Research status in Halal: a review and bibliometric analysis

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Abstract

Purpose – Halal is an emerging business sector and is steadily gaining popularity among scholars and practitioners. The purpose of this paper is to critically evaluate and review the reported literature in the broad area of Halal using bibliometric technique and network analysis tools. Moreover, this paper also proposes future research directions in the field of Halal.

Design/methodology/approach – This paper employed a systematic review technique followed by bibliometric analysis to gain insight and to evaluate the research area associated with Halal. Furthermore, data mining techniques are used for analysing the concerned article title, keywords and abstract of 946 research articles obtained through the Scopus database. Finally, network analysis is used to identify significant research clusters.

Findings – This study reports top authors contributing to this area, the key sub-research areas and the influential works based on citations and PageRank. We identified from the citation analysis that major influential works of Halal are from the subject area of biological science and related areas. Further, this study reports established and emerging research clusters, which provide future research directions.

Research limitations/implications – Scopus database is used to conduct a systematic review and corresponding bibliometric study; the authors might have missed some peer-reviewed studies not reported in Scopus. The selection of keywords for article search may not be accurate for the multi-disciplinary Halal area. Also, the authors have not considered the banking/financial aspects of Halal. The proposed four research clusters may inform potential researcher towards supporting the industry.

Originality/value – The novelty of the study is that no published study has reported the bibliometric study and network analysis techniques in the area of Halal.

Keywords Halal, Research clusters, Bibliometric analysis, Halal supply chain management

Paper type Research paper

1. Introduction

In response to the demand for superior quality goods and services, products labelled as Halal have emerged in the market whose spirit is to provide safe and wholesome consumption. Halal products are emerging as a new paradigm for assuring quality and safety by affecting the people's attitude, tastes and values (Lada et al., 2009; Khan and Haleem, 2016). A general perception is that products/services labelled as Halal are for a particular faith of population. However, Halal is a universal mandate which dictates the aspect of consumption, as well as to conduct modes of earnings, relationships, etc. (Alzeer et al., 2018).

Literally “Halal” means permitted or lawful in Shariah, and all consumables are deemed to be Halal, until and unless specifically restricted. Public view limits Halal to the domain of consumables that is free from pork, alcohol as well as their derivatives, and the animals slaughtering is as per the ritual. However, it is evident from the literature that
the concept of Halal is applicable beyond the dietary requirements and, as earlier stated, covers every aspect of life (Alzeer et al., 2018; Demirci et al., 2016; Khan and Haleem, 2016). The term “Toyyib” is used to compliment Halal, and it refers that the Halal product should be wholesome, i.e. nutritious, pure, non-poisonous, non-hazardous as well as non-toxic (Tieman, 2011; Demirci et al., 2016). Specifically, Toyyib characterises that Halal products are clean, free from intoxicant, derived from Halal sources, not causing pain and misery to people consuming or producing it. Rahman et al. (2014) and Khan, Haleem and Khan (2018) relate the concept of Toyyib to food ethics, with the main issues being “animal welfare”, “humane treatment of animal before slaughtering”, “environmental protection”, and “fair trade and sustainable consumption practices”. The Halal production system eliminates elements hazardous to human health and the environment (Hassan, 2016).

Although research reported in the area of Halal is growing with an upward trend (Alzeer et al., 2018), to the best of authors’ knowledge, no study has reviewed and evaluated the subject area of Halal using bibliometric and network analysis techniques. Therefore, to address this gap, this paper reviews the available literature in the broad area of Halal dating back to the year 2006; identifies top contributing authors, countries, affiliations, journals, primary keywords through bibliometric analysis; identifies influential research and cluster them based on citations and PageRank; and suggests future research direction related to different sub-research areas of Halal. The aim of doing bibliometric analysis is to analyse the research in a systematic, reproducible and transparent manner to inform present and future researcher about the trend and evolution of a subject area, thus to minimise research bias through exhaustive mining/audit trail of literature databases. In upcoming sections, relevant literature has been reviewed to gain more in-depth insight into various aspects of Halal followed by methodology undertaken to perform this research.

2. Literature review
A literature review is an essential work to be done before initiating any research project (Khurana et al., 2019). It assesses the relevant literature of the area, to map the work done and to find out the possible research gaps which would help in strengthening the body of knowledge (Tranfield et al., 2003; Sufiyan et al., 2019).

In the area of Halal, major reported articles have explored the attitude of the consumers towards Halal-certified products (Ali, Ali and Sherwani, 2017; Ariffin and Wahid, 2017; Aziz and Chok, 2013; Bashir et al., 2018; Ali, Xiaoling, Sherwani and Ali, 2017; Izberk-Bilgin and Nakata, 2016; Lestari et al., 2018), their biological and chemical aspects to establish integrity and quality of Halal meat (Park et al., 2017; Premanandh and Bin Salem, 2017; Aghwan et al., 2016; Al-Kahtani et al., 2017; Farouk et al., 2014) and parametric evaluation of effect of stunning on ritually slaughtered animals and their welfare (Fuseini et al., 2016; Rahman, 2017; Nakyinsige et al., 2013; Grandin, 2010; Farouk et al., 2016; Farouk, 2013). However, it is observed that only the recently published literature have focussed on managing operational activities of Halal products (Khan, Khan, Haleem and Jami, 2019; Khan, Haleem and Khan, 2018; Zulfakar et al., 2018; Alzeer et al., 2018; Soon et al., 2017; Haleem and Khan, 2017) and on developing Halal standards as a contemporary standard taking modern lifestyle into consideration (Ahmad et al., 2018; Chandia and Soon, 2018; Talib et al., 2017; Muhamad et al., 2017; Butt et al., 2017).

Bonne et al. (2007) discussed a case to determine the factors influencing the consumption of meat in France. The finding of this study shows that a positive personal attitude of Muslims is the primary driver towards the consumption of halal meat in France. Alam and Sayuti (2011) used the theory of planned behaviour on Malaysian customers to identify their food
purchasing intentions and supported to invest in making Malaysia a Halal Hub. Wilson and Liu (2011) determined the challenges associated with the concept of Halal and how Halal-conscious customer makes a decision. Furthermore, this study advocates the halal decision-making paradigm as a basis for constructing notable and engaging brands. Lada et al. (2009) identified the intention of consumers to choose Halal product through an empirical study focussed on Malaysia. Wilson and Liu (2010) discussed the development of Halal as a brand with the growing market among both Muslims and non-Muslims. Khan, Haleem, Khan, Abidi and Al-Ahmari (2018) emphasized that traceability played a medium to assure the integrity of Halal product and identified the factors which are critical to the successful implementation of traceability in HSCM.

Nakyinsige et al. (2013) described various acceptable methods of stunning by Islamic authorities, highlighting the requirements for stunning to be acceptable in Islam and suggesting practical ways to improve the humanness of slaughter. Karim and Bhat (2008) discussed the rationale for developing an alternative for gelatine, as it is not Halal, and further identified its origin and applications.

