the traceability system for halal food procurement from 2007 to 2021 has become increasingly popular. It is visible that 2007 was the first publication year regarding traceability systems for halal food procurement; there was only one article [50], regarding "Food Safety Drives Growth in Kosher and Halal Foods". Meanwhile, in 2009, the author published two articles in the same year, namely, Othman and Sungkar [51], regarding "Malaysia as an International Halal Food Hub: Competitiveness and Potential of Meat-based Industries". In 2010, only one article was published by Nur, et al. [52], which discussed the "Traceability System Model for Quality Gelatin Raw Material of Cattle Hides".

Meanwhile, in 2011, there was an increased publication of five articles, with authors such as Sonnino and McWilliam [53] discussing "Food Waste, Catering Practices, and Public Procurement: A Case Study of Hospital Food Systems in Wales"; then Jaafar, et al. [54] published "Halal Supply Chain in the Food Industry: A Conceptual Model"; Bahrudin, et al. [42] discussed "Tracking and Tracing Technology for Halal Product Integrity over the Supply Chain"; Campbell, et al. [55] published "Kosher in New York City, Halal in Aquitaine: Challenging the Relationship between Neoliberalism and Food Auditing"; and Nur, et al. [52] discussed "Engineering Support for the Institutional System of Quality Assurance for the Supply of Cowhide Raw Materials for the Development of Gelatin Agroindustry".

In 2015–2017, there was a considerable increase in the publication of articles, especially in 2015, such as discussing halal clusters. In 2016, Khan and Haleem [56] published "Understanding "Halal" and "Halal Certification and Accreditation System": A Brief Review". In 2017, Zailani, et al. [57] discussed halal logistics opportunities and challenges.

In 2020, traceability procurement systems for halal food reached the highest publication peak, with the highest number of publications of 31 articles in 2007–2021. As a result, to date, many researchers study the topic of traceability systems for halal food procurement. Apriyadi, et al. [58] is one example that studied the information system traceability of finished products.

4.2. Scientific Production Publisher

The data processing of the 200 selected journals, along with the 20 sources related to traceability systems for halal food procurement, is presented in Figure 4. The *Journal of Islamic Marketing* occupies the first position with 12 published articles. In second place is the *Journal of Islamic Studies*, with nine published articles, and then the *British Food Journal* with seven published articles. Writing articles requires the use of references to improve

the paper the researcher wishes to publish. The connections must not use any written work and the author must check whether the authorities are credible or in good standing. Reputable institutions have an appropriate peer-review process. If an expert team reviews the reference, it shows that the journal is of the quality chosen as the reference we will use. References that can improve scientific articles are available from books, scientific articles, and written sources, both printed and electronic. From the explanation above, the conclusion was that we needed to check whether the head containing the reference was valid and reliable as a reputable source.

4.3. Ranking of Scientific-Article-Producing Countries

Based on the library data obtained through Publish or Perish on the traceability of halal procurement, 21 countries produced articles on the previously mentioned topics. The visualization of the number of scientific article productions is presented in Figure 5 as follows:

