

**HALAL PRODUCTION FRAMEWORK ON PROCESSED  
MEAT PRODUCT IN FOOD INDUSTRY SCM:  
A SYSTEMATIC LITERATURE REVIEW**

**THESIS**

**Submitted to International Program Department of Industrial Engineering in  
Partial Fulfillment of the Requirement for the Degree of Sarjana Teknik Industri at  
Universitas Islam Indonesia**



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**THESIS APPROVAL OF SUPERVISOR****HALAL PRODUCTION FRAMEWORK ON PROCESSED MEAT  
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LITERATURE REVIEW****THESIS**

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A handwritten signature in black ink, consisting of a large, sweeping loop on the left and several smaller, more intricate loops on the right, all connected by a horizontal line.

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### **HALAL PRODUCTION FRAMEWORK ON PROCESSED MEAT PRODUCT IN FOOD INDUSTRY SCM: A SYSTEMIC LITERATURE REVIEW**

#### THESIS

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Author

## ABSTRACT

The *halal* meat market marked 16 percent of 1.8 billion Muslim populations, it will increase by 17.4% in 2018, and keep increasing for each year. The demand of meat mostly has been fulfilled by livestock than other animals as the main ingredient for package food. In line with these problems, recently, the processing of meat products is considered unacceptable considering with its production in terms of SCM in industry still have the fraud on halal process. So, need to improve the supervision of the handling of the production, which at the time before, during, and after the production process of processed meat products. In order to make the standard, researches are needed to make it more reliable and precise. This study will review the literatures systematically that focused on SLR method and *halal* processed meat product status from the first process and throughout the *halal* production of SCM to create the framework. Finding the good framework of *halal* production on processed meat product in food industry SCM can be helped by systematic literature review (SLR) with thematic synthesis analysis technique. SLR is a methodologically rigorous review of research results. From the 62 papers reviewed, the result shows there are the type of *halal* production in processed meat consist of pre-production (nutritional feeding, *syariah* slaughtering, and *haram* contaminate detection), production process (mixing, production, and proper handling), then post-production (packaging and labelling). Every process has to ensure that the halal parameters.

**Keyword:** Systematic Literature Review, *Halal* SCM, *Halal* Production, Processed Meat Product

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# CHAPTER I

## INTRODUCTION

This chapter will present the preliminary research which is be decomposed into six sub-chapters namely background, formulation of the problem, research objectives, problem limitation, the benefits of research and systematic writing.

### 1.1. Background

Organizing the working process from raw materials taken from the supplier until the raw materials into products and delivered to the end user or also called as supply chain management (SCM), is really a significant sector in companies today.

*Halal* SCM should be understood by actors in the SC, both as a manufacturer, distributor, warehousing providers, transporters, and retailers. The understanding and implementation of *halal* SCM potentially undermines the competitiveness of the companies, including the ASEAN Economic Community (AEC). The main goal of *halal* SCM is not only to ensure that costumers satisfaction, but also to ensure that the *halal* status of the food product remains intact throughout the whole process of the SC (Bahrudin et al., 2011).

The important role scope in SCM is production phase. In practice of *halal* SCM itself, the production should be *halal* also. Tieman et al., (2013) on their research indicated that consumer cares about the production of *halal* meat, approximately 81% from total 501 consumers on their research were agreed with that statement and had willingness to pay meat that was produced with *halal* process.

Researcher develops the issue on *halal* production from food industry SC, which is a continuation of research from Farouk (2013), Farouk et al., (2016), and Zulfakar (2014). Further development on the aspect of SCM in a processed meat industry, will be especially focused on production problems. Recent development on the food industry is referred to the production of fresh food into food products or meat in package. Reuters (2015) also predicts that *halal* food, especially the consumption of *halal* meat products will increase by 17.4% by 2018. In line with these problems, Rahman and Aidaros (2011, 2012) detailed some of these unacceptable practices on meat production, that suggested to enhance the supervision on handling the animals before and during the production of processed meat product.

This research concerns to standardize the production of *halal* processed meat product since the regulation or law on *halal* meat process still requiring. Many organizations hold *halal* certification and labeling with possibility for being different with other countries that have their own standard. Since there are only few of researches about *halal* supply chain thus in this research, the researcher will conduct systematic literature review to identify current and future study and then reviewing those literatures in detail according to the topics which will create *halal* production framework that focused on processed meat product. Meat of livestock is chosen as the material of the food because meat has specific requirement in Islamic law. The problem occurs when there are more aspects that affect *halal* status of processed meat product which will be discussed later by using systematic literature review in the next chapter.

## **1.2. Problem Formulation**

Based on the exposure of the background above, there were some problems in the research to be conducted. Then, the problem can be formulated with research questions as follows:

- a. How to conduct systematic literature review and how the frameworks of *halal* production of processed meat product?
- b. What is the further research to explore better solution in *halal* processed meat product on *halal* food industry supply chain?

### **1.3. Research Objective**

Based on the background and the problem formulation that have been described above, it can be arranged the following research objectives:

1. Able to conduct systematic literature review and how the frameworks of *halal* production of processed meat product.
2. Find the further research to explore better solution in *halal* processed meat product on *halal* food industry supply chain.

### **1.4. Problem Limitation**

Problem limitation means the scope of the study, this stage will lead the research to be more focused. The scopes of the research are as follows:

1. The research only focuses on *halal* processed meat product, especially on production phase.
2. Research was conducted in systematic literature review, its findings and discussions are derived from journals, articles, and previous research.
3. The required papers only located from sciencedirect.com (Elsevier), IEEE (ieeexplore.ieee.org), Researchgate, Advances in Business Research International Journal (ABRIJ), World Academy of Science Engineering and Technology, Emerald Insight, Journal of Emerging Economies and Islamic Research (JEEIR), and The South African Society for Animal Science (Sasas), and MDIP.
4. Source papers are researched from 2012 – 2017.
5. Production system scope is considered as excluded.

### **1.5. Research Benefit**

Based on the description and problem formulation it is expected that the results obtained in this study will provide benefits, such as:

1. As addition to scientific insights about *halal* supply chain, especially on *halal* production of processed meat product.
2. Research methodology can be used to conduct systematic literature review.

3. Research recommendation can be used for better future research.

## **1.6. Systematic Writing of Thesis**

Systematics of writing of this thesis is explained as follows:

### **CHAPTER II LITERATURE REVIEW**

Literature review provides information on previous studies. The objective is to seek the novelty of this research. Besides, it also explains the background theory.

### **CHAPTER III RESEARCH METHODOLOGY**

This chapter will present the research methodology, model development and the necessary data. The data are divided into 2 parts, namely primary and secondary data. Furthermore, this chapter will explain about the techniques of data collection and analysis. The final section of this chapter contains the framework of the research.

### **CHAPTER IV SYNTHESIS AND ANALYSIS**

This chapter presents information of data that have been collected during the research. It also contains problem solving using the proposed model or tools that are implemented in the data processing as well the analysis using the proposed model. This chapter also explain more the synthesis and analysis in phase of systematic literature review, it contains how the selection method for synthesis and analysis, and how the extraction data of paper.

### **CHAPTER V RESULT AND DISCUSSION**

This chapter provides a discussion after data analysis. Furthermore, it also discusses about the result of framework of processed meat product focusing on production, in order to overcome the problem.

