

HALALSPHERE

International Islamic University Malaysia - INHART



Halal Certification: A Bibliometric Analysis (2004 - 2021)

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Received: 5/1/22
Accepted: 22/1/22
Published: 31/7/22

Keywords:

Halal certification; bibliometrics; biblioshiny, R-studio, Halal certifying bodies

Abstract

Halal industry has grown exponentially despite the global disruptions caused by the COVID-19 pandemic and subsequent restrictions. Muslim spending is forecasted to grow at a 5-year Cumulative Annual Growth Rate (CAGR) of 3.1% and reach USD2.4 trillion by 2024. However, issues surrounding *Halal* certification have persistently created problems for *Halal* industry stakeholders. This article aims to provide a holistic overview of *Halal* certification research carried out across the globe between 2004 – 2021 by employing bibliometric analysis to review 248 journal articles. Based on the data, the annual publication trends, author contribution, number of citations, the contribution of countries, trending scientific journals, and an overview of the co-occurrence of author keywords and historiography were obtained. The results will contribute critically towards identifying relevant future research aspects and gaps that need to be undertaken so that it can address concerns troubling *Halal* consumers, industry players, and administrators of *Halal* certification.

1. Introduction

Halal and haram are core Muslim issues affecting individuals and societal well-being. Apart from the religious value attached, an increase in demand for *Halal* products, especially food, arises from the universal guidelines in Islam that emphasizes preserving life and health, preserving lineage, and maintaining self-respect and integrity (Nurdeng, 2009). Muslims are only allowed to consume *Halal* foods and reject haram ones (Al-Qaradawi, 2007). *Halal* (permissible) and *Toyyib* (wholesome, clean, and nourishing) cover everything, from raw material sourcing to the distribution of end products, up to delivery to consumers, and are associated with ethical financial transactions (Che Man & Sazili, 2010). Producers follow Sharia guidelines to assure consumers of the state of *Halal* integrity and obtain *Halal* certification from *Halal* certifying bodies (HCB).

Halal certification first emerged during the mid '60s in the United States of America (USA) and not in a Muslim country. However, 90% of the food supply chain sectors, including farming, manufacturing, restaurants, and retailing, are managed or owned by non-Muslim businesses and countries (Tieman, 2015). Henceforth, *Halal* certification bodies were established to ensure that food products comply with the *Halal* standards (Latif et al., 2014).

The fast-growing Muslim population, representing 26% of the global population in 2020 and forecasted to reach 2.2 billion in 2030 (GIER 2019/2020), consists mainly of affluent and digital savvy Muslims that are keen to embrace the consumer market whilst having a firm adherence to Islamic ethical values (Özlem Sandikci, 2011). Pew Research Centre showed that the fastest-growing religion in the world is Islam and that by 2050, adherents of Islam will reach 30% of the global population. This situation has necessitated Muslim countries to import *Halal* products from developed countries or Muslim minority countries. Interestingly, non-Muslims are also attracted to purchasing *Halal* products as *Halal* products and production activities encapsulate responsible consumerism and promote a green economy (Mohamed et al., 2013; Aoun and Tournois, 2015). *Halal* is a trademark for quality affirmation and often holds more significant value than Good Manufacturing Practices (GMP) or Hazard Analysis of Critical Control Points (HACCP) certification. Now, the *Halal* label is part of brand equity, and *Halal* certification has become a formidable tool.

Demand for *Halal* products by the rising population of Muslims has led to the intensification of *Halal* certification services globally, in Muslim and non-Muslim nations. The need for *Halal* certification has become increasingly evident partly due to the greater liberalization of international economies and globalization brought about by 4.0IR technology. With a *Halal* market worth USD2.3 trillion, of which USD1.3 trillion is spent on food and beverage, the number of HCBs is seemingly inadequate (GIER 2020/2021). Producers not only

need to implement a rigorous *Halal* assurance system to ensure *Halal* integrity, but they also need to navigate the intricacies of differing *Halal* export standards and policies imposed by importing countries. The inconsistencies of *Halal* regulations experienced within the regulatory environment, attributed to lack of information and transparency, inordinately exposing companies to immense risks and their accessibility to lucrative *Halal* markets.

Though there are many literature reviews on studies about *Halal* food, a glance showed that studies on *Halal* certification were very few and far between. Thus, it stands to reason that more research needs to be conducted on *Halal* certification to understand further the fields of *Halal* certification that have been studied, who, where, and what was the outcome of the studies. Employing bibliometric methods would assist in documenting the published research on *Halal* certification. Researchers can fill the missing jigsaw pieces in *Halal* certification research, and the generated information could consequently meet the requirements of *Halal* products and services proponents. This will ultimately ensure the sustainability of the *Halal* industry.

This article sets out to provide a universal overview of *Halal* certification research carried out across the globe from 2004 to 2021 by utilising the bibliometric analysis to reveal the publication trends on *Halal* certification by employing biblioshiny and VOS Viewer and offering graphical illustrations. Biblioshiny is an open-source web interface of the 'bibliometrics 3.0' package of R-studio. This research approach was preferred as it quantitatively provides a systematic study of written publications. The bibliometric analysis produces a transparent, systematic, and reproducible evaluation process that enhances the literature review quality (Aria & Cuccurullo, 2017). Necessary research from various fields can then be visually presented with due diligence and devoid of prejudice in a comprehensive manner (Ellegaard, 2015).

