

Thirty Years of Research in Halal: A Bibliometric Analysis

Yudi Saputra¹ and M. Luthfi Hamidi²

ABSTRACT

This research is tries to conduct science mapping on halal-related research in last thirty years. As far as the author's know, there is no halal-related article that conducts science mapping in the halal landscape and in a long span of time. Some previous studies have used specific halal topics and relatively short time spans. Research with a broad landscape is needed to see the whole thing, as well as chart the future research direction in order to fill the empty spaces of halal science. This study used bibliometric analysis, to adjust to large datasets. In total, this research analyzed 9,456 published articles, with a total of 1,765 different authors. Data that has been collected, then analyzed with web-based (Dimensions) and software-based (Vosviewer). One of the interesting findings in this study is that in 2023 there will be a significant decrease in the number of halal-related articles published, compared to the previous year. Other findings from such as trends, clusters, top leading country, top leading affiliation, connections between author, etc. are described in the findings section.

ملخص

تهدف هذه الدراسة إلى إجراء تحليل خرائطي علمي للأبحاث المتعلقة بالهلال خلال الثلاثين عاما الماضية. وبحسب علم الباحث، لا توجد حتى الآن دراسة تناولت رسم الخرائط العلمية في مجال دراسات الهلال ضمن نطاق زمني ممتد وطويل. إذ ركزت معظم الدراسات السابقة على موضوعات جزئية ضمن سياقات محددة وفترات زمنية قصيرة نسبيا. وتبرز الحاجة إلى إجراء دراسة شاملة ذات منظور واسع لرسم ملامح الحقول المعرفية في دراسات الهلال وتوجيه البحوث المستقبلية لسد الفجوات المعرفية القائمة. استخدمت الدراسة منهج التحليل البيبليومتري بما يتناسب مع حجم البيانات الكبير. وبشكل إجمالي، حلّلت الدراسة 9,456 مقالة منشورة، كتبها 1,765 مؤلفًا مختلفًا. وقد

¹ Faculty of Economics and Business, Universitas Islam Internasional Indonesia (UIII), Depok, Indonesia. E-mail: Yudi.saputra@uiii.ac.id

² Faculty of Economics and Business, Universitas Islam Internasional Indonesia (UIII), Depok, Indonesia. E-mail: Luthfi.hamidi@uiii.ac.id

جرى تحليل البيانات باستخدام منصات إلكترونية (Dimensions) وبرمجيات متخصصة (VOSviewer). ومن أبرز النتائج اللافتة في هذه الدراسة هو التراجع الملحوظ في عدد المقالات المنشورة المتعلقة بالحلal خلال عام 2023 مقارنة بالعام الذي سبقه. كما تستعرض الدراسة في قسم النتائج أبرز الاتجاهات البحثية، التجمعات الموضوعية، الدول والمؤسسات البحثية الرائدة، والعلاقات الشبكية بين المؤلفين، وغيرها من المؤشرات العلمية ذات الصلة.

RESUMÉ

Cette étude vise à cartographier les recherches menées au cours des trente dernières années dans le domaine du halal. À la connaissance de l'auteur, il n'existe aucun article consacré au halal qui dresse une cartographie scientifique de ce domaine sur une longue période. Certaines études antérieures ont porté sur des thèmes spécifiques du halal et couvraient des périodes relativement courtes. Une recherche à grande échelle est nécessaire pour avoir une vue d'ensemble et tracer les orientations futures de la recherche afin de combler les lacunes de la science halal. Cette étude a utilisé l'analyse bibliométrique pour s'adapter à de grands ensembles de données. Au total, cette recherche a analysé 9 456 articles publiés, rédigés par 1 765 auteurs différents. Les données collectées ont ensuite été analysées à l'aide d'outils en ligne (Dimensions) et de logiciels (Vosviewer). L'une des conclusions intéressantes de cette étude est qu'en 2023, le nombre d'articles publiés sur le halal diminuera considérablement par rapport à l'année précédente. D'autres conclusions, telles que les tendances, les clusters, les pays leaders, les affiliations leaders, les liens entre les auteurs, etc. sont présentées dans la section "Résultats".

Keywords: Bibliometric analysis, Science mapping, Halal, Research trend

JEL Classification: M13, L66, Z12, O32

1. Introduction

Bibliometric research was first conducted by Cole and Eales in 1917, although at that time the term 'biliometric' was not yet used (Lawani, 1981). Cole and Eales conducted a stastistical analysis of the literature of comparative anatomy published during 1550 to 1860, to show the fluctuation in interest during this period (Lawani, 1981). In 1926, Alfred Lotka investigated author productivity patterns and established the initial principles for bibliometrics, known as Lotka's law (Ahmad et al., 2020). Samuel Bradford conducted similar research in 1934, he analyzed the

frequency distribution of scientific publications across journals in specific research fields, and his work led to a key law of bibliometrics (Bradford's law) (Ahmad et al., 2020).

Terminologically, Alan Pritchard introduced the concept of bibliometrics in the 1960s, describing it as the utilization of mathematical and statistical approaches for presenting article evaluations related to information retrieval, information literacy, and publication cataloging and classification (Suharso et al., 2021). The term "bibliometric" is used to replace 'statistical bibliography' because it is felt to cause misinterpretation as bibliography on statistics (Lawani, 1981). Bibliometric is applied to explore inquiries like identifying the primary subjects or key research areas in a specific scientific field and understanding the interconnections between these subjects or fields (Waltman et al., 2010). Researchers utilize bibliometric analysis for diverse purposes, including identifying emerging patterns in the performance of articles and journals, collaboration trends, and components of research. Additionally, it is employed to investigate the intellectual framework within a particular domain in existing literature (Donthu et al., 2021).

Nowadays, halal is no longer a religious narrative, more than that halal has turned into a separate and growing industrial sector. The halal industry encompasses sectors such as food and beverages, cosmetics, pharmaceuticals, tourism and logistics, which are characterized by product and services that comply with halal certification standards (Tiemann, 2011; Wilson & Liu, 2010). In this study, "halal science" refers to the interdisciplinary body of knowledge that investigates the principles, practices, and innovations related to halal products, services, and processes within these industry sectors. This research deliberately excludes Sharia-Compliant, Islamic Finance and Economics, as these domains operate under distinct regulatory frameworks, such as those established by Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), and are typically addressed in literature using terms such as "Islamic Finance" rather than "halal" (Dinar Standard, 2022).