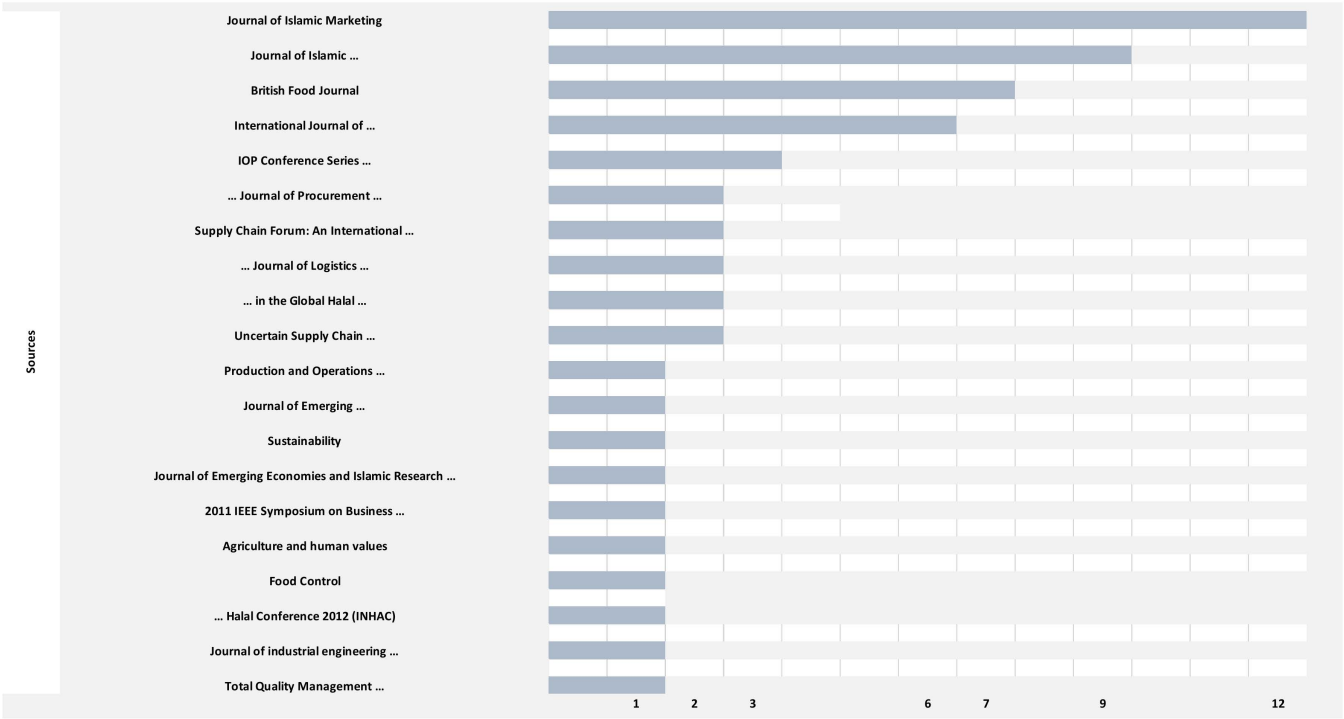

Figure 5. Relevant source rating.

Malaysia is the country in the lead for producing scientific articles on traceability halal procurement topics. This is because Malaysia is one of the many Muslim-majority countries worldwide whose population applies Islamic law to their daily lives. This is supported by nine Islamic sultanates, which became the foundation of the Malaysian government. Therefore, halal consumption is the main focus of the Malaysian government to protect the public, especially Muslims. For example, in one of the studies conducted in Malaysia, Tieman, et al. [59] discussed the rules of supply chain management. Moreover, Othman and Sungkar [51] explained the competitiveness of halal meat sales. This indicated that halal procurement is the main focus of researchers in Malaysia.

The next country that is the largest producer of scientific articles is Indonesia. It is motivated by the demographic factor of Indonesia, which has the largest Muslim population in the world. Indonesia produced 51 articles. The significant number of Muslims in Indonesia is followed by the community's high consumption rates of halal products. Moreover, there is a regulation by the Indonesian Ministry of Religion that requires halal labels on food products, cosmetics, and medicines. It further strengthens the need for halal products in Indonesia. Another study on the traceability of halal procurement was

conducted by Bahrudin, et al. [42], regarding the tracking and tracing technology used for halal products, as well as being the third most relevant reference quoted 129 times. The countries that follow are India with 14 articles, and the United Kingdom, Australia, and Iran with 5 scientific articles.

4.4. The Most Cited Publications Based on Publish or Perish

The most cited publications were obtained from the Publish or Perish databases. Ten scientific articles with the highest number of citations were summarized based on halal procurement traceability topics (Table 1).

Table 1. The most cited articles.