The objective of this research, as mentioned, is to provide a bibliometric review of the literature on *Halal* certification in social sciences, which can then be used to improve *Halal* certification processes, assure *Halal* integrity and ease international trade transactions of *Halal* products. This can be achieved by analysing the literature to: detect the publication trends (publication trend and annual publication), identify the most abundant source (top authors, top countries, top journals), and ascertain the theme of previous studies (frequently used author keywords, co-occurrence of author keywords, network analysis). Obtaining the general themes and research streams can act as a reference point and steer policymakers, academicians, and researchers in the direction of future research and find solutions to prevailing problems such as *Halal* certification compliance and *Halal* standards harmonisation.

2. Materials and methods

This section discusses the method utilised to assess the current state of the *Halal* certification research. This research is a content analysis of identified articles from the online database SCOPUS, in which the data collection consists of the frequency of occurrence of words. Using bibliometric software, co-citation analysis, bibliographic coupling, and keyword co-occurrence were conducted. This will enable the identification

of co-occurrence patterns within the *Halal* certification research field and the strength of associations between each term based on their co-occurrence in the dataset (He, 1999). Thus, content analysis will enable visualisation of the past and current and can potentially forecast future research direction.

Figure 1 outlines the bibliometric workflow suggested by Zupic and Cater (2015), which consists of five steps. It starts with a scheme of study by defining the research question, followed by identifying articles that will act as the essential foundation for the structure of the study through the application of a systematic literature review procedure. Next, data obtained from the systematic literature review by accessing articles from the online database SCOPUS was further processed using bibliometric analysis for a descriptive analysis of documents. The bibliometric analysis employed 'biblioshiny,' a web-specific R package ('bibliometrics 3.0'), and VOS Viewer. 'Biblioshiny' then converted the results into various tables and graphical forms during the following step. Finally, findings were synthesised and interpreted to discover the potential research that still needs to be conducted in the future.

2.1 Workflow of bibliometric analysis

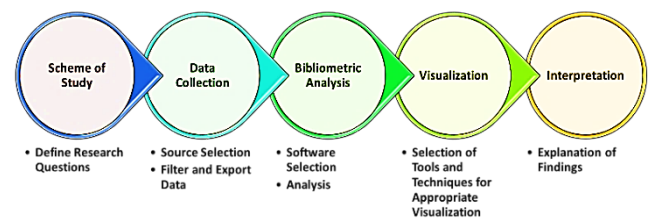


Figure 1: Workflow of bibliometrics analysis

This study seeks to analyse the existing literature on *Halal* certification, its implications to stakeholders, and recommendations for future research through the following questions:

- i. Trends in publication
 - (a) What are the publication trends?
 - (b) What is the number of annual publications?
- ii. Most productive
 - (a) Who are the most productive authors?
 - (b) Which are the most cited articles?
 - (c) Which are the most productive countries?
 - (d) Which are the most trending scientific journals?
- iii. Theme
 - (a) What is the most frequently used keyword and trend?
 - (b) Is there a co-occurrence of keywords and areas of research?
 - (c) What are the areas of focus and development of the research theme?

2.2 Search strategy for data collection

Figure 2 outlines the systematic literature review process divided into three phases, beginning with step one, where authors identify the topic *Halal* certification, the scope to be covered, and formulate the keywords and search string. Data were then extracted and underwent the process of screening. Screening involves the inclusion and exclusion of articles based

on predetermined criteria to ensure eligibility. The next phase involves appraisal of the quality of articles to be reviewed, after which data was extracted and assessed, and lastly, how these extracted data were analysed, validated, and included for bibliometric analysis.

The bibliographic literature resource base SCOPUS was chosen, as results from this search engine are relatively stable and facilitate the generation of a list of journal articles which are then reviewed for eligibility, exclusion, and data extraction and analysis. Advantages of using the Scopus database include the development of an entire search string (based on Boolean operator, phrase searching, truncation, wild card, and field code functions) and permits for advanced searching and comprehensive coverage. With 69 million records, Scopus, Elsevier's abstract and citation database, covers an estimated 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields (life sciences, social sciences, physical sciences, and health sciences). In addition, all journals covered in its database are reviewed annually to maintain high quality standard assurance.

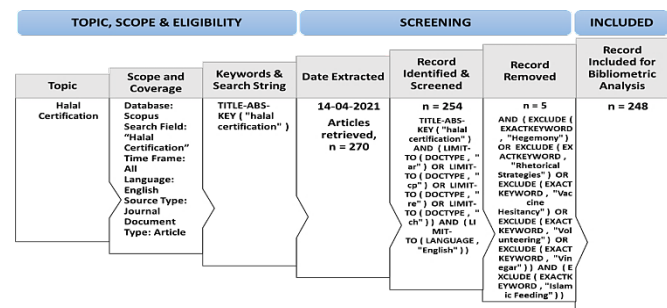


Figure 2: The systematic literature review process
Source: Adapted from Zakaria et al. (2020)

The search string used was: TITLE-ABS-KEY ("Halal certification") AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ch")) AND (LIMIT-TO (LANGUAGE , "English")) AND (EXCLUDE (EXACTKEYWORD , "Hegemony") OR EXCLUDE (EXACTKEYWORD , "Rhetorical Strategies") OR EXCLUDE (EXACTKEYWORD , "Vaccine Hesitancy") OR EXCLUDE (EXACTKEYWORD , "Volunteering") OR EXCLUDE (EXACTKEYWORD , "Vinegar") OR EXCLUDE (EXACTKEYWORD , "Islamic Feeding")). The search string was limited to "Halal certification" without any wild card of any word alternative wordings as this term is particular. Even the word 'Halalfication' and 'compliance' does not carry the same meaning. Halal 'compliance' or 'Halalfication' means that the management system adheres to the requirements of the Halal standard, while 'Halal certification' means that the management system has been certified, by a recognised Halal certification body, to be in conformance with all the requirements of the Halal standard.