**CHAPTER VI CONCLUSION AND RECOMMENDATIONS**

The conclusion and recommendations for further research will be described in this chapter.

**REFERENCES****APPENDIX**

## CHAPTER II

### LITERATURE REVIEW

This chapter will explain about the literature studies. The literature review conducted in systematic literature review, derived from the literatures that consist of previous researches and papers that will be used for the study. This chapter also will explain about the literature review studies which divided into inductive and deductive. Inductive study is a study from previous researches that already have reputation. Besides, deductive study is study that would explain about the basic theory that has relation with research. The source will be derived from the text books, etc. Inductive and deductive study are urgently to be performed to identify the gap between previous study and the recent research to avoid the plagiarism.

#### 2.1. Previous Study

SLR is increasingly used on many researches to critically appraise and summarize all empirical evidences from multiple research studies or papers. In this case, SLR become increasingly significance in Nair et al. (2014) research with extended the SLR method problem, where their research is to compliance of SLR articles provision of evidence for safety certification. They developed compliance SLR using thematic synthesis analysis based. The research will be used as reference and developed in research of this thesis especially in the use of SLR method which has developed in food industry problem especially on production of *halal* processed meat product.

The *halal* meat products demand will increase by 17.4% from the world's demand on food by 2018 (Reuters, 2015). It is forecasted to represent 27% of the global population by 2030 (Farouk, 2013). According to Omar et al., (2012) that has been completed research in Malaysia, the National Product and Expenditure Accounts reported Malaysia as one of the countries with a

majority Muslim population, with an approximation of 6.9 percent growth in the agricultural sector in the Fourth Quarter of 2011. Most of the growth was contributed by palm oil (16.4 percent), livestock (9.6 percent) and other agriculture such as vegetables and a fruit subsectors (6.4 percent). The poultry industry has been the major contributor for the increasing number of livestock products due to its highest consumption, thus reflecting the substantial importance of the products. Then, in Islam perspective, the pursuit of a livelihood here means that all of processes from food industry are governed by the principles of justice, mercy, trust, balance, benevolence, and gratitude (Farouk, 2015).

Based on these high demands of *halal* meat from livestock, the food industry should consider appropriate *halal* SCM. The most important role in SCM is production phase. In practice of *halal* SCM itself, the production should be *halal* also. Tieman et al. (2013) on their research defined that consumer cares about the production of *halal* meat, approximately 81% from total 501 consumers agree and have a willingness to pay meat product with *halal* integrity.

Ngah et al. (2014) explained *halal* production by using interview method to some service providers in Malaysia. The result reveals how to handle the demand of *halal* product by using *halal* supply chain management that should to maintain the *halal* SCM integrity with the syariah requirements.

Another research from Tieman (2013) stated that the integrity of *halal* supply chain becomes an increasing concern. *Halal* integrity issues are more likely to occur than before, because of the increasing of supply chains complexity and focus on cost reduction of the production industry. the complexity of today's supply chain is making integrity issues harder to detect. Based on this, Tieman conducted the research with the focus group. The focus group has been structured to allow open, in-depth discussions with a group of selected individuals as *halal* experts in Malaysia. The result from this focus group was formulated in five principles of *halal* SCM, which are (1) to create the *halal* SCM system; (2) to state that a *halal* SCM system should be fair and practical; (3) to define contamination between *halal* and *haram* and how to avoid it; (4) to create an evolution of a complete *halal* value chain and supply chain. The integrity of a *halal* product for the consumer (and therefore the *halal* supply chains) is a function of the

integrity of the various links in a supply chain.; (5) to benchmark with existing *halal* standards, best practices and international standards.

The next research is conducted by Zulfakar et al. (2014). They made a framework related to *halal* SCM, in order to assure suppliers, producers, consumers, and government. They revealed to increase the integrity of *halal* SCM. The proposed framework from Zulfakar et al. (2014) will be explained below.

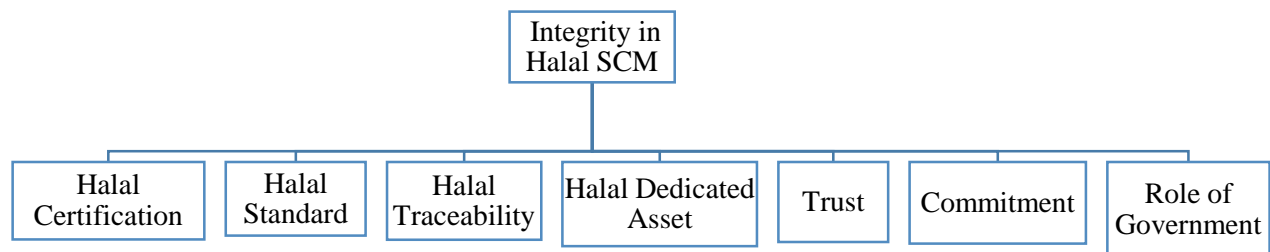


Figure 2.1. Macro Process in *Halal* SCM

Figure 2.1 shows the framework to enhance *halal* SCM based on its integrity in *halal* SCM itself, that will be developed in this research, especially in production aspect that one of part of SCM.

Later, research about *halal* production is also performed by Farouk et al. (2016) who have proposed a continuous review for industrial *halal* meat production by using the qualitative review. His research emphasized to Islam and secular practices advocated zero tolerance for all forms of animal abuse in the meat supply chain from farm to slaughter. The purpose of this research is to make a review in the improvement of animal welfare in the practice of *halal* meat industry and abattoirs. So, based on Farouk's research, researcher will further develop the aspect of SCM a meat industry, especially in the focus of production problems. His framework will be displayed in Figure 2.2.