Ranking	Title	Citations
1	Traceability Issues in Food Supply Chain Management: A Review	318
2	Principles in Halal Supply Chain Management	295
3	Food Waste, Catering Practices, and Public Procurement: A Case Study of Hospital Food Systems in Wales	187
4	Establishing the Principles in Halal Logistics	165
5	Halal Supply Chain Critical Success Factors: A Literature Review	151
6	Halal Supply Chain in the Food Industry - A conceptual model	151
7	Halal Logistics in Malaysia: A SWOT Analysis	141
8	Tracking and Tracing Technology for Halal Product Integrity over the Supply Chain	129
9	Blockchain for Supply Chain Traceability: Business Requirements and Critical Success Factors	129
10	Qualitative Research on Critical Issues in Halal Logistics	123

The ten journals with the highest number of citations were presented based on Publish and Perish. The most cited journal, "Traceability issues in food supply chain management: A review, " was written by [22]. The journal had two objectives: the first was an analysis of how the concept of traceability, needs, and technology affected modern supply chain management; the second highlights the future trends and the field perspective of the researcher.

Subsequently, the journal with the second-highest number of citations was entitled "Principles in Halal Supply Chain Management", which was written by Tieman [60] and cited 295. The journal aimed to introduce a new framework to optimize the design of halal *food supply chains*, also known as the "Halal Supply Chain Model". It used an extensive literature review method with large group discussions and several focus-group sessions to identify the control of halal activities and ensure logistics activities by observing three countries: Malaysia, the Netherlands, and China.

The journal ranked in third place with the most citations was by Sonnino and McWilliam [53], entitled "Food Waste, Catering Practices, and Public Procurement: A Case Study of Hospital Food Systems in Wales" with 187 citations. It contained a study on sustainable food systems in the case of hospital food waste in Wales, UK, based on a combined method that focused on the relationship between hospital food waste, catering, and public procurement strategies. It demonstrated that the hospital feeding system was responsible for overall food-waste levels exceeding Health Board standards.

4.5. Traceability Technology Research

The technology used for traceability conducted by previous researchers based on journals cited by Publish or Perish contained eight articles from 2006 to 2021. The journal titled "Techno-Economic Analysis of RFID Technology Implementation in Traceability Systems" by Nugraheni and Priyandari discussed the application of RFID (Radio Frequency Identification) technology to a traceability system. Radio-based identification technology can simultaneously identify various objects without direct contact (or over a short distance). The journal titled "Halal Traceability Model with a CLD Approach to Food Supply Chain Management Using Blockchain Technology", written by Evitha and Komala, discussed the CLD (Casual Loop Diagram) approach to blockchain technology. The study aimed to help provide solutions for overcoming the challenges of visibility and traceability, and ensuring food quality and safety management.

The journal "Development of a Beef Supply Chain Traceability System Model Based on Information Technology", written by Purnama and Diki Gita, discussed the development of a beef traceability information system using the systems development life cycle (SDLC) prototyping method named sicadas.com. The design was created using the computer-based information system (CBIS) concept to design the traceability system's infrastructure. The journal titled "Traceability System Design based on Information Technology on Organic Rice Farming in Tasikmalaya, West Java" by Irsyaputra [61] discussed the traceability systems that already exist worldwide. They are IoT (Internet of Things) and QR Code (Quick Response Code) used to store data in real-time and read product data using the systems development life cycle (SDLC) approach.

4.6. Cluster and Network Analysis

The formation of the cluster and network analysis in this study used the VOSviewer tool or software to provide a graphical visualization and grouping analysis related to the traceability of halal procurement in the food industry. This type of analysis uses co-occurrence and unit analysis involving all keywords. The minimum number of keyword frequencies is 20.

The first use of VOSviewer software is to create data, including journals operated using Publish or Perish with the file format (Ris) on Vosvierwer. There are several options for creating a map, using the network, bibliographic, and text data. The file format (Ris) of Vosviewer supports RIS, Endnote, and Refworks. Then, input the Ris file and select the title and abstract field, which function to obtain the frequently appearing keywords. Then, set a minimum number of keywords that are related and frequently appear. Subsequently, the data cluster in Vosviewer appears with the minimum number of entered keywords.