Zailani et al. (2011) explored the non-compliance to Halal norms by most of the hoteliers in Malaysia. They established that perceived benefits towards Halal certification could be as one of the factors that influenced hoteliers not to apply for the certification. Tieman (2011) gave basic principles to incorporate Halal in supply chain management through exploratory research. Moreover, this study pointed out that one of the essential principles for Halal supply chains is to maintain the integrity of the Halal product until the point of consumption. Bonne and Verbeke (2008) discussed the social-technical quality and control in the Halal meat chain and identified its crucial attention point. Karia and Asaari (2016) established that to facilitate Halal goods/services, and 3PLs need to gain access to and transform the right resources into Halal value creation. Ngah et al. (2017) identified the determinants of the adoption factors of Halal warehousing activities among Halal manufacturers in Malaysia. The finding of this study suggests that customer pressure, cost, perceived benefits and organisational readiness have a significant relationship with the adoption of Halal warehousing services by Halal manufacturers. In this row, Ngah and Thurasamy (2018) employed the TOE framework to identify the factors that influence the adoption of Halal transport services by Halal pharmaceutical and cosmetic manufacturers.

Ali and Suleiman (2018) through literature review attempted to provide a broad view of Halal food supply chain management. In this review, factors that pose a challenge to food integrity were underlined. These factors are categorised as per supply chain dimensions, related to raw materials, production, service and the consumer. Khan, Haleem and Khan (2018) defined Halal supply chain management to develop a rational understanding of Halal from supply chain perspective by categorising the existing definition reported in this area as per the focus of Halal and supply chain management. Talib et al. (2016) using institutional theory analysed the factors that could potentially explain the impetus of Halal food certificate implementation. This study suggests that Halal certificate implementation in the industry depends upon government regulations, demands from the Muslims for Halal foods and intense industry competition.

In the context of the Halal certification, various studies are available in the literature, and some recent studies are mentioned here. Khan et al. (2019b) evaluated the inter-relationship among barriers which are detrimental in the adoption of Halal certification and suggested that the effective adoption of Halal certification can achieve a higher level of customer satisfaction through assessment and accreditation. Talib (2017) reviewed the motivation and benefits of implementing Halal food safety certification. It suggests that firms are striving for Halal food safety certification in response to the growing demand for Halal food products and rising concern among the consumers over the series of foodborne illnesses. Khan et al. (2019a) using integrated interpretive modelling evaluated initiatives which facilitate the harmonisation of Halal standards by
considering the cost of accomplishment and associated benefits. Haleem et al. (2019) have identified and analysed the barriers towards the adoption of Halal certification assessment and accreditation using interpretive structural modelling. The finding suggests that there is a requirement to develop a globally accepted halal certifying body to address the issue of mislabelling and fake logo. From the above discussion, it is evident that reported studies in the area of Halal are very divergent and need an interdisciplinary approach.

3. Research methodology
This study primarily focuses on the bibliometric analysis applied to examine and categorise the body of the literature published in Halal. The objective of the bibliometric study is to quantitatively analyse a research area of Halal to get useful insights into how this field has developed over a span of time through network maps (Apriliyanti and Alon, 2017). Bibliometric analysis is also used to handle all the existing studies in the adopted area efficiently and so that it provides an understanding of the research breadth. The structure of bibliometric analysis used in this paper follows the structure of many bibliometric studies performed on other topics (Fahimnia et al., 2015; Mishra et al., 2017). Figure 1 shows the research methodology adopted in this study.

3.1 Defining keywords
The first step of the bibliometric analysis is the identification of the keywords that are used for the selection of research papers. This study investigates the area of the “Halal”, and it is a general term used in many contexts ranging from food, tourism, finance, to various functional areas. To encompass every aspect of this area, we have separately searched for keywords such as “Halal”; “Halal Supply Chain”; “Halal Products”, “Halal Authentication”, “Halal” and “Supply Chain” in Scopus database but excluded the articles on finance, banking and insurance. In this research, we have excluded the areas of finance, banking and insurance as our focus is on the operational aspects of the Halal product rather than the financial services.

3.2 Initial results
After finalising the keyword, the next step is the selection of the databases that are considered for the study. We have limited our searches in the English language to Scopus database because it is the largest bibliographic database of peer-reviewed articles: academic journals, conference proceedings and book chapters with more than 22,000 peer-reviewed journals, in the fields of science, technology, social sciences (including arts and humanities) and medicals. During the initial search, 1,208 documents were obtained in total, which were later refined as per the criteria mentioned in upcoming sections.

3.3 Refining the initial results
Initial results are refined by excluding book chapter, short surveys and magazine articles. As per the objectives of the research, we have considered only scientific publications (articles and reviews) which appeared in peer-reviewed journals as they are also termed as “certified knowledge”. This refinement leads to 946 relevant documents, published during 2006–2019*. The final data file is stored in the RIS format for undertaking further analysis.

3.4 Data analysis
The data analysis process is a two-step procedure, which starts with bibliometric analysis and is followed by network analysis. According to Ismail et al. (2012), to measure and assess a large number of scientific articles as well as the citation, a bibliometric analysis is the most suitable technique. Network analysis with the help of a bibliometric tool becomes a
robust approach to specifying emerging and established research area in the relevant field (Mishra et al., 2018; Fosso Wamba and Mishra, 2017). Bibliometric analysis was conducted using BibExcel software, which provides data statistic containing the keyword, author and affiliation statistics.

4. Bibliometric analysis
This study is conducted using BibExcel because it has a flexible nature and can handle data from different databases like Scopus and Web of Science. Other applications such as HistCite, Publish and Perish can also manage bibliographic data but have some limitation regarding the

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**Figure 1.** Flowchart for the study

Note: *Represent Data taken up to May, 2019
source of data. The upcoming sub-sections reveal statistics of authors involved, their respective associations, journals, keywords frequently used as obtained from the bibliometric analysis.

4.1 Authors involvement
Fields containing authors’ detail were extracted from the data file using BibExcel. Table I displays the contribution of Top 10 authors. It is evident from Table I that Rohman, Abdul with 20 publications in the field of Halal dominates the list and is followed by Sazili, Awis Qurni, who has 13 papers.

4.2 Affiliations statistics
BibExcel is used to extract affiliations (with their geographical locations) producing research in Halal from the RIS data file. Figure 2 shows the major institutions with their publication count in the area of Halal.