The search was confined to literature published between 2004 – 2021 as any earlier date was deemed irrelevant as research on Halal had only just started earnestly, and the term "Halal certification" only began to appear regularly as of 2004, while the search string 'Halal certification' initially yielded 270 articles. The author decided to limit the search query to articles in English and exclude conference reviews. Using only the

English language provides a more efficient bibliometric analysis as it enables the application of tools to compare keywords, article sources, affiliations, and others. Furthermore, the author had to manually scrutinise all the articles to ensure that only articles that concur with the study objectives were included. Eventually, the final sample resulted in 248 articles comprising journal articles (185), conference proceedings (38), reviews (17), and book chapters (8). In this study, we excluded conference reviews but included other document types, as this is a new area of research that has attracted much attention due to the exponential growth of the Halal industry even in the face of the COVID-19 pandemic. The extracted bibliography data contains citation information, bibliographic information, abstract and keywords, and references for every 248 articles.

3. Bibliometric analysis and visualisation

In 1987, Broadus referred to bibliometric analysis as a literature review methodology that analyses published studies by applying statistical and mathematical tools to books and media communications. Currently, a scientific field can be mapped through co-citation analysis, bibliographic coupling, keyword co-occurrence, and other techniques (Zupic & Čater, 2015) with the application of bibliometric methods and software and tools such as VOS Viewer (Van Eck & Waltman 2009) and Bibliometrics (Aria & Cuccurullo 2017). 'Biblioshiny' is the tool under the package and provides means for complete scientometric and bibliometric analysis in the shape of tables and graphs, and thus ideal for use by non-coders (Moral-Muñoz, 2020).

3.1 Main information

Table 1 shows the general information on collecting selected articles taken from the 'bibliometrics' tool. According to SCOPUS, the first research on Halal certification began in 2004, which indicates that this is a relatively new research domain. The total number of documents studied in this research was 248, where 185 were journal articles, 8 from book chapters, 39 from conference proceedings, and 17 were review papers between 2004 – 2021. A total of 563 keywords plus and 705 author keywords were registered from the documents that involved a total of 662 authors. Of which single-authored documents were 30, suggesting a high collaboration between authors, with a document per author ratio n= 0.375; on average, three authors wrote one document.

3.2 Trends in publication

3.2.1 Annual publication trends

The graph of the annual publication trends indicated that research in this field started very slowly and only began in earnest in 2012 and doubled from 2017, peaking in 2020. The dip seen in 2021 is aberrant since the data extracted was from April 2021. Figure 2 showed that the rise in published articles on the topic had been rising steadily from 2014, signifying the increasing academic interest and popularity level. The growth in the annual publication could also be attributed to the greater attention given to Halal certification by stakeholders, including industry players, researchers, and academicians, as Halal certification is a symbol of Halal integrity and is required by importing countries to satisfy consumers' demand.

Table 1: Primary information regarding selected articles (Date extracted 14 April 2021)

Description	Results	Description	Results
MAIN INFORMATION ABOUT DATA		DOCUMENT CONTENTS	
Timespan	2004:2021	Keywords Plus (ID)	563
Sources (Journals, Books, etc.)	129	Author's Keywords (DE)	705
Documents	248	AUTHORS	
Average years from publication	4.04	Timespan	2004:2021
Average citations per document	8.819	Authors	662
Average citations per year per doc	1.381	Author Appearances	792
References	8823	Authors of single-authored documents	30
DOCUMENT TYPES		Authors of multi-authored documents	632
Article	185	AUTHORS COLLABORATION	
Book Chapter	8	Single-authored documents	33
Conference Paper	39	Documents per Author	0.375
Note	4	Authors per Document	2.67
Review	17	Co-Authors per Documents	3.21
		Collaboration Index	2.93