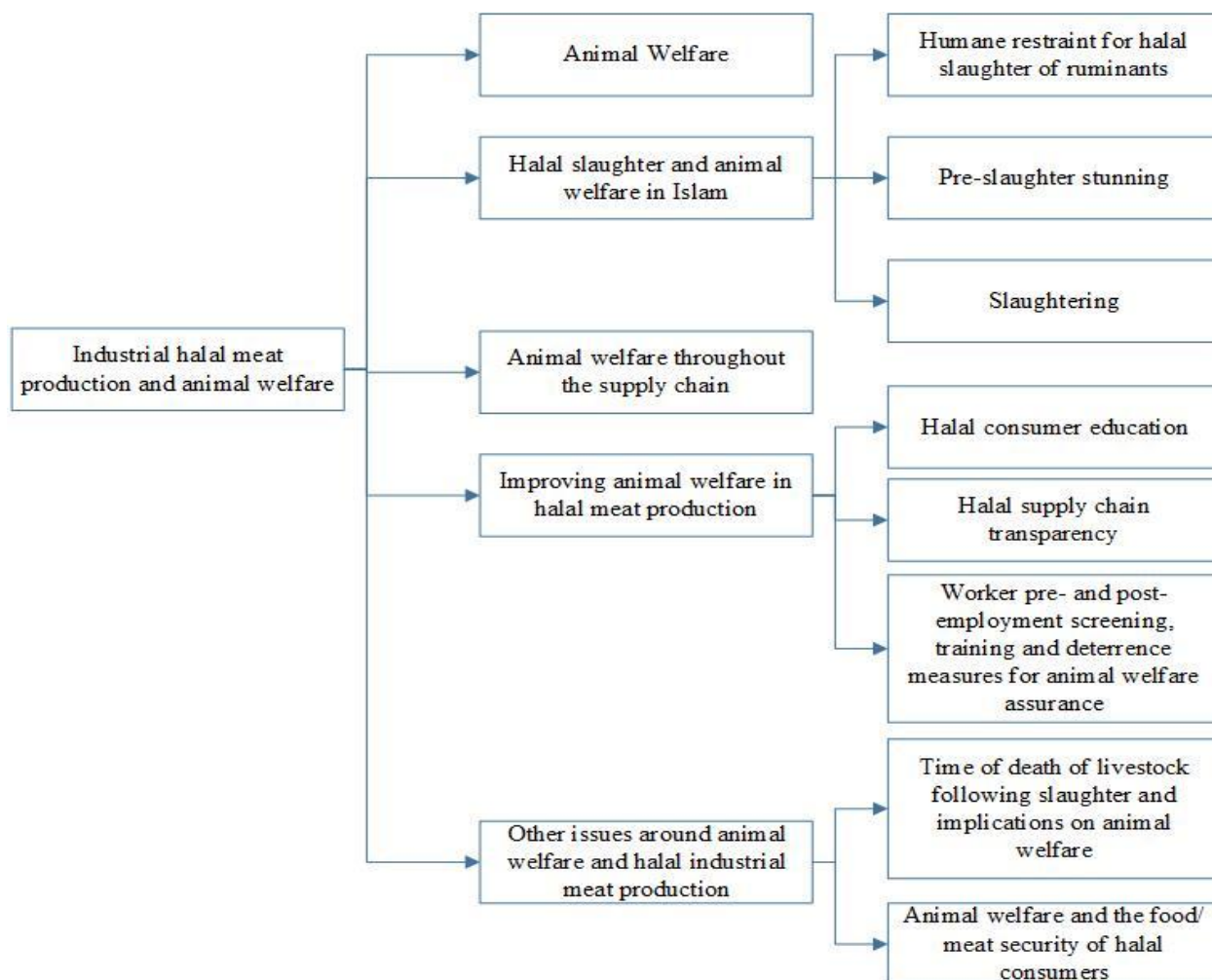


Figure 2.2. M. Farouk's research framework

Table 2.1. Explanation of Research Framework from M. Farouk

Sub Framework	Explanation
1. Animal Welfare	The ethics of animal welfare is not only concerned with giving animals the best life possible but also with carefully examining the relationship between humans and the animals in their care. The ethical view of animal welfare includes human beliefs about their obligations to care for animals and that the physical state of an animal may be less important than how that animal feels about that

	physical state.
2. Halal slaughter and animal welfare in Islam	Also have a prohibition against the consumption of harmful foods, which perfectly harmonizes with the basic modern food safety laws in place to prevent modes of food intoxication and infection, namely from the practice of slaughter.
a. Humane restraint for halal slaughter of ruminants	Animal handlers need to be properly trained on use of equipment and stunning methods. For slaughter without prior stunning, complete immobilization of the head is absolutely necessary.
b. Pre-slaughter stunning	the stunning does not kill the animal but only temporarily makes it unconscious (reversible) for the purposes of minimizing pain and distress, then this aspect is acceptable and also considered as <i>ihsaan</i> (humane), which is highly desirable in Islamic Shariah.
c. Slaughtering	Explain what equipment and work steps that must be taken.
3. Animal welfare throughout the supply chain	Provide halal issues related to the practice of supply chain, as it is increasingly becoming the trend in demand for livestock meat.
4. Improving animal welfare in halal meat production	To raise awareness of the consumption of meat kosher and non-kosher, at an institution of halal meat industry, should also provide knowledge about the halal process on consumer, supply chain transparency, worker pre- and post-employment screening, training and deterrence measures for animal welfare assurance, workers' training, worker animal welfare abuse deterrence measures, incorporating animal welfare requirements in halal certification

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5. Other issues around animal welfare and halal meat production	Explaining related issues such as, time of death of livestock following slaughter and implications on animal welfare, animal welfare and the food/meat security of halal consumers
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Research from Farouk (2016) gave same suggestions with the research that conducted by Ulandari (2016), which is focused on the further research on halal meat production from livestock. Based on above research, this research will develop the SLR method framework and *halal* production framework started from the process in producing *halal* meat to become the *halal* processed meat product, which also has a halal standard in every aspect, especially in production that will be examined by the researchers

## 2.2. *Halal* Processed Meat Product Parameter

The Islamic ethics regarding animals and processed meat product (Farouk et. al., 2015 and Farouk et. al, 2016) are: (1) Quran, the first primary source accepted by all Muslims as the verbatim word of Allah revealed to Prophet Muhammad; (2) *Sunnah* or *Hadiths*, the second primary source, which means the words, actions, and approvals of the Prophet Muhammad; (3) *Ijmaa'* (consensus of scholars); and (4) *Qiyas* (analogy). According to Farouk et al (2015) and Rahman (2017), the researcher makes some *halal* parameters focused on *halal* meat product are explained as follows:

- 1) Obedience to commands of Allah to obey the Qur'an, the Hadith from the Prophet Muhammad, and also follow the advices of existing *qiyas* and *ijma'*:
  - a. "From Muadh ibn Jabal ra that the Prophet when sent him to Yemen, the Prophet asked:" How do you if confronted with legal issues? He said: "I rule by the Book of Allah". The Prophet said: "If it is not found in the book of God"?, He said: "I rule by the Sunnah of the Holy Prophet". The Prophet said: "If it is not contained in the Sunnah of the Prophet PBUH"? he said: "I would *ijtihad* and not excessive (in *ijtihad*)". Then the Prophet PBUH Muadz hit to the chest and said: "Praise be to Allah who has agreed with the messenger (Muadz) with anything that approves the Prophet" [Hadith narrated by al-Thabrani (see: al-Mu'jam al-Kabir, Juz 15), p 96].

- b. "Forbidden to you (take) carrion, blood, pork, (meat animals) are slaughtered in the name of other than Allah, the strangled, which was hit, which fell, headlong, and killed the beast, except that had you kill it, and (forbidden you) are slaughtered for idols. "(QS 5: 3)
  - c. Qur'an actually forbids human actions which may lead to harm; transgress not in the balance, and weigh with justice, and skimp not in the balance . . . earth, He set it down for all beings (QS 55:8–10)
  - d. "then to Allah I put my trust" (QS 10: 71).
  - e. And cattle He has created for you (men); from them ye derive warmth and numerous benefits, and of their (meat) ye eat. (QS 16:5)
- 2) Livestock's animal as a main ingredient for *halal* consumption is permissible species:
- a. O mankind, eat from whatever is on earth [that is] lawful and good and do not follow the footsteps of Satan. Indeed, he is to you a clear enemy." (QS 2:168).
  - b. He hath forbidden you only carrion, and blood, and swine flesh, and that which hath been immolated to (the name of) any other than Allah. But he who is driven by necessity, neither craving nor transgressing, it is no sin for him. Lo! Allah is Forgiving, Merciful. (QS 2:173)
  - c. And they carry your heavy loads to lands that ye could not (otherwise) reach except with souls distressed: for your Lord is indeed Most Kind, Most Merciful. (QS 16:7)
  - d. And (He has created) horses, mules, and donkeys, for you to ride and as an adornment; And he has created other things of which ye have no knowledge. (QS 16:8)
  - e. God provided these animals for their edible parts as well as their useful by-products (QS 16: 80).
  - f. The benefits from animals such as to domesticate and use for transportation and food (QS 23:21; QS 40:79).
  - g. All animals are to be sacrificed for His own sake and the meat distributed to the poor (QS 22:34, 36) who cannot on their own afford to buy and slaughter an animal for meat.
  - h. Religions are rich with traditions around eating. For example, Islam teaches that all animals are created by God (QS 24:45),