Figure 3 shows the major contributing countries in the research area of Halal. Malaysia is the major contributor followed by the UK and Indonesia.

| S. No. | Authors                | No. of articles |
|--------|------------------------|-----------------|
| 1.     | Rohman, Abdul          | 20              |
| 2.     | Sazili, Awis Qurni     | 13              |
| 3.     | Fischer, Johan         | 12              |
| 4.     | Zailani, S.            | 12              |
| 5.     | Regenstein, J.M.       | 11              |
| 6.     | Jaswir, I.             | 10              |
| 7.     | Zulkifli, I.           | 10              |
| 8.     | Goh, Y.M.              | 9               |
| 9.     | Tieman, M.             | 9               |
| 10.    | Mohamed, Zainal Abidin | 8               |

Table I. Top 10 contributing authors

Figure 2.
Major universities contributing to Halal
4.3 Journal statistics
Using the Bibexcel software, we have extracted the top ten journals which have published the articles in the area of Halal. Table II shows the list of the top ten journals concerning the number of articles published from 2006 to 2019*. It also represents the total number of articles published in each year. It is observed that these journals had published 314 articles in this field of research. The maximum number of papers are published in the Journal of Islamic Marketing which has the highest number of articles, approximately 26 per cent of the total papers published by the top ten journals. The published literature associates Halal with Islamic dietary law and is only for non-vegetarian foods.

4.4 Keyword statistics
Similar to the previous sub-sections, using the frequency of the same tool of repeatedly used keywords (terms) in the abstract, document title and the list of authors, keywords were obtained as shown in Table III. On comparing these three columns of Table III, we observe an apparent uniformity in the use of terminology. For instance, the most repeatedly used keywords include Halal, Food, Products, Muslims, Islamic and Malaysia. It is evident that the word “Halal” is used mostly for food, that too, with a focus on Muslims.

5. Network analysis
Different software packages are available to conduct network analysis such as Graph Maker, Gephi, VOS viewer, HistCite and Pajek. Gephi (2013) provides flexible visual aids and has a powerful filtering tool and can handle different data formats (Mishra et al., 2016). Gephi is also capable of dealing with complex data sets and generates purposeful visualisations. However, Gephi cannot handle the RIS format file; therefore, the data file is converted into a .NET format to undertake network analysis.

5.1 Citation analysis
Citations have used a measurement of influence in academia. If the citation index of any author, affiliation or publication is high, then the author, affiliation or publication will be considered as influential in that field. To evaluate the citation frequency for ranking
| Journals                                        | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Total |
|------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Journal of Islamic Marketing                   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Meat Science                                   | 1    | 3    | 2    | 1    | 3    | 5    | 4    | 7    | 4    | 4    | 3    | 1    | 1    |      | 39    |
| Food Manufacture                               |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| International Journal of Supply Chain Management |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| International Food Research Journal            |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Advanced Science Letters                       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| British Food Journal                           | 2    | 1    |      |      |      |      |      |      |      |      |      |      |      |      | 26    |
| Journal of Food Products Marketing             |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Food Control                                   | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      | 11    |
| Journal of International Food and Agribusiness Marketing |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 9     |
| Total                                          | 0    | 5    | 4    | 5    | 6    | 14   | 25   | 20   | 20   | 36   | 34   | 68   | 68   | 9    | 314   |
the journals as per their significance in the research area (Garfield, 1972) and to indicate the scientific research impact, citation analysis is undertaken. It also provides insights into the popularity of articles and the impact of authors based on their citation and co-citation. Using this technique, we have identified the Top 10 authors according to their research citation in Scopus (please see Table IV).

5.2 PageRank analysis

According to Ding and Cronin (2011), the importance of the research article is measured through citation analysis. Popularity and prestige are assumed to be correlated; thus, in 1998, Brin and Page introduced “PageRank” to measure priorities of keyword search results (Mishra et al., 2017). The PageRank value of the Top 10 articles is calculated as per Brin and Page’s (1998) methodology.

Consider a paper “A” has been cited by papers $T_1, \ldots, T_n$. A parameter $d$ is defined called “damping factor”, which represents the fraction of random walks that continue to propagate along with the citations. The value of parameter $d$ is fixed between 0 and 1. Now, $C(T_i)$ is defined as the number of times paper $T_i$ has cited other papers. The PageRank of paper $A$, denoted by “PR ($A$)”, in a network of $N$ papers is calculated as follows:

$$PR(A) = \frac{(1-d)}{N} + d \left( \frac{PR(T_1)}{C(T_1)} + \cdots + \frac{PR(T_n)}{C(T_n)} \right).$$

It is important to note that if $C(T_i) = 0$, then PR($T_i$) will be divided into the number of papers instead of $C(T_i)$. The value of parameter $d$ has been the subject of debate, with scholars suggesting a value of 0.85 (Brin and Page, 1998), whereas others a value of 0.5 (Chen et al., 2007).

| S. No. | Keywords Frequency in document title | Frequency | Keywords Frequency in abstract | Frequency | Keywords Frequency in keywords |
|-------|-------------------------------------|-----------|--------------------------------|-----------|-------------------------------|
| 1     | Halal 475                           |Halal 2,862|Halal 241                      |
| 2     | Food 154                            |Food 1,149|Islam 108                      |
| 3     | Islam 80                            |Products 699|Meat 103                      |
| 4     | Meat 75                             |Islam 607|Malaysia 99                    |
| 5     | Malaysia 73                         |Muslims 578|Animal welfare 89              |
| 6     | Products 63                         |Meat 420|Religion 50                    |
| 7     | Muslims 62                          |Malaysia 354|Human 42                      |
| 8     | Certification 52                    |Consumers 314|Halal food 39                 |
| 9     | Quality 40                          |Religious 308|PCR 36                        |
| 10    | Slaughter 36                        |Certification 296|Gelatine 35                   |

Table III. Showing frequently used keywords in the abstract, document title and the list of authors keywords

| Author (year) | Citation |
|---------------|----------|
| Wilson and Liu (2010) | 150 |
| Alam and Sayuti (2011) | 143 |
| Rohman et al. (2011) | 133 |
| Wilson and Liu (2011) | 133 |
| Bonne et al. (2007) | 124 |
| Bonne and Verbeke (2008) | 115 |
| Aida et al. (2005) | 107 |
| Nakyinsige et al. (2012) | 93 |
| Murugaiah et al. (2009) | 90 |
| Mukhtar and Mohsin Butt (2012) | 82 |

Table IV. Top 10 authors based on citation analysis
In the area of Halal, the Top 10 papers were identified and analysed using PageRank analysis, and Table V shows the result of these papers along with the citations. However, we found from this analysis that citations and top papers are not very well correlated, and this may be because of the mutually exclusive behaviour of respective research areas, or there may be citations from local journals of Malaysia, which are not indexed by Scopus.

5.3 Co-citation analysis

Co-citation analysis is used to track the relationship between authors, journals, keywords or topics. It is applied to measure the correlation degree between two distinct articles. A co-citation occurs when two articles share one or more same references (Walter and Ribière, 2013). When this co-citation analysis is applied to authors, it identifies the structure of the social relationships between them. If this analysis is used for publications, then it gives the intellectual structure of a field and provides the evolution and variation of research over time.