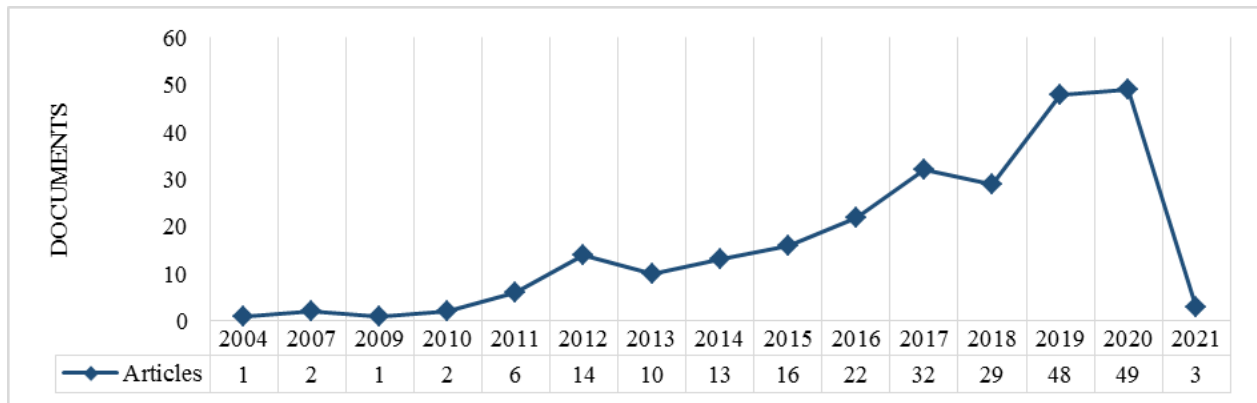


Figure 2: Annual publication trends

3.2.2 Annual publication trends

Figure 2 demonstrates that annual publications related to *Halal* certification only yielded 1 – 2 per year between 2004 – 2010, with 2011 having the highest annual publication of 6. The annual publication grew steadily from 2011 and peaked in 2017 with 32 publications. Then it dipped slightly to 29 publications in 2018 but picked up 48 publications in 2019 and 49 in 2020.

3.3 Most productive

3.3.1 Most relevant authors and most number of citations

Table 2 lists the most relevant authors, with Noordin, and Zailani, each publishing 5 articles, followed by authors Ab Talib, Ismail, Saifudin, and Suhaimi, who produced 4 articles each, while the other authors wrote 3 articles each. However, Table 2b shows that the most cited article was written by Aziz (2013) in the Journal of International Food of Agribusiness and Marketing with 132 citations, Che Man (2007) in Journal of Food Control with 101 citations, and Lever (2012) in Journal of Rural Studies had 100 citations. Fascinatingly, the latter results indicate that the most relevant authors with the highest citation do not mirror one another (Table 3).

The top categorised most relevant authors, Zailani (2017) wrote on “*Halal* Logistics Opportunities and Challenges” published in the Journal of Islamic Marketing (JIM), and Noordin (2009) with article “Value Chain of *Halal* Certification: A Case of the Malaysia Industry” published in the European and Mediterranean Conference on Information Systems. These two articles focus on the *Halal* supply chain and maintaining *Halal* integrity throughout the supply chain framework.

The first ranked cited article was written by Aziz (2013), who studied “The Role of *Halal* Awareness, *Halal* Certification, and Marketing Components in Determining *Halal* Purchase Intention Among Non-Muslims in Malaysia: A Structural Equation Modelling Approach” and published in International Food Agribusiness and Marketing. The article revolved around understanding *Halal* purchase intention among non-Muslims in Malaysia and the role of the variables such as *Halal* awareness, *Halal* certification, and marketing components on the intention of these consumers to purchase *Halal* products. The study by Che Man (2007) was second on the list and published in Food Journal, is in all probability highly referred by researchers interested in food biotech and pork derivatives

Table 2: Top 20 most relevant author

Authors	Articles	Articles Fractionalised	Authors	Articles	Articles Fractionalized
Zailani S	5	1.05	Ghazali MA	3	0.69
Noordin N	5	1.37	Hall CM	3	1.00
Ab Talib MS	4	2.08	Isa WARWM	3	0.60
Ismail RM	4	1.45	Marzuki SZS	3	1.00
Saifudin AM	4	1.03	Mohamed Z	3	0.54
Suhaimi AIH	4	0.80	Noor NLM	3	0.73
Bahron A	3	1.00	Othman B	3	1.00
Ballantine PW	3	1.00	Riaz MN	3	2.00
Fernando Y	3	0.92	Sharifuddin J	3	0.54
Fuseini A	3	1.58	Sulaiman MZM	3	0.60

Table 3: 10 Most global cited documents

Author/Year	Title	Journal	Total Citations	TC Per Year	Normalised TC
Aziz YA, 2013	The Role of <i>Halal</i> Awareness, <i>Halal</i> Certification, and Marketing Components in Determining <i>Halal</i> Purchase Intention Among Non-Muslims in Malaysia: A Structural Equation Modeling Approach	J International Food Agribusiness & Marketing	132	14.6667	5.1163
Che Man YB, 2007	Identification of Pork Derivatives in Food Products By Species-Specific Polymerase Chain Reaction (PCR) for <i>Halal</i> Verification	Food Control	101	6.7333	1.9057
Lever J, 2012	The Growth of <i>Halal</i> Meat Markets in Europe: An Exploration of the Supply Side Theory of Religion	J Rural Studies	100	10	3.3019
Marzuki SZS, 2012	Restaurant Manager and <i>Halal</i> Certification in Malaysia	J Islamic Marketing	79	7.9	2.6085
Rajagopal S, 2011	<i>Halal</i> Certification: Implication for Marketers In UAE	J Islamic Marketing	75	6.8182	2.2727
Ireland J, 2011	UAE Consumer Concerns About <i>Halal</i> Products	J Islamic Marketing	64	5.8182	1.9394
Latif IA, 2014	A Comparative Analysis of Global <i>Halal</i> Certification Requirements	J Food Product Marketing	60	7.5	4.6429
Soon JM, 2017	<i>Halal</i> Integrity in the Food Supply Chain	British Food Journal	53	10.6	5.4359
Zailani S, 2017	<i>Halal</i> Logistics Opportunities and Challenges	J Islamic Marketing	42	8.4	4.3077
Ismaeel M, 2012	Toward Applied Islamic Business Ethics: Responsible <i>Halal</i> Business	J Management Development	42	4.2	1.3868

in the production of *Halal* processed food. While the third most cited article by Lever (2012) was a study on “The Growth of *Halal* Meat Markets in Europe: An Exploration of the Supply Side Theory of Religion.” The study investigates the differences in *Halal* certification and standards applied by different EU nations due to the influence of the different regional schools of Islamic jurisprudence.