In Figure 6, it is visible that two words have a strong relationship, namely, procurement and traceability, which means that these words appear often and are very relevant to the halal procurement traceability system.

The link presents the number of relationships between one item (node) and another. For example, in Figure 7, the big nodes are procurement and traceability, meaning both words appear highly frequently. There are five clusters based on color (i.e., green, yellow, red, blue, and purple). Each color has a grouped specific topic. The colored line shows how often one node is connected to another (for example, procurement is connected to traceability). Different colors show each topic connected to other nodes in the same topic and keyword. For example, cluster 1 presents procurement and cluster 2 is traceability. Moreover, cluster 3 contains halal traceability and cluster 4 has the supply chain. Finally, cluster 5 depicts food traceability.

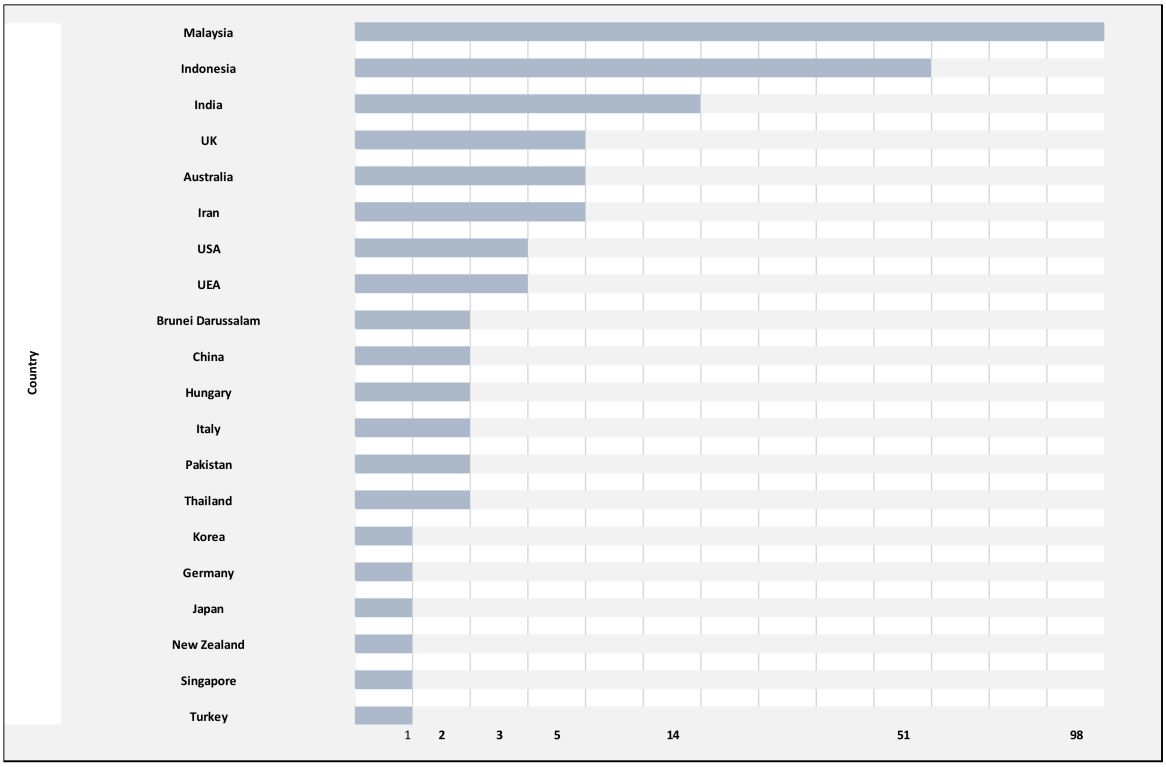

Figure 6. Ranking of scientific-article-producing countries.