Bibliometric analysis is particularly valuable in this context, as it enables the systematic mapping of the intellectual structure of halal science, revealing historical trends, dominant research clusters, and underexplored

areas (Donthu et al. 2021). By analysing publication patterns, citation data, and co-authorship networks, this study not only traces the evolution of halal research over the past three decades but also identifies gaps and opportunities for future research, thereby guiding scholars and policymakers in advancing the field.

The focus on the halal industry, as defined here, align with the keyword “halal” used in Dimensions database, which predominantly captures publications related to consumer-oriented halal product and services rather than financial instruments. As far as the author’s search, few publication capture the theme of halal in broader landscape (Putera & Rakhel, 2023). The objective of this research is to recognize and examine scientific publications associated with halal to outline evolving patterns, predominant areas of interest, center of excellence, and notable progress achieved over past three decades. In simple terms, this research is tries to conduct science mapping on halal-related research. Specifically, this research will answer several questions as follows:

RQ1: *What is halal research cluster and/or pattern based on its publication?*

RQ2: *What research topic that has the largest portion in halal publications?*

RQ3: *Who/Which Author or Country that has the most contribution in halal-related publications?*

RQ4: *What is the potential halal-related topics for future research and/or publications?*

This paper is divided into four sections. The first section contains an introduction and research questions. The second section contains research methods and data. The third section contains findings and discussions. The last (fourth) section contains conclusions and recommendations.

2. Literature Review

Bibliometric analysis has become a widely adopted method for mapping research fields, particularly in finance, economics, and interdisciplinary domains like Islamic studies. In the context of Islamic finance and economics, several studies have utilized bibliometric techniques to explore specific subfields. For instance, Biancone et al. (2020) conducted a bibliometric analysis of Islamic Banking and Finance (IBF) using 7,662

Scopus-indexed articles, identifying key themes such as banking performance, governance, and ethical finance. Similarly, Ismail et al. (2022) analyzed 391 publications on Islamic social finance, focusing on zakat, waqf, and Islamic microfinance, and highlighted their role in addressing socio-economic challenges. Other studies have examined Islamic fintech (Lada et al., 2023).

The common structure of bibliometric analyses typically involves two main approaches: performance analysis and science mapping (Donthu et al., 2021). Performance analysis evaluates publication metrics, such as the number of articles, citations, leading authors, institutions, and journals. Science mapping, on the other hand, visualizes relationships among research components using techniques like co-authorship analysis, co-citation analysis, bibliographic coupling, and co-word analysis. Tools such as VOSviewer, Biblioshiny, and RStudio are commonly used to generate network visualizations, keyword maps, and trend analyses. In Islamic finance studies, co-word analysis is frequently employed to identify thematic clusters (e.g., governance, fintech, or sustainability), while citation analysis highlights influential works and authors (Biancone et al., 2020). This study adopts a similar structure, combining performance analysis (e.g., publication trends, leading authors) and science mapping (e.g., co-word and overlay visualization) to map the intellectual landscape of halal science.

3. Data and Methodology

This research is quantitative research using bibliometric analysis technique. Bibliometric analysis was chosen among several review methods (bibliometric, meta-analysis, and systematic literature review), because it is more in accordance with the research objectives. Bibliometrics are more suitable for research that uses large datasets, to capture the state of the intellectual structure and emerging trends of a research topic (Donthu et al., 2021). Because this research uses a large dataset, and raises the theme of halal in general, bibliometric analysis is more suitable than meta-analysis or systematic literature review. In general, bibliometric analysis can be divided into 2, namely: performance analysis and science mapping (Donthu et al., 2021). **Figure 1** is a summary of each analysis technique in bibliometrics.

Figure 1: Bibliometric analysis toolbox

Bibliometric Analysis	
Performance Analysis	Science Mapping
Publication-related metrics 1. Total publications (TP) 2. Number of contributing authors (NCA) 3. Solo-authored publications (SA) 4. Co-authored publications (CA)	Citation analysis 1. Relationships among publications 2. Most influential publications
Citations-related metrics 1. Total citation (TC) 2. Average citation (AC)	Co-Citation analysis 1. Relationships among cited publications 2. Foundational themes
Citations-and-publication-related metrics 1. Collaboration index (CI) 2. Collaboration coefficient (CC) 3. Number of cited publication (NCP) 4. Proportion of cited publication (PCP) 5. <i>h</i>-index (<i>h</i>) 6. <i>g</i>-index (<i>g</i>) 7. <i>i</i>-index (<i>i</i>-10, 1-100, <i>i</i>-200)	Bibliography coupling 1. Relationships among citing publications 2. Periodical or present themes
	Co-word analysis 1. Existing or future relationships among topics 2. Written content (word)
	Co-authorship analysis 1. Social interactions or relationships among authors 2. Authors and affiliations (institution or