- i. All of created by God, especially animals created specifically for man's benefit (QS 36:71)
- j. "... In fact, the food of illicit goods, drinks from the unlawful, his clothing from the unlawful and fed with food that is illegitimate, then how God will let their prayer?" (Hadiths: Muslim Number 1015)

### 3) *Halal* pre-production requirement

- a. O ye who believe! fulfil (all) obligations. Lawful unto you (for food) are all four-footed animals with the exceptions named: but animals of the chase are forbidden while ye are in the Sacred Precincts or in pilgrim garb: for Allah doth command according to His Will and Plan (QS 5:1)
- b. Forbidden to you are Maytatah (carrion or dead animal, animal not slaughtered with Tasmiyah i.e. reciting 'Bismillahi Allahu Akbar'), flowing blood, the flesh of swine, and that slaughter on which was invoked name other than Allah, as well as the (animal) killed by strangulation or beaten to death with violent blow or falling (from a height) to its death or gored to death (through fighting) or by falling to a predator (and about to be consumed -- unless you are able to slaughter before it dies).... (QS 5:3)
- c. And such animals (cattle) upon which they mention not the Name of Allah (during slaughter) only to fabricate a lie against Him (QS 6:138)
- d. Food security for Muslims is affected by permissions and prohibitions on consumption. Muslims are required to eat what is lawful, wholesome, pure, nutritious, and safe (Quran 2:168; QS 5:87) and not what is loathsome or foul (QS 7:157).
- e. A good deed done to an animal is commendable as a good deed done to a human being while an act of unkindness to an animal is as bad as an act of cruelty to a human being (Hadiths: Abu Dawud and At-Tirmidhi).
- f. Fear Allah in these silent animals, and ride them while they are suitable to be ridden, and let free when they need to rest' (Hadiths: Abu Dawud).
- d. A key condition of the permission given to man to slaughter and eat the flesh of animals is to mention the name of God during the slaughtering (QS 6:121; QS 22:36)
- e. The grievous things are: shirk (polytheism); disobedience to parents; the killing of breathing beings." (Hadiths: Bukhari and Muslim)

- f. “May god curse anyone who maims animals.” (Hadith: Bukhari)
- g. “Verily Allah has enjoined goodness to everything; so when you kill, kill in a good way and when you slaughter, slaughter in a good way. So every one of you should sharpen his knife, and let the slaughtered animal die comfortably.” (Hadiths: Sahih Muslim, Book 21, Chapter 11, Number 4810)
- h. Stunning of meat animals prior to slaughter has been shown to reduce the pain associated with slaughter.
- i. The Apostle of Allah (peace be upon him) prohibited eating and drinking the milk of an animal which feeds on filth. (Hadiths: Sunan Abu Dawud Number 3778)
- j. On the day of Khaybar the Apostle of Allah (May peace be upon him) forbade (eating) the flesh of the animal which feeds on filth and forbade riding it too. (Hadiths: Sunan Abu Dawud Number 3802)

#### 4) *Halal* production process

- a. God provides these animals for their edible parts, their various by-products (QS 16:5, 80), and for them to be sacrificed for His own sake and the meat distributed to the poor (QS 22:34,36).
- b. "There are people who ask: 'O Messenger of Allah, there are people who give us meat that we do not know whether the slaughter in the name of God or not?'. So, the Prophet sallallaahu 'alaihi wasallam said: "Mention the name of Allah and eat" (Hadiths: Al-Bukhari Number 2057).
- c. O you who believe! Eat of the good things that We have provided for you and be grateful to Allah, if it is Him that you worship (QS 2:172)
- d. O ye messengers! Enjoy (all) things good and pure, and work righteousness: for I am well-acquainted with (all) that ye do (QS 23: 51)

#### 5) *Halal* post-production requirement

- a. “O you who believe! Fear God, and be with those who are true (in word and deeds).” (QS 9:119)

- b. And they will say, "Praise to Allah, who has fulfilled for us His promise and made us inherit the earth [so] we may settle in Paradise wherever we will. And excellent is the reward of [righteous] workers." (QS 39:74)
- c. Abdullah ibn Mas'ud reported: The Messenger of Allah, peace and blessings be upon him, said, "You must be truthful. Verily, truthfulness leads to righteousness and righteousness leads to Paradise. A man continues to be truthful and encourages honesty until he is recorded with Allah as truthful. And beware of falsehood. Verily, falsehood leads to wickedness and wickedness leads to the Hellfire. A man continues tell lies and encourages falsehood until he is recorded with Allah as a liar." (Hadiths: Ṣaḥīḥ al-Bukhārī 5743, Ṣaḥīḥ Muslim 2607).

### **2.3. Systematic Literature Review**

Systematic literature review (SLR) is one of method that adapts a precise, transparent and explicit approach that includes a series of phases to ensure that an appropriate rigor and transparency is brought to the literature review process (Tranfield *et al.*, 2003; Kitchenham & Charters, 2007). According to " and Garza-Reyes (2015), there are five phases of SLR which will be explained briefly in this sub-chapter. First phase is question formulation which will formulate research questions that will guide the research. Second phase is locating studies and third phase is study selection and evaluation, which will locate, select, and evaluate relevant literatures. Fourth phase is synthesis and analysis which will synthesize and analyze selected articles, then final phase which is reporting and using the result to report the findings. The following sections will explain the process of locating the studies, study selection and evaluation, and also synthesis and analysis.

#### **2.3.1. Locating Study**

Location of studies are found by using electronic databases which are Elsevier (sciencedirect.com), IEEE (ieeexplore.ieee.org), Researchgate, Advances in Business Research International Journal (ABRIJ), World Academy of Science Engineering and Technology, Emerald Insight, Journal of Emerging Economies and Islamic Research (JEEIR), and The South

African Society for Animal Science (Sasas), and MDPI. Researches about *halal* supply chain focused on *halal* meat product are searched in 5-period-papers which are from 2012 to 2017.

### **2.3.2. Study Selection and Evaluation**

In study selection and evaluation, researcher only uses article that published in academic journals and proceedings of international conferences because they are considered as the most useful and reliable for literature reviews (Saunders et al., 2012). Then, in terms of the search strings, they were specified based on the main topics of the phenomena under investigation (Garza-Reyes, 2015). There is a framework that can be followed in order to determine the inclusion/exclusion criteria of the search strings, that are context-intervention-mechanism-outcome (Briner & Denyer, 2012; Rousseau, 2012). Search strings included in this research are SLR method, synthesis analysis, *halal* meat, *halal* processed meat product, traceability, *syariah* production process on *halal* meat, *syariah* slaughtering, *halal* packaging, and certification. According to criteria described in this section, a final sample of 62 articles with reference to *halal* meat product in food industry, focused on production was identified.