Meanwhile, Marzuki (2012), in his article, declared that Malaysia’s restaurant managers have high expectations of *Halal* certification and view it as a critical aspect in the foodservice industry since it signifies attributes such as trust, safety, and hygiene. The paper by Rajagopal (2011) suggests that consumers in the United Arab Emirates (UAE) lack awareness about *Halal* certification and *Halal* brands; hence

marketers should put more effort into promoting and branding *Halal* to increase sales of *Halal* products and services. Meanwhile, findings by Ireland (2011) indicated that consumers in UAE, an Islamic country, are concerned about the *Halal* status of products, their desire for assurance of *Halal* integrity, and their general distrust of the UAE *Halal* ecosystem.

International Journal of Supply Chain Management has an IF of 4.75 published articles on issues in the field of supply chain management. The third ranked is the Malaysian Journal of Consumer and Family Economics (IF0.15), followed by the British Food Journal (IF2.102).

Table 4: Most relevant source

Sources	Articles	Sources	Articles
Journal of Islamic Marketing	45	International Journal of Business and Society	3
International Journal of Supply Chain Management	16	International Journal of Civil Engineering and Technology	3
Malaysian Journal of Consumer and Family Economics	9	International Journal of Innovation Creativity and Change	3
British Food Journal	8	IOP Conference Series: Materials Science and Engineering	3
Asian Social Science	5	Journal of Critical Reviews	3
IOP Conference Series: Earth and Environmental Science	4	Journal of International Food and Agribusiness Marketing	3
World Applied Sciences Journal	4	ACM International Conference Proceeding Series	2
Advanced Science Letters	3	Agriculture and Human Values	2
Food Control	3	AIP Conference Proceedings	2
International Food Research Journal	3	Asia Pacific Journal of Marketing and Logistics	2

3.3.2 Most productive countries

Looking Figure 3, generated by VOS Viewer, the most productive countries in researching *Halal* certification are Malaysia (249), followed by Indonesia (79), Pakistan, the United Kingdom (UK), and the United States of America (USA) (13), Japan (11), Australia (10) and the other nations had single-digit publication. Malaysia has long been respected as a leader in the field of *Halal* and was the first country to publish *Halal* standards and gained world recognition from Codex Alimentarius Commission. The latter adopted the Codex general guidelines outlined by Malaysia to use the term “*Halal*.” Having been the champion of *Halal* since the early ’70s, it is also at the forefront of *Halal* research. However, in recent years Indonesia has been catching up, and emphasis given to research on *Halal* certification can also be seen in countries like Pakistan, UK, USA, Japan, Australia, and South Korea; the last 5 countries are non-Muslim countries. Conceivably the interest from these countries is attributed to the increase in trans-border *Halal* trade between non-Muslim countries as suppliers to Muslim countries, especially in terms of *Halal* food.

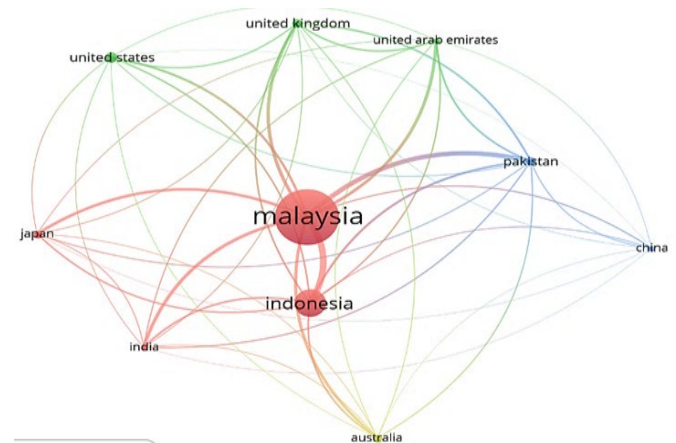


Figure 3: Most productive countries

3.3.3 Most trending scientific journals

Table 4 lists the most relevant source for *Halal* certification, starting with the most publication originating from the Journal of Islamic Marketing (JIMA), 45 articles, International Journal of Supply Chain Management (IJSCM), 16 articles, Malaysia Journal of Consumer and Family Economics 9 articles, British Food Journal 8 articles, and Asian Social Science 5 articles.

The journal impact factor (IF) measures the number of times an average paper in a journal is cited during a year; hence the more significant the IF number the better the journal is at getting its articles viewed, read, and cited. Launched in 2010, JIMA has a journal impact factor (IF) of 3.278, covering broad research fields related to Islamic marketing, while the

3.4 Theme

3.4.1 Most frequently used author keywords and trend

Keywords indicate the author’s opinion of the three to five most important words that they feel embody the contents of their articles (Li, 2009). Collectively, it highlights which research topics in a field are popular or less popular, and analysis can potentially detect trending research topics both currently and in the past.