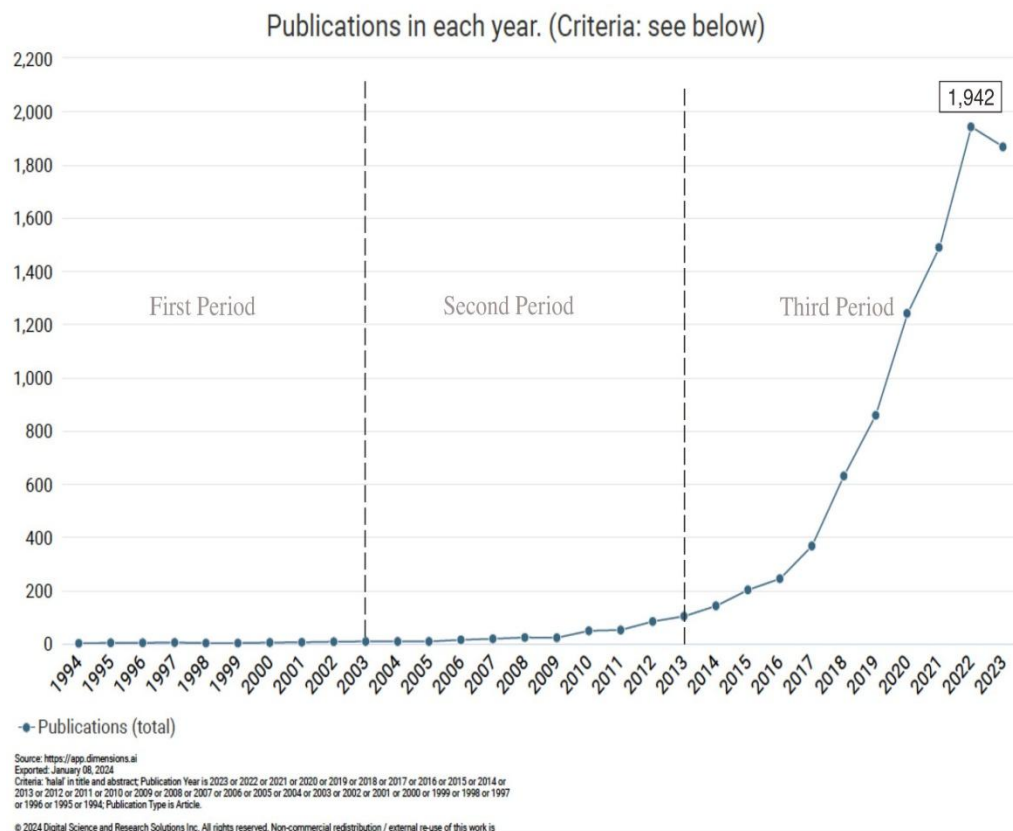
Source: Adopted from (Donthu et al., 2021)

Quantitative research on electronic information sources were conducted using the Dimensions database. Dimensions database is an inter-linked research information system, provided by Digital Science (<https://www.dimensions.ai>). The data used are publications in the form of scientific articles published in the period from 1994 to 2023 (last thirty years), from Dimensions database. In total, this research used 9,399 published articles, with 1,765 researchers as a dataset. The data was collected according to criteria (article, within 1994-2023, using "halal" keyword), then analyzed with web-based (Dimensions) and software-based (Vosviewer).

4. Results

4.1. Overview

Figure 2: Publication Overview



Source: Dimensions, modified by author.

In the first period (1994-2003), the number of publications related to halal was minimal, with only 39 publications over span of 10 years (see Fig.2 and Table 1). During this period, halal research was in its infancy, primarily focusing on foundational topics such as the authentication of halal food products and compliance with Islamic dietary laws. Keywords like "meat," "blood," and "detection" dominated early publications, as evidenced by the co-word analysis (Fig. 6), reflecting a focus on scientific methods for verifying halal status, particularly in meat production and processing (Wilson & Liu, 2010). These topics laid the groundwork for

halal science, driven by the need to establish standards in food industries, especially in Muslim-majority countries like Malaysia and Indonesia.

In contrast, the second period (2004–2013) marked a noteworthy growth in publication output, with a total of 378 publications, an almost tenfold increase from the first period. This period saw the expansion of halal research into broader areas, including supply chain management and early discussions on halal certification processes. Keywords such as "animal" and "slaughtering" remained prominent, but emerging terms like "halal logistics" began to appear, indicating a shift toward operational and regulatory aspects of the halal industry (Tieman, 2011). The growth in this period coincided with the globalization of the halal market, which spurred academic interest in standardizing halal practices across industries.

Table 1: Number of published articles by year

First Period (1994-2003)		Second Period (2004-2013)		Third Period (2014-2023)	
Year	Total Publication	Year	Total Publication	Year	Total Publication
1994	1	2004	8	2014	142
1995	3	2005	8	2015	202
1996	3	2006	14	2016	244
1997	4	2007	18	2017	367
1998	2	2008	23	2018	630
1999	2	2009	22	2019	858
2000	4	2010	48	2020	1,241
2001	5	2011	51	2021	1,489
2002	7	2012	83	2022	1,942
2003	8	2013	103	2023	1,867
	39		378		8,982

Source: Calculated by author

In line with the second period, the third period (2014–2023) witnessed a significant surge in publications, with 8,982 publications, accounting for approximately 95% of the total dataset. The peak occurred in 2022 with 1,942 publications, driven by consumer-oriented topics like "halal certification" and "halal awareness," as well as health-related issues such as "vaccine" post-COVID-19 (see Fig. 7). Overall, the number of published articles produced each year can be seen in Table 1. The trend of increasing publications, particularly in periods 2 and 3, reflects the maturing of halal science as an interdisciplinary field. However, an anomaly occurred in 2023, with a decline to 1,867 publications,

potentially due to saturation in dominant topics like marketing and religious studies, as discussed later.