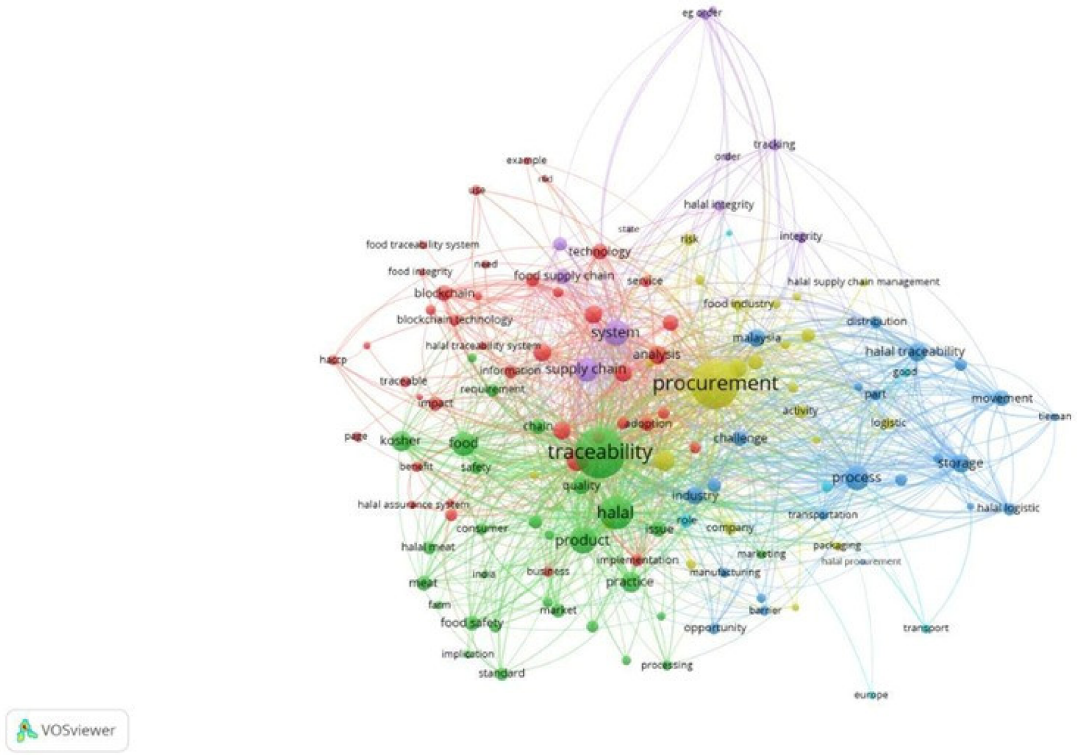

Figure 7. VOSviewer cluster data.

Cluster 1 (yellow) focuses more on the procurement of goods, a concept that developed from 1986 until the present as an innovation in the procurement of goods that functions in all procurement contexts according to Uyarra and Flanagan [62], as stated in "Understanding the Innovation Impacts of Public Procurement" journal. The definition of the procurement

of goods and services according to K. Vaidya and J. Campbell [63] includes an explanation of the entire process from the beginning of planning, preparation, licensing, determining the winner of the auction to the implementation stage and administrative functions in the procurement of goods, works or services, such as technical consulting services, financial consulting services, legal consulting services, or other services.

Cluster 2 (green) is more focused on traceability. It is an activity conducted by production companies aiming to determine the processing system, starting from receiving raw materials and processing until the product is ready to be distributed and knowing the quality of the product. Traceability systems assist firms in isolating the source and scope of safety or quality-control problems. The firms are incentivized to invest in traceability systems. They help minimize the production and distribution of unsafe or poor-quality products, reducing the potential for negative publicity, liability, and recalls [64].