In this paper, Gephi is used to conduct the co-citation analysis. Here, we have analysed the “.NET” file for all the available articles in Gephi. However, this generates a random map with no identifiable (visible) pattern. Thus, to restore visibility, an algorithm named “Force Atlas” of Gephi is used to show the networks of co-cited related articles that was recommended by several researchers (Fahimnia et al., 2015). Additionally, after adjusting the strength, repulsion and other characters in Gephi, Figure 4 reflects the Force Atlas layout of the 946 nodes network. It shows that only strongly connected nodes were allowed to be at the centre, whereas loosely connected nodes are at the boundaries. The relative size of the bubbles in Figure 4 shows the relative citation they have received. Force Atlas layout map represents the connection between co-cited articles, and at the same time, a rarely

| Author (year)                    | PageRank | Citation |
|----------------------------------|----------|----------|
| Wilson and Liu (2010)            | 0.023329 | 40       |
| Zulfakar et al. (2014)           | 0.017117 | 7        |
| Zakaria (2008)                   | 0.016793 | 19       |
| Zailani et al. (2010)            | 0.016542 | 9        |
| Wilson and Liu (2011)            | 0.013537 | 29       |
| Zakaria and Abdul-Talib (2010)   | 0.011045 | 8        |
| Tieman (2011)                    | 0.009317 | 53       |
| Zailani et al. (2015)            | 0.009176 | 8        |
| Lada et al. (2009)               | 0.008032 | 34       |
| Eliasi and Dwyer (2002)          | 0.007825 | 11       |

Table V. Top article based on PageRank analysis

Figure 4. Force Atlas layout of 960 nodes
connected node is moving away from the centre. In data clustering, the nodes which are isolated from rest of the network are taken as outliers and excluded.

5.4 Data clustering

The data clustering method helps to group articles in different clusters (Mishra et al., 2017). It is used in the literature for classifying given set of publications and termed as modularity. Data clustering places together the sets of articles sharing the same characteristics. In this study, data clustering is conducted as per Clauset et al. (2004) and the concept of modularity to measure the density of links as per Blondel et al. (2008) is used. Gephi is used for making measurement calculations and observed that here the value of modularity index varies between $-1$ and $+1$. In this paper, we have applied the Louvain algorithm to a network of 946 nodes. Figure 5 shows the identified four significant clusters obtained through this analysis and the same are depicted along with their positioning and interaction. The value of the modularity index is 0.54, indicating a healthy relationship among the nodes within each cluster.

Table VI shows the co-citation analysis and papers listed in each cluster of research areas as provided through PageRank. The research areas identified through these clusters help in identifying different phases of research in Halal.

![Figure 5. Structure of four clusters](image)

Notes: (a) With arcs; (b) without arcs

| Cluster 1          | Cluster 2                         | Cluster 3                        | Cluster 4                             |
|--------------------|-----------------------------------|----------------------------------|---------------------------------------|
| Zakaria (2008)     | Zivotosky and Strous (2012)       | Zhou et al. (2006)               | Eliasi and Dwyer (2002)               |
| Wilson and Liu (2010) | Vergara and Gallego (2000)       | Zhou and Regenstein (2004)       | Yusop et al. (2011)                   |
| Tieman (2011)      | Zulkifli et al. (2014)           | Zayas (1997)                     | Tanabe et al. (2007)                  |
| Wilson and Liu (2011) | Vergara et al. (2006)           | Surh et al. (2006)               | Yang et al. (2005)                    |
| Zulfakar et al. (2014) | Velarde et al. (2003)          | Yi et al. (2006)                 | Wu et al. (2009)                      |
| Zakaria and Abdul-Talib (2010) | Rosen (2004)            | Ward and Courts (1977)           | Rohman et al. (2011)                  |
| Riaz and Chaudry (2004) | Webster (1994)              | Yang et al. (2007)               | Tartaglia et al. (1998)               |
| Zulfakar et al. (2012) | Velarde et al. (2014)          | Zhou and Regenstein (2005)       | Syahariza et al. (2005)               |
| Zakaria and Abdul-Talib (2010) | Wotton et al. (2000)         | Yamauchi et al. (1980)           | Rohman and Che Man (2009)             |
| Zailani et al. (2010) | Newhook and Blackmore (1982)    | Schrieber and Gareis (2007)      | Xu et al. (2012)                      |

Table VI. Clusters and respective top contributing authors
Table VII shows the four major clusters and the associated research areas of Halal to help the researcher community. The first cluster is labelled as “Supply Chain, Branding and associated aspects of Halal”. Therefore, this cluster suggests developing the measures to analyse perception of non-Muslim consumers, branding of Halal for non-Muslims customers, integrating cold chain in Halal logistics with cradle to grave approach, developing framework for Halal reverse logistics, measuring customer satisfaction and customer delight with the belief in Halal and developing framework to extend Halal integrity from farm to fork and risk analysis in Halal Supply Chain. This cluster is evolving, and most researchers are focussing on Halal from a supply chain perspective.

The second Cluster focusses on “Slaughtering and Stunning aspects of Halal”. Early research in this area focusses on the legality of stunning for Halal meat, and after developing the consensus, the focus is on the effect of stunning on meat quality. Future research is to focus on developing humane slaughtering methods while improving the quality of the meat.

Labelled the third cluster as “Additives in Halal Foods”. Research in this sub-area focusses on developing additives that are Halal and not derived from non-Halal sources. Research in this cluster also focussed on developing and improving the processing of Halal additives.

The fourth cluster is labelled as “Food Chemistry and associated Sciences”. Research in this area is focussing on developing testing methods to ascertain the integrity of Halal products. Extensive research is being undertaken in this area as compared to other sub-areas.