Figure 3: Number of Publications of Each Dicipline/Category

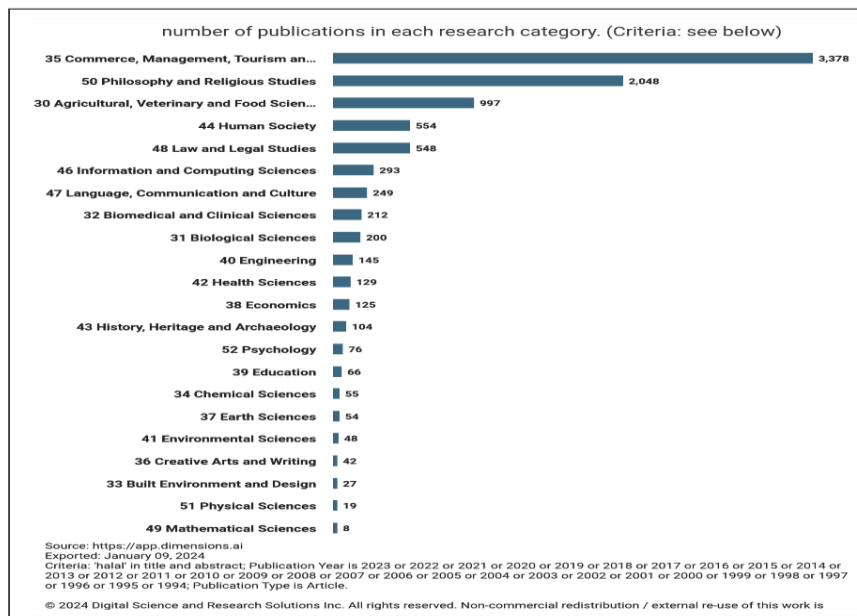


Figure 4: Number of Publications in Commerce, Management, Tourism, and Services

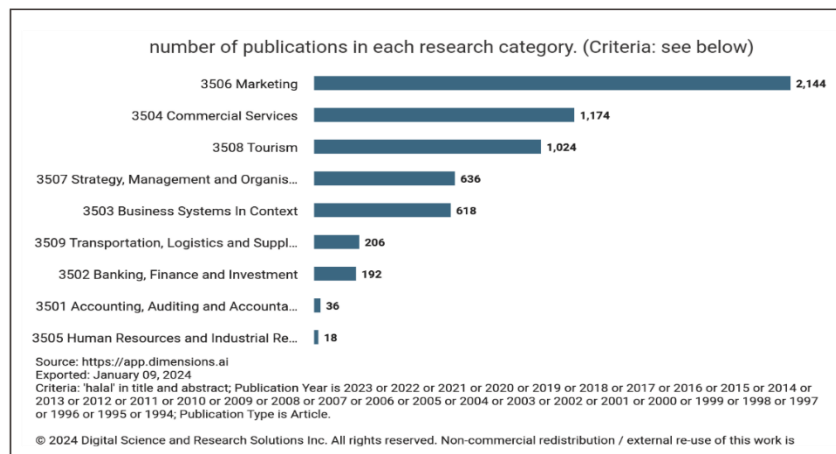
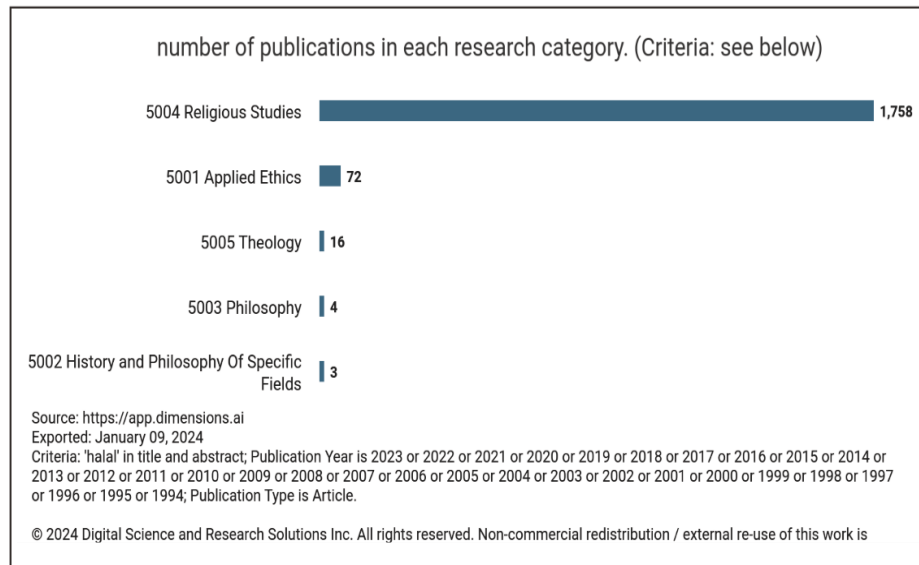


Figure 5: Number of Publications in Philosophy, and Religious Studies

Source: Dimensions, modified by author.

Figure 3 shows the number of publications in each cluster. It can be noted that the cluster “Commerce, Management, Tourism, and Services” was a leading cluster in terms of quantity of article publications produced, which is 3,378 publications. While the second place, occupied by cluster “Philosophy and Religious Studies” with 2,048 publications.

If we look in more depth at **Figure 4**, the Marketing topic dominates the “Commerce, Management, Tourism, and Services” cluster, with total number of publications > 2,000 articles. In **Figure 5**, the number of article publications in “Philosophy and Religious Studies” cluster, is extreme dominated by the Religious Studies. When compared with the close family of disciplines in this context economics. The “Economics” cluster has only produced a total of 125 publications of halal-related articles in the last 30 years. This data can be used as an early indication that halal-related publications have reached a saturation point due to over-publication in one discipline and less-publication in another. In other words, even though the publication of halal-related articles experienced a very significant increase especially in the third period, It cannot be interpreted that knowledge related to halal develops thoroughly. The development of halal science is only concentrated in a few knowledge

families (e.g. Marketing, Commerce, Tourism, and Religious Studies), and does not develop evenly in other science families.

Table 2: Type of Access

Type of Acces	Total
Open Acces	7,828
Closed Acces	1,628

From total published articles as many as 9,456, as many as 7,828 or about 82% of them are open access. This is an indication that both the academic and general public can access articles for free. Only 1,628 or 18% of all articles are closed access. When an article has closed access, then someone has to pay around 20-45 if they want to access the article (Suharso et al., 2021). The cost of accessing a closed article is a barrier in this case of scientific development itself, because not everyone, especially individuals, can afford to spend money to read an article. In fact, not all educational institutions have equal access to a published article. Because most halal-related articles are open access, so more individual and/or institutions can access these articles. The more parties who can access, indicating that the dissemination of halal-related knowledge can be faster and more evenly distributed.

Table 3. Show 15 top leading authors on halal-related research. Of the 15 samples taken, at least several countries emerged, namely: Indonesia, Malaysia, India, Brunei, and the United Kingdom. Although in terms of quantity of publications Indonesia is superior, in terms of quality, publications originating from Malaysia relatively have a higher average citation per document (mean). The same is true of publications originating from India, which have relatively high citations per document.