Cluster 3 (blue) focuses more on halal traceability, a medium for tracking the halal status of a food product, by recording all activity information in producing products from upstream supply chains, namely, the origin of raw materials, to downstream supply chains [65]. The traceability of the use and delivery of materials is also essential to ensure that complaints or halal status are easy to trace for the batch or lot produced [66]. In addition, traceability systems may influence the supply chain management and provide information about the product and business [67,68]. It can also validate the quality of credibility [64,69]. Halal is a food credential that, similar to organic food, humanely handles small items and ecologically sustainable products cannot be easily-reviewed or verified by the customer. As a result, the attribute must be communicated to customers through suitable labeling that clearly articulates its credibility and trustworthiness [70].

Cluster 4 (red) focuses more on the supply chain, a system that can coordinate the process of moving material, information, and finance within a company. This chain is also a network of inter-connected organizations with the same goal, namely, to organize as best as possible the procurement of these goods [71]. Food supply chain information systems can enable traceability and transparency. They have various types of users, each requiring different traceability analyses. These users can be divided into three categories: (1) supply chain partners, ranging between food producers, such as farmers to retailers; (2) food production and supply chain consumers; and (3) authorities and regulators to ensure safe food, control, empowering food laws and regulations, preventing contaminated food and other food-related hazards, and aspiring to rapid and surgical responses to any food crisis [25].

Cluster 5 (purple) focuses more on food traceability. It is about the identification results of halal traceability implementation of the supply chain. This cluster also presents the performance of the halal traceability system in a company. It can minimize the threat of contamination of illicit substances traced from the implementation of the SCOR model process, namely, plan, resource, make, and deliver a return. The SCOR model can enable the concept of halal and *tayyib* for halal meat products sold [72]. Food product traceability systems provide honesty in food manufacturing, allowing customers to trust halal product claims [70]. Traceability is crucial for manufacturers, producers, and distributors [73]. It is becoming an essential requirement [68] in the EU [74], the United States [75], and Canada [68].

The results of current studies should be interpreted in light of their limitations. First, the review was limited to articles from peer-reviewed journals available in scholarly databases. Second, the review used the phrase "traceability system for halal food procurement" and did not consider vernacular interchangeable terms. These limitations may be addressed in future research by including additional keywords, such as smart contracts, and databases, such as ACM and IEEE, to broaden the scope of the information assimilated.

We highlighted the specific areas where future research could inform the study and practice of traceability systems for halal food procurement, in addition to the previously discussed four future research directions derived from the reviewed studies. Future research could concentrate on the potential implementation of technology, such as electronic

data interchange (EDI), radio frequency identification (RFID), and blockchains (BCs). We advocate for more policy and service development research and information stored in blockchain-based systems. The conceptual knowledge of the traceability system in halal procurement must be advanced for specific cases, such as halal integrity in halal procurement, information sharing in supply chains, and supply chain transparency through blockchain-based traceability.

5. Conclusions

The current article provided an overview of the traceability of halal procurement in the food industry. Traceability is a system used to track the halal status of a food product by recording and documenting every process, from the origin of raw materials to the finished product. Therefore, it is possible to guarantee the halal status of a food product because it uses a system to track (traceability) the halalness of food products. Procurement provides goods; in this process, it is essential to ensure the halalness of raw materials and choose the best quality raw materials.

The previous research that was used as a reference presented shortcomings in choosing raw materials that ensured their halal status. Therefore, traceability was only tracked in this study using additional procurements, which aimed to select raw materials with a guaranteed halal status and of the best quality. The procurement system is essential and helps the traceability system track the halalness of the raw materials.

The present study obtained 997 articles discussing halal traceability in the food industry. The articles were filtered down to 200 and divided into relevant articles: 167 on halal traceability and 33 on procurement. Following filtering, 200 articles could be analyzed through the title of the paper and its abstract. The authors and keywords made the most significant contribution to filtering articles to become more relevant to the topic of the current research.

This study will help future researchers understand their work's overview and status. The results will also help young researchers to understand and attain and insight into the traceability of halal food and procurement in the food industry. However, in this study, there were several shortcomings in the search for various articles; we recommend that future researchers use the article search option with multiple tools to obtain more relevant results.

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