6. Discussion of results

Halal as a research area is highly divergent, and most of the authors involved are from Islamic countries and have contributed to different related subject areas. The broad research area seems to be “biological sciences”, especially “meat sciences” and “food technology”, and Halal appears to be a sub-area of these broad areas. The significant contributions are from the research institutes of Malaysia and Indonesia. There is a need to develop this area to cater to the industry needs, which has a size of more than $3.66 trillion. Unless researchers from all over the world are involved, there will always be a problem of acceptability of Halal-based research, technology and process.

| Cluster number and label | Future research areas and suggestions |
|--------------------------|--------------------------------------|
| Cluster 1: supply chain, branding and associated aspects of Halal | Developing measures to analyse the perception of non-Muslim consumers | Branding of Halal for non-Muslims customers |
| | Integrating cold chain in Halal logistics with cradle to grave approach | Developing a framework for Halal reverse logistics |
| | Measuring customer satisfaction and customer delight with the belief in Halal | Developing a framework to extend Halal integrity from farm to fork |
| | Risk analysis in Halal supply chain | |
| Cluster 2: slaughtering and stunning in Halal meat production | Measuring the effect of stunning on meat quality and its parametric evaluation | Process design and development to safeguard animal welfare |
| Cluster 3: additives in Halal foods | Developing new additives in vegetarian and non-vegetarian Halal foods | Establish new testing methods to diagnose Halal integrity |
| | Determine the role of preserving agents and additives on Halal integrity | Permissibility of toxics/banned items/intoxicants in Halal foods |
| Cluster 4: Halal related food chemistry and sciences | Developing implementable chemical processing methods for Halal foods | Develop a better understanding of Halal foods chemical composition |
| | Effect of physiochemically altered ingredients on the Halal status of consumables | Develop expertise in chemistry, food technology or other related science with a pharmaceutical background in order to cater to emerging Halal issues |
Contemporary authors have rarely touched upon the operations management aspect of Halal, and this is also a major limitation. The need is to undertake research in “Halal” with a perspective of “Operations Management” and stress “Halal” as a “process-oriented” approach instead of a product-oriented. Thus, it involves practitioners and researchers from all over the world, and not from some few countries. One needs to include new development in the areas of medicine (pharmaceuticals), natural products, cosmetics and tourism in the area of Halal.

The important keywords identified in this subject area are “Halal”, “food”, “products”, “Muslims” and “Islam”, and this shows that researchers are more interested in the food aspect of Halal and inferred that Halal is only for Muslims. A significant area of Halal, such as Halal Cosmetics, Halal Pharmaceuticals, vegetarian and natural products remains untouched. Also, “Toyyib” aspects of Halal products are rarely touched, which compliment Halal and conceptualise it in a broader term.

Citation analysis reveals that “Halal” as a research area receives less citation as compared to other similar research areas of food safety and security. We have identified four significant clusters based on PageRank analysis. We have used the concept of Modularity as given by Blondel et al. (2008) to measure the density of the links. The Louvain algorithm has been used in Gephi to measure the modularity. These four clusters are Supply Chain, Branding and associated aspects of Halal; Slaughtering and Stunning; Additives in Halal Foods and Food Chemistry and associated Sciences.

7. Conclusion, limitation and future work
Halal being an upcoming industry seems to have insufficient support from the research and development as the research work around Halal appears to be in infancy. All possible articles which are listed in the Scopus database were extracted. We have tried to analyse the designated area of Halal using bibliometric analysis like identifying the top authors, journals, and citation, and further data mining techniques are for analysing article title, keywords and abstract of 946 articles obtained through Scopus. PageRank analysis has been done to identify four significant clusters by considering the top research articles. Research direction has been identified using available bibliometric and data mining techniques. Through this study, an attempt was made to explore the different sub-fields in the area of Halal that will provide the direction for future researchers.

This study has some limitation as, during this study, only the Scopus database was used to conduct a systematic review and bibliometric study; some peer-reviewed studies may have missed. As Halal is a broad area, the selection of keywords for article search may not be accurate. Also, we have not considered the banking/financial aspects of Halal. Moreover, we have employed the bibliometric technique of citation and co-citation analysis for reviewing the literature, but there may be other methods to be used for citation and co-citation analysis. Conclusively, this study will help in the identification of the future research areas in Halal and may cater to the need of the associated developing industry.

References
Aghwan, Z., Bello, A., Abubakar, A., Imlan, J. and Sazili, A. (2016), “Efficient halal bleeding, animal handling, and welfare: a holistic approach for meat quality”, Meat Science, Vol. 121, pp. 420-428.
Ahmad, A., Abidin, U.Z., Othman, M. and Abdul Rahman, R. (2018), “Overview of the halal food control system in Malaysia”, Food Control, Vol. 90, pp. 352-363.
Aida, A., Che Man, Y., Wong, C., Raha, A. and Son, R. (2005), “Analysis of raw meats and fats of pigs using polymerase chain reaction for Halal authentication”, Meat Science, Vol. 69 No. 1, pp. 47-52.
Alam, S.S. and Sayuti, N.M. (2011), “Applying the theory of planned behavior (TPB) in Halal food purchasing”, International Journal of Commerce and Management, Vol. 21 No. 1, pp. 8-20.
Ali, A., Ali, A. and Sherwani, M. (2017), “Shaping Halal into a brand? Factors affecting consumers’ Halal brand purchase intention”, Journal of International Food & Agribusiness Marketing, Vol. 29 No. 3, pp. 234-259.

Ali, A., Xiaoling, G., Sherwani, M. and Ali, A. (2017), “Factors affecting Halal meat purchase intention”, British Food Journal, Vol. 119 No. 3, pp. 527-541.

Ali, M. and Suleiman, N. (2018), “Eleven shades of food integrity: a halal supply chain perspective”, Trends in Food Science & Technology, Vol. 71, pp. 216-224.

Al-Kahtani, H., Ismail, E. and Asif Ahmed, M. (2017), “Pork detection in binary meat mixtures and some commercial food products using conventional and real-time PCR techniques”, Food Chemistry, Vol. 219, pp. 54-60.

Alzeer, J., Rieder, U. and Hadeed, K. (2018), “Rational and practical aspects of Halal and Tayyib in the context of food safety”, Trends in Food Science & Technology, Vol. 71, pp. 264-267.

Apriliyanti, I.D. and Alon, I. (2017), “Bibliometric analysis of absorptive capacity”, International Business Review, Vol. 26 No. 5, pp. 896-907.

Ariffin, S. and Wahid, N. (2017), “Confidence in Halal Logo strengthens the relationship between consumer’s value-expressive function and attitude toward Kopitiam (coffee shop)”, Advanced Science Letters, Vol. 23 No. 11, pp. 10672-10675.

Bashir, A., Bayat, A., Olutuase, S. and Abdul Latiff, Z. (2018), “Factors affecting consumers’ intention towards purchasing halal food in South Africa: a structural equation modelling”, Journal of Food Products Marketing, Vol. 25 No. 1, pp. 1-23.

Blondel, V.D., Guillaume, J.L., Lambiotte, R. and Lefebvre, E. (2008), “Fast unfolding of communities in large networks”, Journal of Statistical Mechanics: Theory and Experiment, Vol. 2008 No. 10, p. P10008.

Brin, S. and Page, L. (1998), “The anatomy of a large-scale hypertextual web search engine”, Computer Networks and ISDN Systems, Vol. 30 Nos 1-7, pp. 107-117.

Butt, M., Rose, S., Wilkins, S. and Ul Haq, J. (2017), “MNCs and religious influences in global markets”, International Marketing Review, Vol. 34 No. 6, pp. 885-908.

Chandia, M. and Soon, J. (2018), “The variations in religious and legal understandings on halal slaughter”, British Food Journal, Vol. 120 No. 3, pp. 714-730.