Table 3: Leading Authors

Name	Total Publications	Total Citations	Mean	Affiliation	Country
Abdul Rohman	53	671	12.66	Gadjah Mada University	Indonesia
Suhaiza Hanim Binti Dato Mohamad	25	1,230	49.20	University of Malaya	Malaysia
Hendri Hermawan Adinugraha	24	62	2.58	n.a.	n.a.
Ririn Tri Ratnasari	23	117	5.09	Airlangga University	Indonesia
Sucipto Sucipto	22	42	1.91	University of Brawijaya	Indonesia
Awis Qurni Sazili	20	885	44.25	University Putra Malaysia	Malaysia
Suhaimi Mustafa Mustafa	20	602	30.10	University Putra Malaysia	Malaysia
Mohd Imran Khan	19	677	35.63	Lovely Professional University	India
Abid Haleem	18	633	35.17	Jamia Millia Islamia	India
Shahbaz Khan	18	567	31.50	GLA University	India
Irwandi Jazwir	17	139	8.18	Internasional Islamic University Malaysia	Malaysia
Abdul Hafaz Ngah	17	437	25.71	University Malaysiwa Terengganu	Malaysia
Mohamed Syazwan Ab Talib	17	604	35.53	University Brunei Darussalam	Brunei
Anjar Windarsih Windarsih	16	119	7.44	University of Malaya	Malaysia
Awal Fuseini	16	210	13.13	University of Huddersfield	United Kingdom

Table 4: Leading Journal

Journal	Total Publication	Total Citation	Mean
Journal of Islamic Marketing	286	8,178	28.59
International Journal of Academic Research in Business and Social Sciences	91	159	1.75
Journal of Food Science	60	267	4.45
IOP Conference Series Earth and Environmental Science	60	149	2.48
Jurnal Ekonomi Syariah Teori dan Terapan	53	38	0.72
Journal of Fatwa Management and Research	52	25	0.48
Journal of Halal Product and Research	49	156	3.18
International Journal of Islamic Marketing and Branding	48	86	1.79
KnE Social Sciences	44	114	2.59
Procedia – Social and Behavioral Sciences	43	1,337	31.09
Indonesia Journal of Halal Research	42	73	1.74
British Food Journal	41	2,012	49.07
Meat Science	40	2,666	66.65
Journal Ilmiah Ekonomi Islam	39	82	2.10
ICR Journal	34	106	3.12
Global Journal Al-Thaqafah	33	63	1.91

Table 4 contains a list of the top 15 leading journals based on total publications. In terms of number of publications, social science journals dominate more publications than natural science journals. However, in terms of citations, natural science journals have a higher average citation per document. For example, "British Food Journal" and "Meat Science" have the highest citation rates per document (mean) of 49.07 and 66.65.

Table 5: Frequently used Keyword

No.	Frequency in Title of Articles		Frequency in Abstract of Articles	
	Keywords	Frequency	Keywords	Frequency
1.	Analysis	31	Meat	236
2.	Slaughter	30	Indonesia	233
3.	Detection	24	Halal Certification	206
4.	Effect	20	Sample	172
5.	Halal Certification	19	Animal	131
6.	Malaysia	17	Group	113
7.	Halal Awareness	13	Halal Awareness	108
8.	Challenge	12	Slaughter	98
9.	Halal Authentication	11	Vaccine	94
10.	Evaluation	10	Halal Industry	88

Source: Vosviewer, calculated by author

Table 5 shows frequently used keywords in halal-related articles in the title and abstract fields. The keywords "halal certification" and "halal awareness" appear in both fields (title and abstract). The keyword "Malaysia" is part of the leading used keyword in the title, while the keyword "Indonesia" appears as the leading used keyword in the abstract. The keyword "vaccine" is also a leading used keyword of course, it cannot be separated from the COVID-19 pandemic.

4.2. Analysis

4.2.1. Co-authorship Analysis

Figure 6: Author Network (500)