### **2.3.3. Synthesis and Analysis**

Papers obtained then will be transcribed and analyzed to get important findings in constructing the framework of *halal* processed meat product in food industry by using specific analysis or synthesis method. Garza-Reyes (2015) stated that various methods can be included to perform systematic literature review, thematic synthesis or analysis, qualitative comparative analysis, qualitative meta-summary, meta-ethnography, qualitative meta-analysis, grounded theory and content analysis can be considered for the synthesis of qualitative research. Method which will be used in this phase is thematic synthesis and analysis. This method will group the papers based on specific themes. It is easier and more effective to synthesize and analyze the papers. Based on findings in papers, this research will explain certain framework, namely *halal* production framework, derivative research from Farouk et al. (2016). Figure 2.8 will show those frameworks.

#### 2.3.4. Descriptive Analysis and Findings

There are 62 papers suitable with the selection criteria. The papers are referred to SLR method and *halal* processed meat product as well as related topics of standards in *halal* parameter, package food focused on *halal* processed meat product, and *halal* production (pre-production, production process, and post-production).

This study discusses about the way to conduct SLR method that represented by 10 papers, consist of Yu (2013), Nair et al. (2014), Nooren et al. (2015), Johnsen et al. (2016), Dubey et al. (2016), Oliveira et al. (2016), Akhigbe et al. (2017), HENCHIONI et al. (2017), Mohammed et al. (2017), Quiñones and Rusu (2017). Then *halal* parameters have been conducted by 2 researchers, such as Farouk et al. (2015) and Rahman (2017). Researcher also found 10 researches that explain about Package food focused on *halal* processed meat products, which are conducted by Ali et al. (2012), Omar et al. (2012), Nakyinsige et al. (2012), Mohtar et al. (2012), Paulsen et al. (2013), Lubis et al. (2016), Perestam et al. (2017), Marchi et al. (2017), and Inguglia et al. (2017). Lastly, researcher found 40 researchers that explain about production of meat including pre-production, production process, and post-production, which have been done by Agbeniga (2012), Dabbene et al. (2012), Gregory et al. (2012), Lambooi et al. (2012), Lever and Miele (2012), Marzuki et al. (2012), Rezai et al. (2012), Spiegel et al. (2012), Shafii et al. (2012), Farouk (2013), Nakyinsige et al. (2012), Aziz and Chok (2013), Ratanamaneichat and Rakkarn (2013), Tieman (2013), Aidaros (2014), Ahsan et al. (2014), Farouk et al. (2014), Ngah et al. (2014), Grandin (2014), Hopkins et al. (2014), Valarde et al. (2014), Noordin et al. (2014), Shariff and Lah (2014), Fauzi et al. (2014), Yunus et al. (2014), Poniman et al. (2015), Bukhoria et al. (2015), Al-Busaidi and Jukes (2015), Kadir et al. (2015), Teruel et al., (2015), Aghwan et al. (2016), Rahman et al. (2016), Christina Alamprese et al. (2016), Farouk et al. (2016), Fuseini et al. (2016a, 2016b), Lubis et al. (2016), Ismail et al. (2016), and Wigmann et al. (2016).

Below are the graphs of paper findings that use in this research. The graph including journal distribution in Figure 2.3., paper publication years is described in Figure 2.4., and electronic database publisher source is described in Figure 2.5.

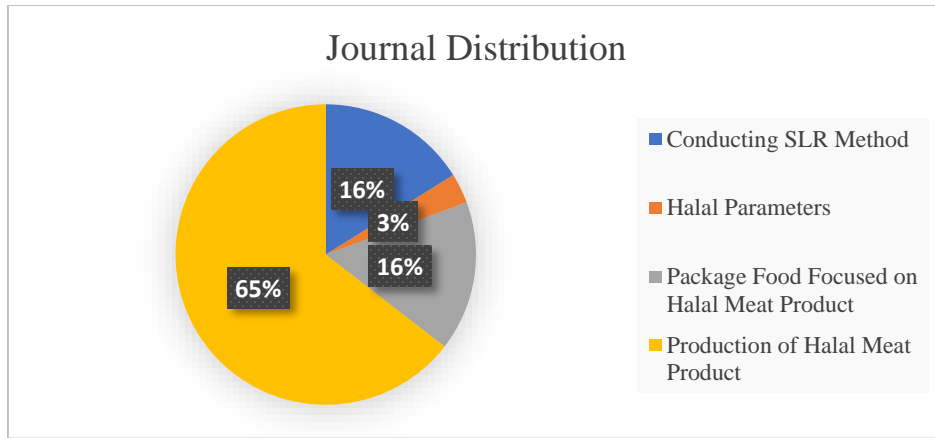


Figure 2.3. Journal Distribution in Research of *Halal* Meat Processed Product

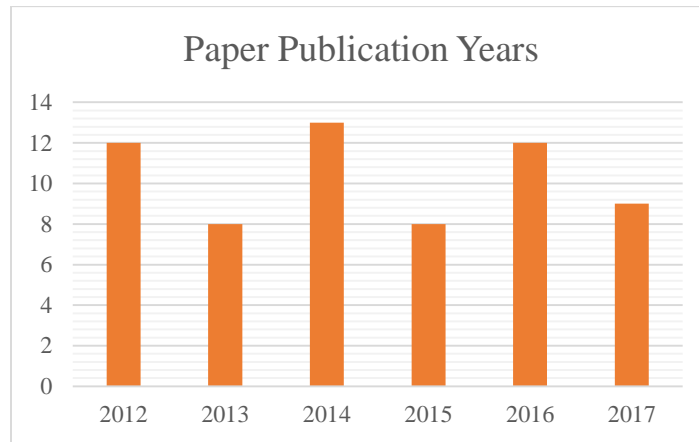


Figure 2.4 Publication Year Distribution

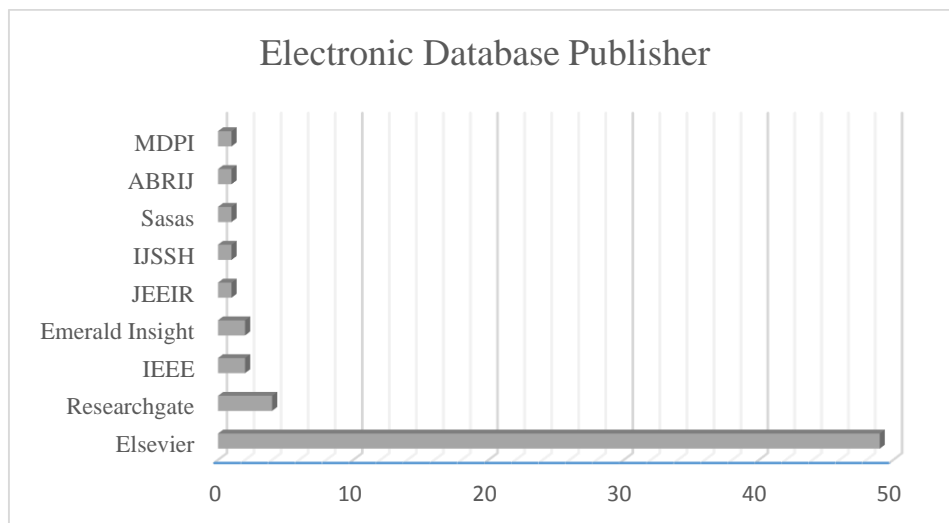


Figure 2.5. Distribution of Electronic Publication Database Journal

### 2.3.5. Conducting Systematic Literature Review

First article was derived from Oliveira et al. (2016), who had run the research to develop a meta-analysis about the relationships and potential perspectives of modeling and simulation in supply chain (SC), with the use of SLR method. In this case, SC has some stakeholders and consumer. However, these relationships and the number of role players can increase the complexity of SCs, signaling the need for decision support tools that can better deal with the dynamics in SC networks. Considering the complexity, dynamics and interactions that permeate a SC, computational modeling and simulation (M&S) can support managers in the decision-making process.