Chen, P., Xie, H., Maslov, S. and Redner, S. (2007), “Finding scientific gems with Google’s PageRank algorithm”, Journal of Informetrics, Vol. 1 pp. 8-15.

Demirci, M.N., Soon, J.M. and Wallace, C.A. (2016), “Positioning food safety in halal assurance”, Food Control, Vol. 70, pp. 257-270.

Eliasi, J.R. and Dwyer, J.T. (2002), “Kosher and halal: religious observances affecting dietary intakes”, Journal of the American Dietetic Association, Vol. 101 No. 7, pp. 911-913.

Fahimnia, B., Sarkis, J. and Davarzani, H. (2015), “Green supply chain management: a review and bibliometric analysis”, International Journal of Production Economics, Vol. 162, pp. 101-114.
Farouk, M. (2013), “Advances in the industrial production of halal and kosher red meat”, *Meat Science*, Vol. 95, No. 4, pp. 805-820.

Farouk, M., Pufpaff, K. and Amir, M. (2016), “Industrial halal meat production and animal welfare: a review”, *Meat Science*, Vol. 120, pp. 60-70.

Farouk, M., Al-Mazeedi, H., Sabow, A., Bekhit, A., Adeyemi, K., Sazili, A. and Ghani, A. (2014), “Halal and kosher slaughter methods and meat quality: a review”, *Meat Science*, Vol. 98 No. 3, pp. 505-519.

Fosso Wamba, S. and Mishra, D. (2017), “Big data integration with business processes: a literature review”, *Business Process Management Journal*, Vol. 23 No. 3, pp. 477-492.

Fuseini, A., Knowles, T., Hadley, P. and Wotton, S. (2016), “Halal stunning and slaughter: criteria for the assessment of dead animals”, *Meat Science*, Vol. 119, pp. 132-137.

Garfield, E. (1972), “Citation analysis as a tool in journal evaluation”, *Science*, Vol. 178, pp. 471-479.

Gephi (2013), “Gephi – Makes Graphs Handy”.

Grandin, T. (2010), “Auditing animal welfare at slaughter plants”, *Meat Science*, Vol. 86, No. 1, pp. 56-65.

Haleem, A. and Khan, M.I. (2017), “Towards successful adoption of Halal logistics and its’ implications for the stakeholders”, *British Food Journal*, Vol. 119 No. 7, pp. 1592-1605.

Haleem, A., Khan, M.I. and Khan, S. (2019), “Halal certification, the inadequacy of its adoption, modelling and strategising the efforts”, *Journal of Islamic Marketing*, (in press), available at: https://doi.org/10.1108/JIMA-05-2017-0062

Hassan, A. (2016), “Islamic ethical responsibilities for business and sustainable development”, *Humanomics*, Vol. 32 No. 1, pp. 80-94.

Ismail, S., Nason, E., Marjanovic, S. and Grant, J. (2012), “Bibliometrics as a tool for supporting prospective R&D decision-making in the health sciences: strengths, weaknesses and options for future development”, *Rand Health Quarterly*, Vol. 1 No. 4, p. 11.

Izberk-Bilgin, E. and Nakata, C. (2016), “A new look at faith-based marketing: the global halal market”, *Business Horizons*, Vol. 59 No. 3, pp. 285-292.

Karia, N. and Asaari, M.H.A.H. (2016), “Halal value creation: its role in adding value and enabling logistics service”, *Production Planning & Control: The Management of Operations*, Vol. 27 No. 9, pp. 677-685.

Karim, A.A. and Bhat, R. (2008), “Gelatin alternatives for the food industry: recent developments, challenges and prospects”, *Trends in Food Science and Technology*, Vol. 19 No. 12, pp. 644-656.

Khan, M., Haleem, A. and Khan, S. (2018), “Defining Halal supply chain management”, *Supply Chain Forum: An International Journal*, Vol. 19 No. 2, pp. 1-10.

Khan, M., Khan, S. and Haleem, A. (2019a), “Using integrated weighted IRP-fuzzy TISM approach towards evaluation of initiatives to harmonise halal standards”, *Benchmarking: An International Journal*, Vol. 26 No. 2, pp. 434-451.

Khan, M.I. and Haleem, A. (2016), “Understanding ‘Halal’ and ‘Halal Certification & accreditation system’ – a brief review”, *Saudi Journal of Business and Management Studies*, Vol. 1 No. 1, pp. 32-42.

Khan, S., Khan, M. and Haleem, A. (2019b), “Evaluation of barriers in the adoption of halal certification: a fuzzy DEMATEL approach”., *Journal of Modelling in Management*, Vol. 14 No. 1, pp. 153-174, doi: 10.1108/jmm2-03-2018-0031.

Khan, S., Khan, M., Haleem, A. and Jami, A. (2019), “Prioritising the risks in Halal food supply chain: an MCDM approach”, *Journal of Islamic Marketing*, (in press).

Khan, S., Haleem, A., Khan, M., Abidi, M. and Al-Ahmari, A. (2018), “Implementing traceability systems in specific supply chain management (SCM) through critical success factors (CSFs)”, *Sustainability*, Vol. 10 No. 2, pp. 204-230.
Khurana, S., Haleem, A. and Mannan, B. (2019), “Determinants for integration of sustainability with innovation for Indian manufacturing enterprises: empirical evidence in MSMEs”, Journal of Cleaner Production, Vol. 229, pp. 374-386.

Lada, S., Tanakinjal, G.H. and Amin, H. (2009), “Predicting intention to choose halal products using theory of reasoned action”, International Journal of Islamic and Middle Eastern Finance and Management, Vol. 2 No. 1, pp. 22-40.

Lestari, Y., Susanto, J., Simatupang, T. and Yudoko, G. (2018), “Intention towards halal logistics: a case study of Indonesian consumers”, Journal for Global Business Advancement, Vol. 11 No. 1, pp. 66-76.

Mishra, D., Gunasekaran, A., Papadopoulos, T. and Dubey, R. (2018), “Supply chain performance measures and metrics: a bibliometric study”, Benchmarking: An International Journal, Vol. 25 No. 3, pp. 932-967.

Mishra, D., Luo, Z., Jiang, S., Papadopoulos, T. and Dubey, R. (2017), “A bibliographic study on big data: concepts, trends, and challenges”, Business Process Management Journal, Vol. 23 No. 3, pp. 555-573.

Mishra, D., Gunasekaran, A., Childe, S., Papadopoulos, T., Dubey, R. and Wamba, S. (2016), “Vision, applications and future challenges of Internet of Things”, Industrial Management & Data Systems, Vol. 116 No. 7, pp. 1331-1355.

Muhamad, N., Leong, V. and Md Isa, N. (2017), “Does the country of origin of a halal logo matter? The case of packaged food purchases”, Review of International Business and Strategy, Vol. 27 No. 4, pp. 484-500.