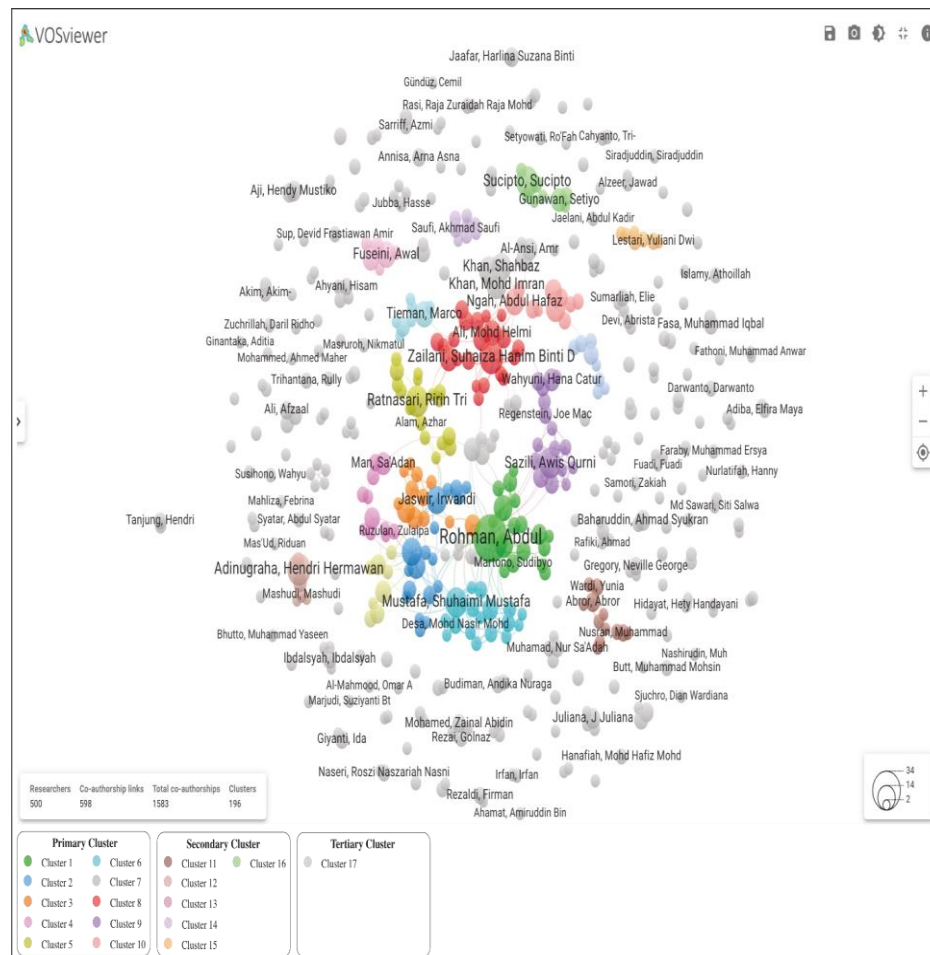


Table 6: Group of Leading Author in Primary Cluster

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Abdul Rohman	Mohammad Aizat Jamaludin	Yakoob Bin Che Man	Mohd Anuar Ramli	Mohd Mahyedin
Yuny Erwanto	Betania Kartika	Dzulkifly Mat Hashim	Zulaipa Ruzulan	Irwan Mohd Subri
Nina Salamah	Rashidi Bin Othman	Azmawani Abd. Rahman	Norhidayu Muhamad Zain	Nurdeng Deuraseh
Anjar Windarsih	Sahilah Abd Mutalib	Nitty Hirawati Kamarulzaman	Sa'adan Man	Setiyawan Gunardi
Nancy Dewi Yuliana	Nurina Anuar	Russly Abdul Rahman	Mohd Fauzi Bin Abu-Hussin	Suhaimi Ab Rahman
Cluster 6	Cluster 7	Cluster 8	Cluster 9	Cluster 10
Suhaimi Mustafa	N. Nurul Huda	Suhaiza Hanim Binti D Zailani	Hana Catur Wahyuni	Mohamed Shazwan Ab Talib
Uda Hashim	Arief Salleh Bin Rohman	Mohammad Iranmanesh	Adam Voak	Abdul Hafaz Ngah
Md. Eaqub Ali	Kuwat Triyana	Mohd Helmi Ali	Moch Khoirul Anwar	Johan Fischer
Nur Fadhilah Khairil Mokhtar	Noor Faizul Hadri Nordin	Mohamed Battour	Iwan Vanany	Too Ai Chin
Mohd. Hafis Yuswan	Riyanarto Sarno	Kim Hua Tan	Jan Mei Soon	Ramayah A L Thurasamy

Table 7: Group of Leading Author in Secondary and Tertiary Cluster

Cluster 11	Cluster 12	Cluster 13	Cluster 14	Cluster 15
Abror	Hendi Hermawan Adinuraha	Awal Fuseini	Handry Sudiarta Athar	Nono Wibisono
Yunia Wardi	Kuat Ismanto	John K M Lever	Hermanto	Hanudin Amin
Trisno Wardy Putra	Mashudi	Phil J Hadley	Dwi Putra Buana Sakti	Dwi Suhartanto
Syaakir Sofyan	Mila Sartika	Toby Grahame Knowles	Akhmad Saufi	Yuliani Dwi Lestari
Muhamad Nusrach	Warto	Steve B Wotton	Baiq Handayani Rinuastuti	Suddin B Lada
Cluster 16	Cluster 17			
Sucipto	Abdul Kadir Jaelani			
Retno Tri Astuti	Muhamad Cahyadi			
Luki Hidayati	Akhmad Kusuma Whardana			
Nur Hasanah	Carrie Amani Annabi			
Setiyo Gunawan	Moncef Nasri			

The co-authorship analysis investigates the interactions (network) among researchers within a particular field of research (Donthu et al., 2021). It's quite crucial to comprehend the interactions among scholars, and how the publication of one author affects or shapes the publication carried out by another author in the future.

Due to limited visualization capabilities that can be displayed, out of a total of 1,765 authors, only 500 authors are displayed on. **Figure 6.** contains relationships (networks) between authors. In total there are 195 individual and group clusters. Individual in this case is, an author has no association with other authors, while group in this case is when the author has a relationship with other authors. Of the total 195 clusters, it can be divided into 3 main clusters, namely: primary, secondary, and tertiary clusters. Primary cluster is the main cluster that forms a strong network between authors, there are at least 10 clusters that are included in the primary cluster (clusters 1-10). Secondary clusters are small clusters that are separate from the primary cluster. Authors in secondary clusters are

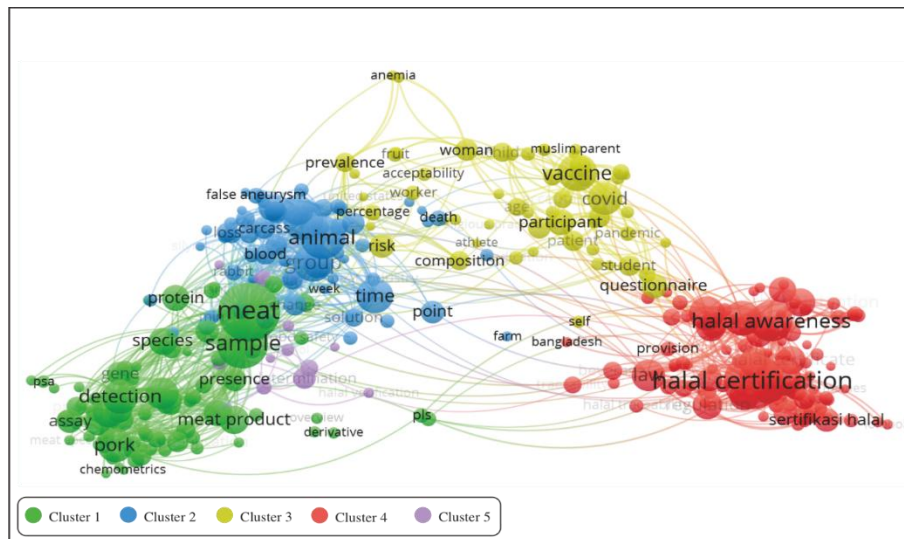
related to other authors but do not form strong relationships. There are 6 clusters in the secondary cluster (clusters 11-16). Unlike other clusters, tertiary clusters contain authors who are not related to other authors or can also be called as individual clusters.

Authors such as: Rohman Abdul, Suhaiza Hanim, Awis Qurni, Jaswir Irwandi, Ririn Tri, and Suhaimi Mustafa who are included in the primary cluster, have a role in shaping the publication trend of other authors. Because it is included in the primary cluster, the inter-cluster has a network that forms a large group. While the authors who are included in secondary clusters such as: Abror, Hendi Hermawan Adinuraha, Awal Fuseini, Handry Sudiarta Athar, Nono Wibisono, and Sucipto also have a role in forming new research clusters, but they are not related to another cluster.