Similar with article above about SC, Yu (2013) conducted the research using SLR method, reviewed 47 articles between 1990 and 2011 that related to the financial impact of SC itself. This research summarized and classified the performance drivers are identified from literature to future SC practice.

SLR is increasingly used on many researches to critically appraise and summarize all empirical evidence from multiple research studies or papers. In this case, SLR become increasingly significance in Akhigbe et al. (2017) research with health care problem, where their research is to compliance of SLR articles in brain arteriovenous malformation (AVM). They developed compliance SLR using meta-analysis based on QUORUM Guidelines, once used by Moher et al. (1999). This study was updated by the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement (PRISMA) (Moher et al., 2009).

Another advance research about SLR that from Dubey et al. (2016) which revealed about SLR with illustrate the use of Total Interpretive Structural Modelling (TISM) in SSCM problem. This paper is approaches and techniques that take into account the dynamic nature of SSCM and bridge the existing quantitative/qualitative divide.

Different with advanced SLR above, Nooren et al. (2015) tended to use rules SLR based on Theory of Planned Behavior. Since there are many behavioral factors, this study only focus

on the Theory of Planned Behavior (TPB) and specifically on halal studies. Also has similarities by applying the rules of SLR's phase by Khan et al. (2003), and Garza-Reyes (2015), but it is also the development of TPB once used by Ajzen (1991), where TPB had widely been practiced and proven as the best way in predicting individual intention on consumption, then still in this article from Nooren, TPB has been an important model in determining food related behavior (Cook, 2000).

In fact, the opinion from HENCHIONI et al. (2017), systematic review tends to use synthesis and analysis in order to identify the important of QA both practical or attributes on meat quality. In this research, 5 steps of the SLR method are applied as described in the research of Khan et al. (2003) and Garza-Rayes (2015). Another research that used this standard is a research from Quiñones and Rusu (2017) about Develop Usability Heuristics, Johnsen et al. (2016) on Sustainable Purchasing and Supply, and Mohammed et al. (2017) on Benefits and Challenges of Cloud ERP Systems.

Research from Nair et al. (2014) also used SLR method and the standard steps to discuss on researches that use SLR method in further, and the research can provide more evidences for advanced safety certification that extracted from the primary studies, which consist of application domain, underlying standard, technique contributing to evidence, technique for assessing evidence confidence, tool support, objective/challenges, and validation method.

### **2.3.6. Processed Meat Product**

Nowadays, the demands of *halal* food increase rapidly, the original supply chain is not enough, a comprehensive and well managed SCM approach need to be adopted to ensure the availability of the *halal* food product. Zulfakar et al. (2014) said that *halal* supply chain is represented the process of managing *halal* food products from different points of suppliers to different points of buyers/consumers.

*Halal* and Haram are usually referring to food, but presently, it goes beyond food consumption and pervades other areas (Wilson & Liu, 2010), for instance supply chain.

(Syazwan et. Al, 2014). In fact, that the demand for *halal* food consumption is increasing annually as a result of the rising number of Muslim population globally, which is approximately 1.8 billion. Yousef (2010) highlighted that the *halal* food market constituted about 16 percent of the world food trade in which the trade value has been estimated as US\$547 billion in the global *halal* market. Consequently, the trend has attracted the attention of all countries to generate more *halal* food producers. In addition, the *Halal* market is very promising, the Malaysia Investment Development Authority (MIDA) valued global *Halal* food industry in 2013 was between US\$600 billion to US\$2.3 trillion and it is forecasted to be worth US\$6.4 trillion by 2030. Furthermore, the European *Halal* market is worth US\$67 billion, with huge demand from countries such as the United Kingdom, France and Germany. Another factor contributing to the very promising *Halal* market is the vast Muslim population and strong demand from the non-Muslim market. In the year 2030, Muslim population will rise 35 percent to 2.2 billion from its 1.8 billion population in 2012 (Grim & Karim, 2011; PricewaterhouseCoopers, 2013).

From high demand, the impact to the *halal* food also requires the application of *halal* supply chain in the food industries. Omar and Jaafar (2011) stated that *halal* supply chain is a process that must be *halal* starting from the source of supply until it reaches the customer. As in this study, the *halal* supply chain will start from the farm, the slaughter house, to transporting and storing of the poultry products before they reach the customers. This is to ensure that *halal* is not only applied for products or food but also for all the activities in the supply chain which include the handling and managing of the products (inventory management and material handling).

In Lubis et al. (2016) researched that all foods can be consumed by Muslims except those that are made of or contain the following: carrion or dead animals, blood (flowing or congealed), swine and all its derivatives, animals slaughtered in the name of any other than Allah (how Muslims refer to their God) or not according to Islamic law, animals that were killed accidentally or on purpose through means such as strangling or beating, intoxicants (alcohol and drugs), carnivorous animals, predator birds, and certain land animals. Meat that is permitted in Islam is those from domesticated animals such as goat, sheep, cow, cattle, buffalo and camel, which are all ruminants possessing split hoof with padding in between. Meanwhile, meats from pigs, boars

and swine's, or any of their derivatives are strictly forbidden. Birds such as chicken, duck, turkeys, pigeons and quails, among others are allowed. Prey birds with sharp claws such as eagles, falcons and vultures are not permissible. Fresh, raw meat from permitted animal is *halal* as long as the animal was slaughtered accordingly and that the place of slaughter is not contaminated with any pork meat or its derivatives (Hassan & Lewis, 2014).