Mukhtar, A. and Mohsin Butt, M. (2012), “Intention to choose Halal products: the role of religiosity”, Journal of Islamic Marketing, Vol. 3 No. 2, pp. 108-120.

Murugaiah, C., Noor, Z., Mastakim, M., Bilung, L., Selamat, J. and Radu, S. (2009), “Meat species identification and Halal authentication analysis using mitochondrial DNA”, Meat Science, Vol. 83 No. 1, pp. 57-61.

Nakyinsige, K., Man, Y. and Sazili, A. (2012), “Halal authenticity issues in meat and meat products”, Meat Science, Vol. 91 No. 3, pp. 207-214.

Nakyinsige, K., Che Man, Y.B., Aghwan, Z.A., Zulkifli, L, Goh, Y.M., Abu Bakar, F., Al-Kahtani, H.A. and Sazili, A.Q. (2013), “Stunning and animal welfare from Islamic and scientific perspectives”, Meat Science, Vol. 95 No. 2, pp. 352-361.

Newhook, J.C. and Blackmore, D.K. (1982), “Electroencephalographic studies of stunning and slaughter of sheep and calves – part 2: the onset of permanent insensibility in calves during slaughter”, Meat Science, Vol. 6, pp. 295-300.

Ngah, A. and Thurasamy, R. (2018), “Modelling the intention to adopt Halal transportation among Halal pharmaceutical and cosmetic manufacturers in Malaysia”, Advanced Science Letters, Vol. 24 No. 1, pp. 205-207.

Ngah, A., Zainuddin, Y. and Thurasamy, R. (2017), “Applying the TOE framework in the Halal warehouse adoption study”, Journal of Islamic Accounting and Business Research, Vol. 8 No. 2, pp. 161-181.

Park, S., Lee, S., Sim, Y., Choi, J., Park, E. and Noh, B. (2017), “Analysis of ethanol in soy sauce using electronic nose for halal food certification”, Food Science and Biotechnology, Vol. 26 No. 2, pp. 311-317.

Premanandh, J. and Bin Salem, S. (2017), “Progress and challenges associated with halal authentication of consumer-packaged goods”, Journal of the Science of Food and Agriculture, Vol. 97 No. 14, pp. 4672-4678.

Rahman, M.M., Khatun, M.M., Rahman, M.H. and Ansary, N.P. (2014), “Food safety issues in Islam”, Health, Safety and Environment, Vol. 2 No. 6, pp. 132-145.

Rahman, S. (2017), “Religion and animal welfare – an Islamic perspective”, Animals, Vol. 7, No. 12, pp. 1-6.

Riaz, M.N. and Chaudry, M.M. (2004), Halal Food Production, CRC Press, Boca Raton, FL.
Rohman, A. and Che Man, Y.B. (2009), “Analysis of cod-liver oil adulteration using Fourier Transform Infrared (FTIR) spectroscopy”, *Journal of the American Oil Chemists’ Society*, Vol. 86 No. 12, pp. 1149-1153.

Rohman, A., Sismindari, Erwanto, Y. and Che Man, Y.B. (2011), “Analysis of pork adulteration in beef meatball using Fourier transform infrared (FTIR) spectroscopy”, *Meat Science*, Vol. 88 No. 1, pp. 91-95.

Rosen, S. (2004), “Physiological insights into Shechita”, *Veterinary Record*, Vol. 154 No. 24, pp. 759-765.

Schrieber, R. and Gareis, H. (2007), *Gelatine Handbook*, Wiley, Weinheim.

Soon, J., Chandia, M. and Regenstein, J. (2017), “Halal integrity in the food supply chain”, *British Food Journal*, Vol. 119 No. 1, pp. 39-51.

Sufiyan, M., Haleem, A., Khan, S. and Khan, M. (2019), “Evaluating food supply chain performance using hybrid fuzzy MCDM technique”, *Sustainable Production and Consumption*, Vol. 20, pp. 40-57.

Surh, J., Decker, E.A. and McClements, D.J. (2006), “Properties and stability of oil in water emulsions stabilized by fish gelatin”, *Food Hydrocolloids*, Vol. 20 No. 5, pp. 596-606.

Syahariza, Z.A., Che Man, Y.B., Selamat, J. and Bakar, J. (2005), “Detection of lard adulteration in cake formulation by Fourier transform infrared (FTIR) spectroscopy”, *Food Chemistry*, Vol. 92 No. 2, pp. 365-371.

Talib, M. (2017), “Motivations and benefits of halal food safety certification”, *Journal of Islamic Marketing*, Vol. 8 No. 4, pp. 605-624.

Talib, M.S.A., Chin, T.A. and Fischer, J. (2017), “Linking Halal food certification and business performance”, *British Food Journal*, Vol. 119 No. 7, pp. 1606-1618, available at: https://doi.org/10.1108/BFJ-01-2017-0019

Talib, M.S.A., Hamid, A.B.A. and Chin, T.A. (2016), “Can halal certification influence logistics performance?”, *Journal of Islamic Marketing*, Vol. 7 No. 4, pp. 461-475, available at: https://doi.org/10.1108/JIMA-02-2015-0015

Tanabe, S., Hase, M., Yano, T., Sato, M., Fujimura, T. and Akiyama, H. (2007), “A real-time quantitative PCR detection method for pork, chicken, beef, mutton and horseflesh in foods”, *Bioscience Biotechnology and Biochemistry*, Vol. 71 No. 12, pp. 3131-3135.

Tartaglia, M., Saulle, E., Pestalozza, S., Morelli, L., Antonucci, G. and Battaglia, P.A. (1998), “Detection of bovine mitochondrial DNA in ruminant feeds: a molecular approach to test for the presence of bovine-derived materials”, *Journal of Food Protection*, Vol. 61 No. 5, pp. 513-518.

Tieman, M. (2011), “The application of Halal in supply chain management: in-depth interviews”, *Journal of Islamic Marketing*, Vol. 2 No. 2, pp. 186-195.

Tranfield, D., Denyer, D. and Smart, P. (2003), “Towards a methodology for developing evidence-informed management knowledge by means of systematic review”, *British Journal of Management*, Vol. 14 No. 3, pp. 207-222.

Velarde, A., Gispert, M., Diestre, A. and Manteca, X. (2003), “Effect of electrical stunning on meat and carcass quality in lambs”, *Meat Science*, Vol. 63 No. 1, pp. 35-38.

Velarde, A., Rodriguez, P., Dalmau, A., Fuentes, C., Llonch, P., von Holleben, K., Anil, M., Lambooij, J., Pleiter, H., Yesildere, T. and Cenci-Goga, B. (2014), “Religious slaughter: evaluation of current practices in selected countries”, *Meat Science*, Vol. 96 No. 1, pp. 278-287.