Table 5: Most frequent author keywords

Words	Occurrences	Words	Occurrences
Halal certification	73	Halal tourism	8
Halal	55	consumer behaviour	7
Malaysia	20	food safety	7
Halal food	19	Halal product	7
Islam	12	Halal awareness	6
Halal industry	11	Islamic marketing	6
certification	9	animal welfare	5
Muslim consumers	9	Halal assurance system	5
Halal market	9	religion	5
Halal logistics	8	attitude	4

Results for the most frequent words from R-Studio Bibliometric analysis are listed in Table 5. Generated by VOS Viewer, Figure 4 visualises the co-occurrence. According to the list in Table 5, the most frequent word used concerning the topic of this study is appropriate: *Halal certification* (73), *Halal* (55), *Malaysia* (20), *Halal food* (19), *Islam* (12), *Halal industry* (11) certification, *Halal market* (9) and *Muslim consumers* (9), *Halal logistics* and *tourism* (8) each, *consumer behaviour*, *food safety*, *Halal product* (7) each, *Halal awareness*, *Islamic marketing* (6) each, *animal welfare*, *Halal assurance system* and *religion* (5) each and *attitude* (4).

The author keyword ‘*Halal certification*’ followed by ‘*Halal*’ is central to this bibliometric study, while the third most frequent word is ‘*Malaysia*.’ ‘*Malaysia*’ is recognised as the leader in ‘*Halal certification*’ and thus, naturally, most of the articles were carried out in Malaysia and on Malaysian consumers. The next most frequent author keyword is ‘*Halal food*,’ which remains the main thrust of much research as it is a mandatory dietary obligation for adherents of ‘*Islam*.’

The keywords ‘*certification*’, ‘*Muslim consumers*’ and ‘*Halal market*’ are connected, demonstrating that studies delved into how Muslim consumers, making up the primary *Halal* market, are concerned about the robustness of the ‘*certification*’ system and ‘*Halal certification*’ ecosystem. All these keywords are linked and address many issues regarding *Halal certification*. It also highlights the importance ‘*Muslim consumers*’ place on *Halal integrity* and how it influences their trust and dictates their ‘*behaviour*’ towards *Halal products*. Other articles on ‘*Halal logistics*’ and ‘*Halal tourism*’ indicate that consumers, both Muslims, and non-Muslims, pay special attention to maintaining *Halal integrity* throughout the supply chain. Some studies linked *Halal slaughtering* and processing, emphasising ‘*animal welfare*.’

Figure 5a shows authors’ keyword growth, generated by R-Studio Bibliometric analysis, starting from 2007 to 2021. Bearing that most *Halal* certification research stems from Malaysia, the research in this field is seen to steadily increase from 2011 when the *Halal* logo used by Malaysia was standardised, the Manual Procedure for Malaysia *Halal Certification* was published in English, and the *Halal Assurance System* added to it. In 2014 and 2019, new standards were introduced for another *Halal* business sector.

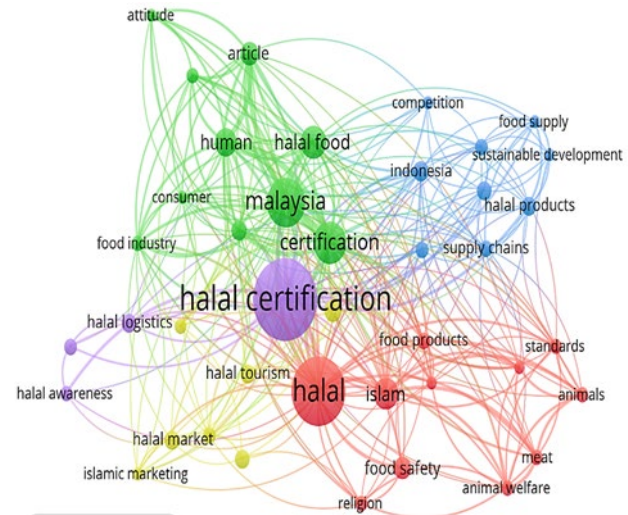


Figure 4: Most frequent author keywords (VOS viewer)

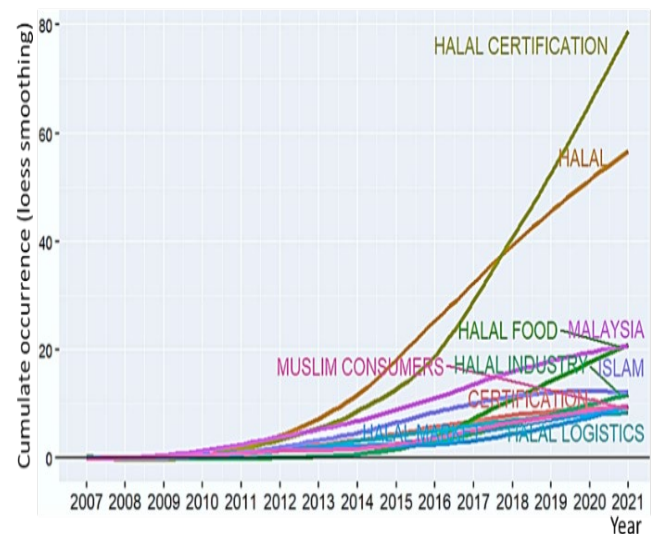


Figure 5a: Authors keyword growth (biblioshiny)

Figure 5b is an overlay visualisation of the co-occurrence of author keywords generated by the VOS viewer. Here it identified the trend of research shifting from *Islam* (2015) to *Halal* (mid 2016), then *Halal certification* (mid 2017) and *Halal food* (2018). Both figures 5a and 5b indicated that the term ‘*Halal certification*’ is growing exponentially in tandem with the word ‘*Halal*,’ but the word *Malaysia* and ‘*Halal food*’ is growing at a slower rate. Research on ‘*Muslim consumers*,’ ‘*Halal market*,’ and ‘*Halal logistics*’ are gaining traction, but the term ‘*Islam*’ seems to have tapered. The pronounced shift of research towards *Halal certification* could be attributed to