Table 2.2. *Halal* Food Market and Consumption Data

The Halal Food Market	
The number of Muslim in the world	1.8b
Growth in the number of Muslims in Europe in a decade	140%
Muslims make their homes in the Russian Federation	30m
Of the world food trade part of the halal food market	16%
Muslim living in Asia	1b
Halal Food Consumption in Selected Markets	
North America	\$16.1b
Europe	\$66.6b
India	\$25.6b
China	\$20.8b

Source: Omar, et al. (2012)

Table 2.3. The Needs Value (USDx1000) of imported halal and kosher red meat and co-products of some selected countries/regions in 2011

Importing Country/Region & Product	Red Meat Category			
	Chilled Beef	Frozen Beef	Lamb	Edible Offal
<b><i>Halal</i> Red Meat &amp; Co-product</b>				
Indonesia	14,368	219,898	6555	87,161
Maghreb	57,470	183,766	5436	3177
Malaysia	15,435	373,661	97,047	38,268
Middle East	974,727	2,816,453	823,448	233,193
Saudi Arabia	63,584	323,356	233,735	29,485
United Arab Emirates	116,900	176,331	212,909	10,256
<b><i>Kosher</i> Red Meat &amp; Co-product</b>				
Israel	No import	453,546	7898	9025

Source: Farouk. (2013)

According to Omar et al., (2012) that has been completed research in Malaysia, the National Product and Expenditure Accounts reported Malaysia as one of the countries with a majority of Muslim population, an approximately of 6.9 percent growth in the agricultural sector in the Fourth Quarter of 2011. Most of the growth was contributed by palm oil (16.4 percent), livestock (9.6 percent) and other agricultures such as vegetables and fruit subsectors (6.4 percent). The poultry industry has been the major contributor of the growth from the livestock products due to its highest consumption, thus reflecting the substantial importance of the products.

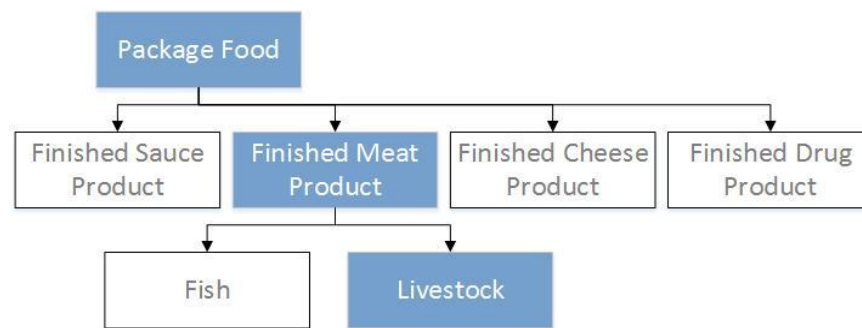


Figure 2.6. Livestock as The Focus in The Topic of Processed Products of Meat

Many types of animal products are allowed in Islam, the animal meat has undergone further processing in a food industry. According to Lubis et al. (2016) products from animals including sauces, milk, cheese, chocolate, drugs, and gelatin. But the author, focusing more on product types of processed meat from animals that are allowed in Islam. Then author more focusing on livestock animal, like we can see on Figure 2.6.

Then, from this focus from above, the research more focusing on production of processed meat product. The framework will be seen on Figure 2.7.

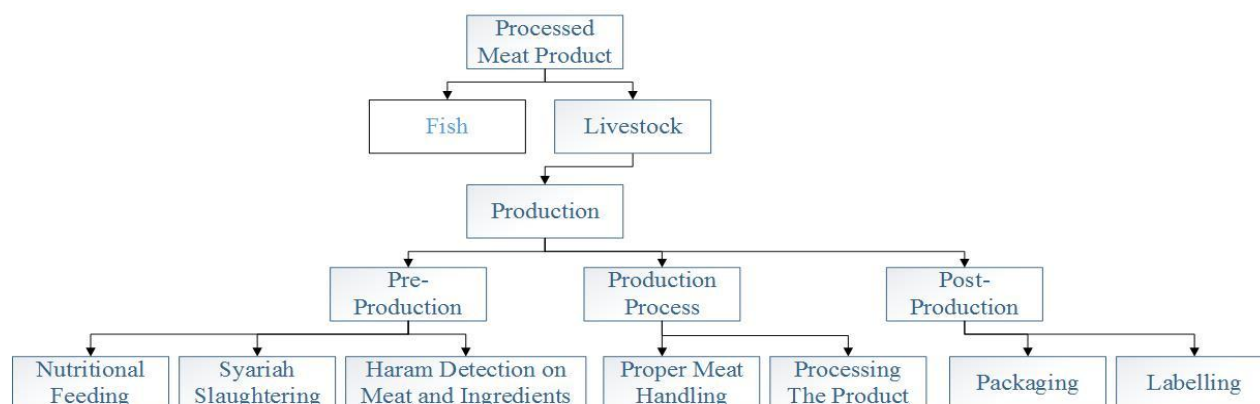


Figure 2.7. The Framework of Halal Production

## 2.3.7. Production

### 2.3.7.1. Pre-Production

#### a. Nutritional Feeding on Animals Permitted

Farouk et. al (2016) mentioned about feeding way to animal that permitted to human eat by Qur'an and hadith. There are feeding ways for herbivore animal that are natural and morally acceptable in Islam. According to it, giving good feed, feeding the animals with food that is good and nourishing, is a necessity. Because it will impact directly to the production of future *halal* meat, as well as the consumer.

In addition, Aghwan et al. (2016) explained, animals must have access to water and have the chance to rehydrate after their arrival at the abattoir. Unfamiliarity with watering facilities in novel environments may result in limited access and failure to drink water particularly in young calves and lambs as livestock animals.

#### b. *Syariah* Slaughtering

Many researched which conducting the animal welfare for the procedure of preparations, handling, previous slaughtering, slaughtering process, and after slaughtering, such as on Agbeniga et al. (2012), Ahsan et al. (2014), Aidaros (2014), Farouk et al. (2016), Temple Grandin (2014). In these several articles, mentioned despite the majority of livestock are for human food consumption, but livestock is animal as well

as living creatures. Velarde et al. (2014) revealed animal welfare have the meaning of the need to avoid unnecessary suffering to animals, the need to observe basic health and hygiene rules and the need to perform in authorized abattoirs (as a third party of *halal* meat production) which these processes are in line with the Prophet Muhammad's teaching and also accordance with the standards of OIE (World Organization for Animal Health).

All food can be consumed by Muslims except those that are made of or contain the following: carrion or dead animals, blood (flowing or congealed), swine and all its derivatives, animals slaughtered in the name of any other than Allah (how Muslims refer to their God) or not according to Islamic law, animals that were killed accidentally or on purpose through means such as strangling or beating, intoxicants (alcohol and drugs), carnivorous animals, predator birds, and certain land animals (Lubis et.al, 2016). The slaughtering procedure needs to be performed by a sane Muslim who invokes Allah's name while slaughtering and cut the animal's jugular vein in the neck with a sharp knife. This is to allow the rapid draining of blood in order to ensure the quickest death for the animal.

Regarding to the slaughtering, issues are arose that developed from this research, which is about the stunning animals before being slaughtered. Many researchers have addressed specifically about the issue of halal meat afterwards. The research that was conducted by Aghwan et al (2016), Farouk et al (2013, 2014, 2016), Fuseini et al. (2016a, 2016b), Lambooij (2012), Lever and Miele (2012), Hopkins et al. (2014), agreed and recommended the use of pre-slaughtering with electrical stunning, and it still considered as *halal* as the goal of stunning is for make the livestock more relax, however *halal* slaughtering requires animal must be alive before the ritual of slaughtering.

c. *Haram* Contaminate Detection on Meat and Ingredients

Currently, Muslim becomes more concern about meat. Meat product usually contains pork, gelatin, blood plasma etc, thus based on (Ali et al., 2012, 2015) mentioned the method that can be used to detect whether *halal* meat in market is contaminated by *haram* contents or

not, is PCR (Polymerase Chain Reaction). PCR is one of method that can be used to detect *haram* contamination by detecting its DNA. Based on Nakyinsige et al., (2012) there are some analytical techniques to detect *haram* contamination in meat based on authenticity issues that want to be detected. Pork adulteration can be detected using PDR-RELP, Real time PCR, species-specific PCR, RAPD and PCR Sequencing, pork protein can be detected using ELISA, Chromatography, Peptide examination and Isoelectric focusing, pork fat (lard) can be detected using FTIR spectroscopy, DSC and Electronic nose while blood plasma can be detected using Isoelectric focusing, ELISA, Immunodiffusion and LC-M5/MS. All the methods above can be used to detect contamination of *halal* meat, but will not be explained specifically since it contains chemical process that will be excluded in industrial engineering studies.