Abdul Rohman's publication (primary cluster), is related to Anjar Windarsih in the same cluster and Yakoob Bin Che Man in a different cluster. The relationship between clusters is something distinguishes between primary and secondary clusters. Each cluster that is included in the secondary cluster, is not related to each other. For example, the publication of Abror (cluster 11), is not related to the publication of Hendi Hermawan Adinuraha, but only has a relationship with publications in the same cluster (Yunia Wardi, Trisno Wardy Putra, Syaakir Sofyan, and Muhamad Nusrah). Primary cluster can be interpreted that, the research carried out has two directions (vertical and horizontal), while secondary cluster only has one direction (vertical). For tertiary cluster, this cluster shows that the author has no connection to other authors. It can be seen that the authors included in tertiary cluster are quite large, this can be used as a note that researchers in the halal landscape need to conduct collaborative studies.

4.2.2. Co-word (occurrence) Analysis

Figure 6: Co-occurrence Network



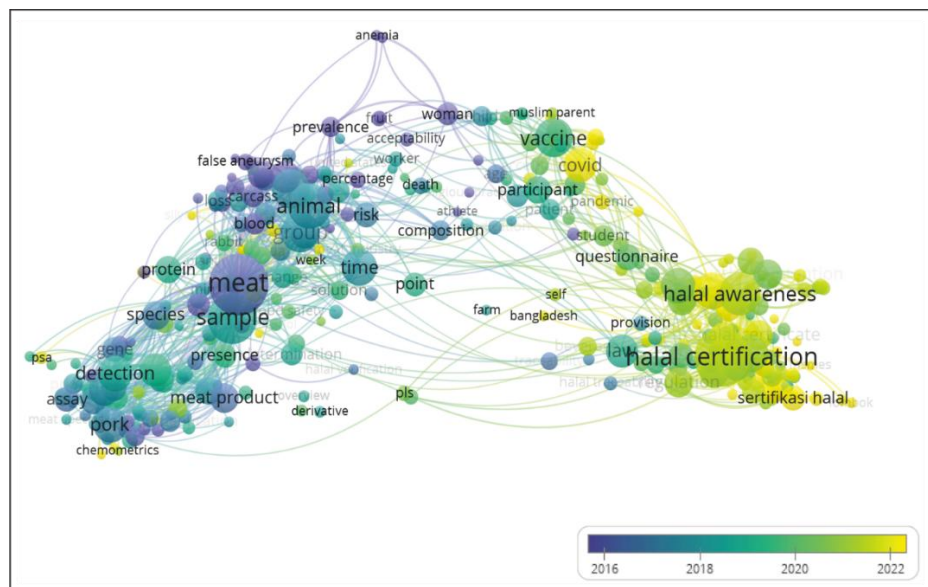
Source: Vosviewer, modified by author

Co-word (co-occurrence) analysis is a method that scrutinizes the specific content within a publication. The terms utilized in co-word analysis are frequently sourced from "author keywords." In cases where these are unavailable, significant terms can be extracted from "article titles," "abstracts," and "full texts" for further analysis (Donthu et al., 2021). In other words, co-word analysis is an analytical technique to see the relationship between one article and another, based on keywords that appear in "titles", "abstract", or "full text". Co-word analysis in this research, extracted keywords based on titles and abstracts from an article.

From **figure 6**, it can be seen that there are 5 clusters in halal-related articles. In the cluster 1, there are several keywords that have a very close relationship including: meat, sample, detection, etc. In cluster 2, the keywords that are quite dominant are "animal", "blood", and related

terms, indicating a focus on slaughtering and processing standards Cluster 3, influenced by the post-pandemic period (data up to 2023) include keywords related to "vaccine" and "COVID", forming a distinct cluster tied to health-related halal concerns.. In cluster 4, the dominant keywords are "halal awareness" and "halal certification", which signify a shift toward consumer behaviour and regulatory frameworks. Cluster 5 is a relatively small cluster, with no dominant keywords sufficient to indicate a clear research focus.

Figure 7: Co-occurrence Network (overlay visualization)



Source: Vosviewer, modified by author

Figure 7 provides an overlay visualization to examine trends in keyword usage over time, serving as a horizontal data analysis that compares the evolution of research topics across the study period (1994–2023). The lighter the color, the more recent the keyword, and vice versa. Over the last six years, keywords such as "meat," "blood," and "carcass" appeared earlier, reflecting foundational research in halal food production. In contrast, keywords like "halal certification," "halal awareness," and "COVID" emerged more recently, indicating a shift toward consumer-oriented and regulatory topics. This horizontal analysis reveals a clear

trend: while early halal research focused on technical aspects of food production (e.g., authentication and slaughtering), recent studies have prioritized consumer perceptions, certification processes, and health-related issues, particularly post-COVID-19. Emerging topics, such as "halal certification" and "halal awareness," suggest a growing emphasis on standardization and market-driven research, while the presence of "vaccine" highlights the influence of global health crises on halal discourse. These trends align with the broader evolution of the halal industry toward consumer-centric and regulatory frameworks (Wilson & Liu, 2010).

4.3 Significance of Findings

The bibliometric analysis conducted in this study provides critical insights into the evolution and structure of halal-related research over the past three decades, directly addressing the research questions posted. For RQ1, the identification of 22 distinct research clusters, with "Commerce, Management, Tourism, and Services" as the largest (3,78 publications), reveals the interdisciplinary nature of halal science and highlights the concentration of research in consumer-oriented sectors (see Fig. 3). This clustering pattern underscores historical trends, such as the dominance of marketing and religious studies, while significantly fewer publications (e.g., 125 for economics). For RQ2, the finding that marketing constitutes the largest topic (2,144 publications) reflects a mature research area but also suggests potential saturation, prompting the need to explore novel perspectives within this domain.

Regarding RQ3, the analysis of leading authors and countries (e.g., Indonesia and Malaysia as top contributors, with Abdul Rohman and Suhaiza Hanim as prominent authors) illustrates the geographic and intellectual centers of excellence in halal research (see Tables 3 and 4).

This not only maps the collaborative networks shaping the field but also highlights the need for increased collaboration, as many authors remain unconnected (tertiary cluster). For RQ4, the co-word analysis (Fig. 6 and Fig. 7) identifies emerging themes, such as “halal certification” and “halal awareness,” which have gained traction in recent years, alongside underexplored topics like economics and environmental sciences. These findings provide a roadmap for future research by pinpointing areas with high potential for novelty and impact.