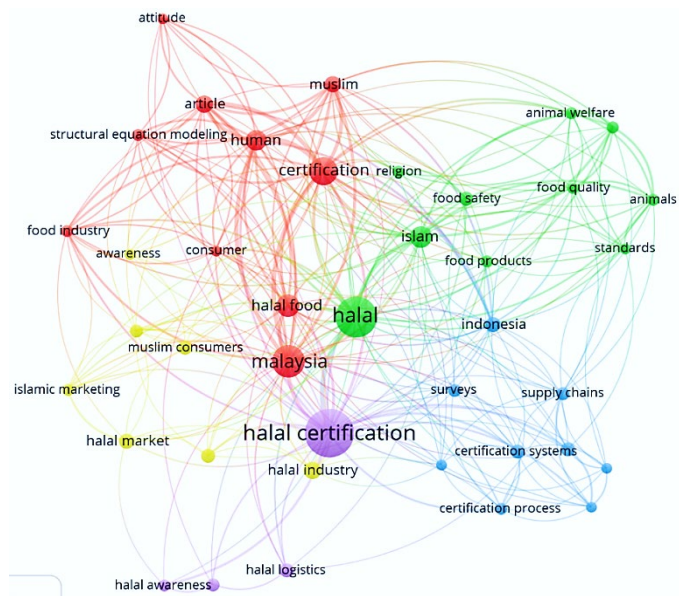


Figure 6: Co-occurrence of all keywords

the recognition of *Halal* certification as an alternative benchmark for safety, hygiene, and quality assurance by the international community.

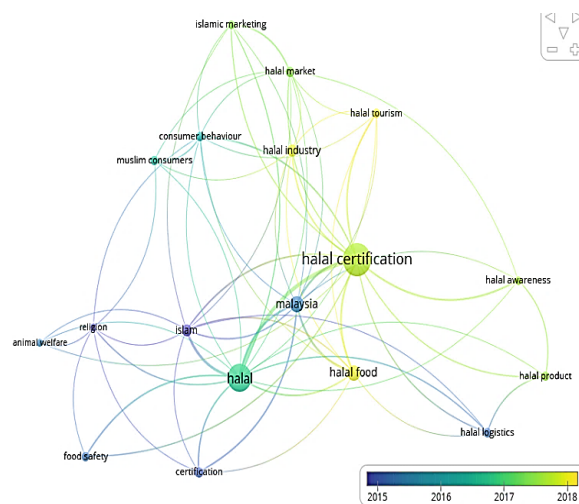


Figure 5b: Co-occurrence and trend of all keywords (VOS viewer)

Figure 5b is an overlay visualisation of the co-occurrence of author keywords generated by the VOS viewer. Here it identified the trend of research shifting from Islam (2015) to *Halal* (mid 2016), then *Halal* certification (mid 2017) and *Halal* food (2018). Both figures 5a and 5b indicated that the term '*Halal* certification' is growing exponentially in tandem with the word '*Halal*,' but the word Malaysia and '*Halal* food' is growing at a slower rate. Research on 'Muslim consumers,' '*Halal* market,' and '*Halal* logistics' are gaining traction, but the term 'Islam' seems to have tapered. The pronounced shift of research towards *Halal* certification could be attributed to the recognition of *Halal* certification as an alternative benchmark for safety, hygiene, and quality assurance by the international community

Table 6: Co-occurrence of all keywords

Cluster	Keyword	Cluster	Keyword
1 RED (10 items)	Malaysia	3 BLUE (9 items)	Indonesia
	certification		certification systems
	<i>Halal</i> food		supply chains
	human		surveys
	Muslim		<i>Halal</i> products
	food industry		certification process
	attitude		competition
	article		food supply
	consumer		sustainable development
	structural equation modelling	4 YELLOW (7 items)	<i>Halal</i> industry
2 GREEN (10 items)	<i>Halal</i>		consumer behaviour
	Islam		awareness
	food safety		<i>Halal</i> market
	food products		<i>Halal</i> tourism
	food quality		Islamic marketing
	animal welfare		Muslim consumers
	animals	<i>Halal</i> certification	
standards	<i>Halal</i> logistics		
religion	5 PURPLE (4 items)	<i>Halal</i> products	
meat		<i>Halal</i> awareness	

3.4.2 Most frequently used author keywords and trend

Figure 6 shows the co-occurrence network of all keywords extracted from VOS Viewer, while table 6 shows clusters generated from R-Studio bibliometric analysis. The network of keywords shows that '*Halal* certification' literature in social sciences can be divided into five clusters. A purple cluster consists of four items, *Halal* certification, logistics, products, and awareness; though the central cluster with high centrality, the term *Halal*, represented by the green cluster, has the highest centrality. The purple cluster, cluster 5, is represented by the largest circle, '*Halal* certification,' and remains the research major focus and studied in connection to *Halal* logistics, *Halal* products, and *Halal* awareness and has 74 occurrences. The next largest circle with the highest centrality is the research stream '*Halal*,' cluster 2, with 9 other sub-themes and 55 occurrences. '*Halal*' is the general research theme and is one of the earlier research themes that started sometime in late 2016 compared to '*Halal* certification,' which began in earnest in mid-2017 (Figure 2). '*Halal*' is strongly linked to Islam as, after all, *Halal* is part of Islam and mandatory for Muslims. Cluster 1 centres on research conducted in Malaysia, and another 9 sub-themes cover *Halal* food, certification, human, Muslim, food industry, attitude, article, consumer, and structural equation modelling.