Vergara, H. and Gallego, L. (2000), “Effect of electrical stunning on meat quality of Lamb”, *Meat Science*, Vol. 56 No. 4, pp. 345-349.

Vergara, H., Linares, M.B., Berruga, M.I. and Gallego, L. (2005), “Meat quality of suckling lambs: effect of pre-slaughter handling”, *Meat Science*, Vol. 69 No. 3, pp. 473-478.

Walter, C. and Ribière, V. (2013), “A citation and co-citation analysis of 10 years of KM theory and practices”, *Knowledge Management Research & Practice*, Vol. 11 No. 3, pp. 221-229.

Ward, A.G. and Courts, A. (1977), *The Science and Technology of Gelatin*, Academic Press, London.
Webster, J. (1994), *Animal Welfare. A Cool Eye Towards*, Eden Blackwell Science, Oxford, p. 106.

Wilson, J.A.J. and Liu, J. (2010), “Shaping the Halal into a brand?”, *Journal of Islamic Marketing*, Vol. 1 No. 2, pp. 107-123.

Wilson, J.A.J. and Liu, J. (2011), “The challenges of Islamic branding: navigating emotions and halal”, *Journal of Islamic Marketing*, Vol. 2 No. 1, pp. 28-42.

Wotton, S.B., Gregory, N.G., Whittington, P.E. and Parkman, I.D. (2000), “Electrical stunning of cattle”, *The Veterinary Record*, Vol. 147 No. 24, pp. 681-684.

Wu, J.H., Hong, P.Y. and Liu, W.T. (2009), “Quantitative effects of position and type of single mismatch on single base primer extension”, *Journal of Microbiological Methods*, Vol. 77 No. 3, pp. 267-275.

Xu, L., Cai, C.B., Cui, H.F., Ye, Z.H. and Yu, X.P. (2012), “Rapid discrimination of pork in halal and non-halal Chinese ham sausages by Fourier transform infrared (FTIR) spectroscopy and chemometrics”, *Meat Science*, Vol. 92 No. 4, pp. 506-510.

Yamauchi, K., Schimizu, M. and Kamiya, T. (1980), “Emulsifying properties of whey proteins”, *Journal of Food Science*, Vol. 45, pp. 1237-1244.

Yang, H., Wang, Y., Jiang, M., Oh, J.H., Hicensing, J. and Zhou, P. (2007), “2-step optimization of the extraction and subsequent physical properties of Channel Catfish (Ictalurus punctatus) skin gelatin”, *Journal of Food Science*, Vol. 72 No. 4, pp. C188-C195.

Yang, I., Kim, Y.-H., Byun, J.-Y. and Park, S.-R. (2005), “Use of multiplex polymerase chain reactions to indicate the accuracy of the annealing temperature of thermal cycling”, *Analytical Biochemistry*, Vol. 338 No. 2, pp. 192-200.

Zailani, S., Omar, A. and Kopong, S. (2011), “An exploratory study on the factors influencing the non-compliance to Halal among hoteliers in Malaysia”, *International Business Management*, Vol. 5 No. 1, pp. 1-12.

Zailani, S., Kanapathy, K., Iranmanesh, M. and Tieman, M. (2015), “Drivers of halal orientation strategy among halal foodfirms”, *British Food Journal*, Vol. 117 No. 8, pp. 2143-2160.

Zailani, S., Arriffin, Z., Abd Wahid, N., Othman, R. and Fernando, Y. (2010), “Halal traceability and Halal tracking systems in strengthening Halal food supply chains for food industry in Malaysia (a review)”, *Journal of Food Technology*, Vol. 8 No. 3, pp. 74-81.

Zakaria, N. and Abdul-Talib, A.N. (2010), “Applying Islamic market-oriented cultural model to sensitize strategies towards global customers, competitors, and environment”, *Journal of Islamic Marketing*, Vol. 1 No. 1, pp. 51-62.

Zakaria, Z. (2008), “Tapping into the world halal market: Some discussions on Malaysian laws and standards”, *Shariah Journal*, Vol. 16, pp. 603-616.

Zayas, J.F. (1997), “Solubility of proteins”, *Functionality of Proteins in Food*, 22-27, Springer-Verlag, Harwood Academic Publishers, Berlin, pp. 6-22.

Zhou, P. and Regenstein, J.M. (2004), “Optimization of extraction conditions for pollock skin gelatin”, *Journal of Food Science*, Vol. 69 No. 5, pp. 393-398.

Zhou, P. and Regenstein, J.M. (2005), “Effects of alkaline and acid pre-treatments on Alaska Pollock skin gelatin extraction”, *Journal of Food Science*, Vol. 70 No. 6, pp. C392-C396.

Zhou, P., Mulvaney, S.J. and Regenstein, J.M. (2006), “Properties of Alaska pollock skin gelatin: a comparison with tilapia and pork skin gelaatin”, *Journal of Food Science*, Vol. 71 No. 6, pp. 313-321.
Zivotofsky, A.Z. and Strous, R.D. (2012), “A perspective on the electrical stunning of animals: are there lessons to be learned from human electro-convulsive therapy (ECT)”, *Meat Science*, Vol. 90 No. 4, pp. 956-961.

Zulfakar, M., Chan, C. and Jie, F. (2018), “Institutional forces on Australian halal meat supply chain (AHMSC) operations”, *Journal of Islamic Marketing*, Vol. 9 No. 1, pp. 80-98.

Zulfakar, M.H., Anuar, M.M. and Talib, M.S.A. (2014), “Conceptual framework on halal food supply chain integrity enhancement”, *Procedia Social and Behavioral Sciences*, Vol. 121, pp. 58-67.

Zulfakar, M.H., Jie, F. and Chan, C. (2012), “Halal food supply chain integrity: from a literature review to a conceptual framework”, 10th ANZAM Operations, Supply Chain and Services Management Symposium, Melbourne, 14–15 June.

Zulkifli, I., Goh, Y.M., Norbaiyah, B., Sazili, A.Q., Lotfi, M., Soleimani, A.F. and Small, A.H. (2014), “Changes in blood parameters and electroencephalogram of cattle as affected by different stunning and slaughter methods in cattle”, *Animal Production Science*, Vol. 54 No. 2, pp. 187-193.

Further reading

Abdul-Talib, A.-N. and Abd-Razak, I.-S. (2013), “Cultivating export market-oriented behavior in Halal marketing”, *Journal of Islamic Marketing*, Vol. 4 No. 2, pp. 187-197.

Arif, S. and Ahmad, R. (2011), “Food quality standards in developing quality human capital: an Islamic perspective”, *African Journal of Business Management*, Vol. 5 No. 31, pp. 12242-12248.

Ding, Y., Yan, E., Frazho, A. and Caverlee, J. (2009), “PageRank for ranking authors in co-citation networks”, *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 11, pp. 2229-2243.

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