The significance of this bibliometric analysis lies in its ability to synthesize large-scale publication and citation data to trace the trajectory of halal research and guide its future direction. By revealing past trend, such as the exponential growth in publications during 2014–2023 (95% of total publications), and identifying gaps, such as the limited focus on economics, this study informs researchers and policymakers about opportunities to diversify and deepen halal science. The descriptive tools employed publication counts, clustering, and co-authorship networks, thus serves as a foundation for understanding the intellectual landscape and fostering innovative research that addresses both established and emerging challenges in the halal industry (Donthu et. al., 2021).

4.4. Analysis by Decade

Dividing the analysis of halal-related research into three decades (1994–2003, 2004–2013, and 2014–2023) provides valuable insights into the evolution of the field, highlighting shifts in research focus, publication volume, and intellectual structure. In the first decade (1994–2003), with only 39 publications, research was narrowly focused on technical aspects of halal food production, such as meat authentication and compliance with Islamic slaughtering standards. The limited output reflects the nascent stage of halal science, with contributions primarily from Muslim-majority

countries like Malaysia, where early halal standards were developed (Wilson & Liu, 2010).

The second decade (2004–2013) saw a significant increase to 378 publications, driven by the globalization of the halal industry and growing academic interest. Topics expanded to include halal supply chain management, logistics, and initial explorations of halal certification, as evidenced by the emergence of keywords like "halal logistics" in co-word analysis (Tieman, 2011). This period marked the transition from purely technical research to operational and market-driven studies, laying the foundation for the interdisciplinary growth observed in the third decade.

The third decade (2014–2023) was characterized by an exponential increase in publications (8,982), reflecting the maturation of halal science. Topics like "halal certification," "halal awareness," and "vaccine" dominated, driven by consumer demand, regulatory developments, and global health crises (see Fig. 7). The cluster "Commerce, Management, Tourism, and Services" became the largest, with marketing as the leading topic (2,144 publications), indicating a shift toward consumer-oriented research (see Fig. 3). However, the decline in 2023 suggests potential saturation in dominant topics, highlighting the need to explore underexplored areas like economics and sustainability.

Analyzing the data by decade reveals distinct phases in the development of halal research: an initial phase of technical groundwork (1994–2003), a transitional phase of operational expansion (2004–2013), and a mature phase of consumer-driven and regulatory focus (2014–2023). This approach adds value by identifying critical turning points, such as the rapid growth in the third decade, and highlighting underexplored areas that emerged over time, such as economics (only 125 publications). It also underscores the evolving interdisciplinary nature of halal science,

informing researchers about opportunities to build on early foundational work while addressing contemporary challenges (Donthu et al., 2021).

5. Conclusion

5.1. Conclusion

The purpose of this research is to conduct science mapping on halal-related research. By definition science mapping is a visual depiction illustrating the spatial connections between disciplines, fields, specialties, and individual publication or authors. So this research shows how trends, topics, connections and interconnections between researchers in the halal landscape. In terms of trends, halal-related research has continued to increase in the last three decades (1994-2023). The most significant increase occurred in the third decade (2014-2023), where about 95% of the total article publications were generated in this decade. 2022 has been a very productive year in the last 30 years, with the highest publication achievement of 1,942 articles.. However, a slight decline to 1,867 articles in 2023 suggest potential saturation in certain topics, such as marketing and religious studies, necessitating exploration of underexplored areas.

Horizontal data analysis, particularly through co-word analysis and overlay visualization (Fig. 7), reveals a shift from early technical topics (e.g., "meat," "blood") to recent consumer-oriented and regulatory themes (e.g., "halal certification," "halal awareness"). Emerging topics like sustainability and technology-driven certification (e.g., blockchain) offer significant potential for future research. The analysis also highlights underexplored disciplines, such as economics (125 articles) and environmental sciences, which present opportunities for interdisciplinary studies.

This research contributes to the existing literature on bibliometric analysis in several ways. First, unlike prior bibliometric studies that focus on Islamic finance subfields like banking (Biancone et al., 2020), microfinance (Hassan et al., 2021), or social finance (Ismail et al., 2022), this study is the first to comprehensively map the intellectual structure of halal science, a relatively underexplored interdisciplinary field. Second, by analyzing a large dataset of 9,399 articles from the Dimensions database, this study provides a more extensive scope than previous analyses, which often rely on smaller datasets from Scopus or Web of Science (e.g., 7,662 articles in Biancone et al. (2020)). Finally, the use of advanced bibliometric techniques, such as co-word analysis and overlay visualization, ensures methodological rigor comparable to studies in finance and management.

This research addresses the following research questions:

- RQ1: In clusters, there are at least 22 clusters in halal-related publications, encompassing social and natural sciences (see Fig. 3).
- RQ2: The "Commerce, Management, Tourism, and Services" cluster has the largest portion (3,378 publications), with "marketing" as the dominant topic (2,144 publications).
- RQ3: Indonesia and Malaysia are the top contributors, with Abdul Rohman (53 articles) and Suhaiza Hanim (25 articles) as leading authors, though citation quality varies.
- RQ4: Recent topics like "halal certification" and "halal awareness" are prominent, while underexplored areas like economics and sustainability present opportunities for future research.

5.2. Recommendation

Based on the research findings, several recommendations were prepared as follows:

- Conduct halal-related research in underexplored clusters, such as economics, biological sciences, chemical sciences, and environmental sciences, to diversify the field.
- Shift focus from saturated clusters like "Commerce, Management, Tourism, and Services" to maintain productivity and quality, leveraging emerging topics like "halal certification" and "halal awareness."
- Explore emerging topics identified in the horizontal analysis, such as sustainability in halal supply chains or technology-driven certification processes (e.g., blockchain), to address market and regulatory demands.
- Improve the quality of Indonesian publications, as their citation rates are relatively low, potentially through enhanced research rigor and international collaboration.
- Foster collaborative research to connect unlinked authors, as seen in tertiary clusters, to strengthen the global halal research network.
- Encourage future bibliometric studies to build on this research by integrating multiple databases (e.g., Scopus, Web of Science) and exploring niche areas within halal science, such as halal tourism or biotechnology.

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