3.4.3 Most frequently used author keywords and trend

Thematic mapping allows a visualisation of four different typologies of themes, as shown in Figure 7. The thematic map is a visual strategic diagram that can assist in analysing the importance and development of the research theme (Cobo, 2011). The size of the spheres emphasises the focus of the research theme. Centrality (vertical axis) measures the

relevance or importance of the selected theme, and density (horizontal axis) measures the development of the chosen theme. There are four quadrants in the thematic map. Going clockwise, themes in the upper right represent high density and high centrality and are categorized as motor themes that are being developed and hence essential.

Islam, animals, meat, certification, Malaysia, and human research themes lie within the motor typology, which is also categorised as developed. It is no surprise that Malaysia represents a cluster on its own, as much research is conducted about the various aspects of the *Halal* ecosystem in Malaysia. Research methodology mass spectrometry and ethanol (alcohol) are also in this quadrant. The research theme *Halal* certification, certification systems, and supply chain are clustered together and located between motor and basic themes suggesting that there is still much interest in these areas.

The lower right part of the thematic map is the primary or transversal themes, which are low density but high centrality, indicating that much research has been done on these themes: keywords survey, sales, and food products, forming another research cluster within basic and transversal research theme.

Emerging or declining themes appear on the lower left, whereby new themes can emerge stronger or drop off from the research area. The research on the website is gaining more attention while Islamism and religion seem to have declined. Research themes in the upper left part represent high density but lower centrality research areas that are developed but isolated. In this case, there seems to be no niche research done.

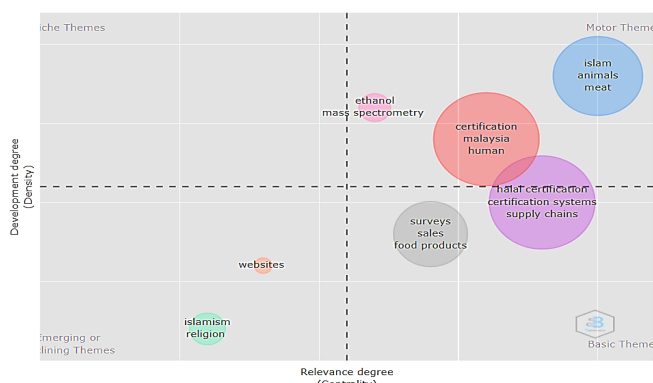


Figure 7: Thematic map (keywords plus)

4. Conclusion

A bibliometric analysis, employing 'biblioshiny' R package and VOS Viewer, was conducted on the scientific publications of '*Halal* certification' covering the period between 2004 - April 2021. About 248 documents extracted from the Scopus database, comprising journal articles, conference proceedings, reviews, and book chapters, from scientific publications, were analysed to have a broad understanding of the research work carried out in this sphere. This research analysed the annual publication trends, the most productive authors, the most cited articles, the most productive countries, the most frequent journals, and the most frequent author keywords. The article also identified the co-occurrence of keywords, areas of research, and research trends and performed a thematic map analysis to discover the area of focus and development regarding '*Halal* certification.'

The study revealed that although research on *Halal* certification began in 2004, the annual publication grew at a steady pace from 2011 and picked up pace from 2017. Data also suggested a high collaboration between authors with documents per author ratio $n=0.375$. Although the most productive authors were Noordin, N., and Zailani, S., the most cited author was Aziz (2013), who delved into *Halal* awareness, *Halal* certification, and marketing components in determining *Halal* purchase intention among non-Muslims in Malaysia. It was further found that the most productive country researching *Halal* certification is Malaysia (55.5%), and the most productive source is the Journal of Islamic Marketing (35.7%).

This article also looked at the author's keywords as it embodies the contents of the articles (Li, 2009). The most frequent keywords were *Halal* certification, *Halal*, and Malaysia, while analyses of the trend of keywords suggested that the term shifted from Islam (2015) to *Halal* (mid 2016), then *Halal* certification (mid 2017) and *Halal* food (2018). The rate of growth of the keyword '*Halal* certification' has increased significantly, probably attributed to the recognition by the international community that the *Halal* certification standard is an alternative benchmark for safety, hygiene, and quality assurance.

In conceptual structure, the study has adopted a thematic map to categorise the themes and it was demonstrated *Halal* certification, certification systems and supply chain as one cluster located between the basic theme and motor theme and therefore transversal. This suggests that research in this domain has captured ongoing attention from researchers. Research theme covering Islam, animals, and meat together with certification, Malaysia, and human research themes is within the motor typology or developed theme.

This study has contributed to identifying the themes and sub-themes related to the *Halal* certification research domain more extensively and revealed that there are still many areas that should be researched, seeing that the *Halal* industry is growing at a faster pace than other comparable industries. While this study also implied that *Halal* certification is key to ensuring *Halal* integrity to gain consumer trust.

The results generated by the bibliometric analysis disclose that the studies performed were mainly from Muslim majority countries, namely Malaysia and Indonesia, with robust *Halal* certification systems. At the same time, research on *Halal* certification should be conducted by non-Muslim countries who themselves are major global exporters of *Halal* food and *Halal* products. This study also noticed a gap in that there are as yet minimal research papers on the impact of Industry Revolution 4.0 technology on *Halal* certification ecosystem, which can lead to increased effectiveness and efficiency of the system and *Halal* integrity assurance.

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