### 2.3.7.2. Production Process

#### a. Mixing / Processing The Product

The researches from Kaur et al. (2017) and Jung et al. (2016) revealed, before making some products of finished meat product, the fresh meat should cut with proper treatment.

After all selected products of meat and ingredient are filtered by certain haram detection on logistic phase, the next step is mixing or processing the product with *halal* procedure also. The explanation step of this process is done by the research of Teruel (2015), with mixing all the material ingredients with maintain the halal procedure to make nugget product, with mixing the extracted ingredients using methanol and acetone to improve the purity and deodorization. Then blended all, also pre-fried using a household fryer for 30 s at 165 °C.

#### b. Proper Meat Handling

Lubis et al. (2016) revealed on his research, there is a concern on *halal* food industry as a growing market globally. One of these concerns need accuracy in processing and handling in manufacturing the meat process. So, it can be ascertained that the food will *inhalal* condition eventually.

### 2.3.7.3. Post-Production

#### a. Packaging

All *halal* meat products should be packaged in clean containers with proper labels affixed to identify the *halal* markings. During storage and display, *halal* products must be segregated from non-*halal* ones so as to prevent cross contamination (Nakyinsige et al, 2012). Package is the way of communication. Special package for *halal* meat must be attached with the logo or label. Yunus et al., (2014) said that descriptively, majority of the customer will see the statement of *halal* and product ingredient on the package which encourages the willingness to buy the product.

#### b. *Halal* Labelling

Farouk (2013) on *Advances in The Industrial Production of Halal and Kosher Red Meat*, reviewed on the issues surrounding *halal* meat accreditation, certification, auditing and authentication, the supporting structures and processes such as laboratories and analyses have been previously researched. The world and the increased demand for assurance by the consumers of these foods, a number of regulatory and certifying bodies have sprung up in both producing and importing countries to ensure the compliance of these products to the *halal* requirements. Riaz (2013) reported the number of *halal* certifying bodies around the world are counted to be 111 and growing. Although these *halal* certifying/regulatory bodies differ in their standards for certification (See Figure 2.9 for symbols of several *halal* certifying bodies around the world), the differences tend to be minor and largely reflect variations in the way the preferred, but not the obligatory practices laid down in Islamic religious texts are interpreted (Farouk et al., 2013). Because of that, the processed meat product shall be having the *halal* label in packaging. After all processes are done, the processed product will back to logistic or warehouse keeping.

In line with ISO standardization definition from Shafii et. al (2012) research, traceability is the ability to trace the history, application or location of a product by means of recorded identification. In SCM focus, traceability will provide the clear of *halal*

ingredients information that will be used to be mixed with the meat product. Besides, this tracker can help to track and trace the product later.



Source: Farouk (2013)

Figure 2.8. Some Halal Certification Label in several countries

## CHAPTER III

### RESEARCH METHODOLOGY

This chapter will explain the steps applied in conducting the research. Locating studies, study selection and evaluation which have been explained in Chapter II will be repeated briefly in this chapter.

#### 3.1. Locating Studies

The Location of studies are found by using electronic databases which are Elsevier (sciencedirect.com), IEEE (ieeexplore.ieee.org), Researchgate, Advances in Business Research International Journal (ABRIJ), Emerald Insight, Journal of Emerging Economies and Islamic Research (JEEIR), and The South African Society for Animal Science (Sasas). Researches about *halal* supply chain focused on *halal* meat product are searched in 5-period-papers which are from 2012 to 2017. According to the objectives of this research, the references paper that reviewed focus on paper of SCM especially *halal* processed meat product. The keywords which preset the *halal* processed meat supply chain used in the search of electronic database, include *halal* supply chain, *halal* processed meat product, and *halal* production.

#### 3.2. Study Selection and Evaluation

In this research, researcher only uses articles that published in academic journals and proceedings of international conferences because they are considered as the most useful and reliable for literature reviews (Saunders et al., 2012). There is a framework that can be followed in order to determine the inclusion/exclusion criteria of the search strings, that are context-intervention-mechanism-outcome (Briner & Denyer, 2012; Rousseau, 2012). Then, in terms of

the search strings, they were specified based on the main topics of the phenomena under investigation (Garza-Reyes, 2015). There are following search string was eventually used: (SLR OR literature review) AND (synthesis OR analysis review) AND (*halal* SCM OR *halal* meat OR *halal* processed meat product OR halal production) AND (traceability) AND (*syariah* production meat process OR *syariah* slaughtering) AND (halal packaging OR halal labelling OR certification). The search string was subsequently adjusted to suit the specific requirements of each database. The databases were searched by title, keyword and abstract. The search was limited by the year of article publication 2012-2017 from International journal papers. According to criteria described in this section, a final sample of articles with reference to *halal* meat product in food industry, focused on production was identified.

### **3.3. Planning and Research Position**

The topic that will be discussed is production in *halal* processed meat product of SCM on food industry based on literature review. The literature review specifically will be conducted in SLR method. It is a method that adpts a precise, transparent and explicit approach that includes a series of phases to ensure that an appropriate rigor and transparency is brought to the literature review process (Tranfield et al., 2003; Kitchenham & Charters, 2007). According to on Garza-Reyes (2015), there are five phases of SLR. First phase is question formulation which will formulate research questions that will guide the research. Second phase which is locating studies and third phase which is study selection and evaluation will locate, select, and evaluate relevant literatures. Fourth phase are synthesis and analysis which will synthesize and analyze selected articles, then final phase which is reporting and using the result to report the findings. In this study, researcher will conduct SLR by using journal form which are Elsevier (sciencedirect.com), IEEE (ieeexplore.ieee.org), Researchgate, Advances in Business Research International Journal (ABRIJ), World Academy of Science, Engineering and Technology, Emerald Insight, Journal of Emerging Economies and Islamic Research (JEEIR), and The South African Society for Animal Science (Sasas), within year 2012-2017 that are focused only to *halal* processed meat product on production in food industry.

Then, in order to define research position specifically, researcher will use k-chart. It is a tool for research planning and monitoring which is developed by Khazani et al. (2006) based on Zasyana (2016) and Ulandari (2016) research before. It will show clear organization and designation of issues under study, the methodologies adopted, the detail results expected and the timelines for each of the results, as well as the monitoring features. Therefore, it will be explained started from the general issue until chosen topic that is *halal* SCM in food industry, and the method used to synthesis and analyze the paper which is systematic literature review.

The Figure 3.1 below shows the k-chart of the research. It begins by showing the general issue of research which is *halal* SCM, and sub issues are processed meat product, until on concern sub issue in macro processes of supply chain.

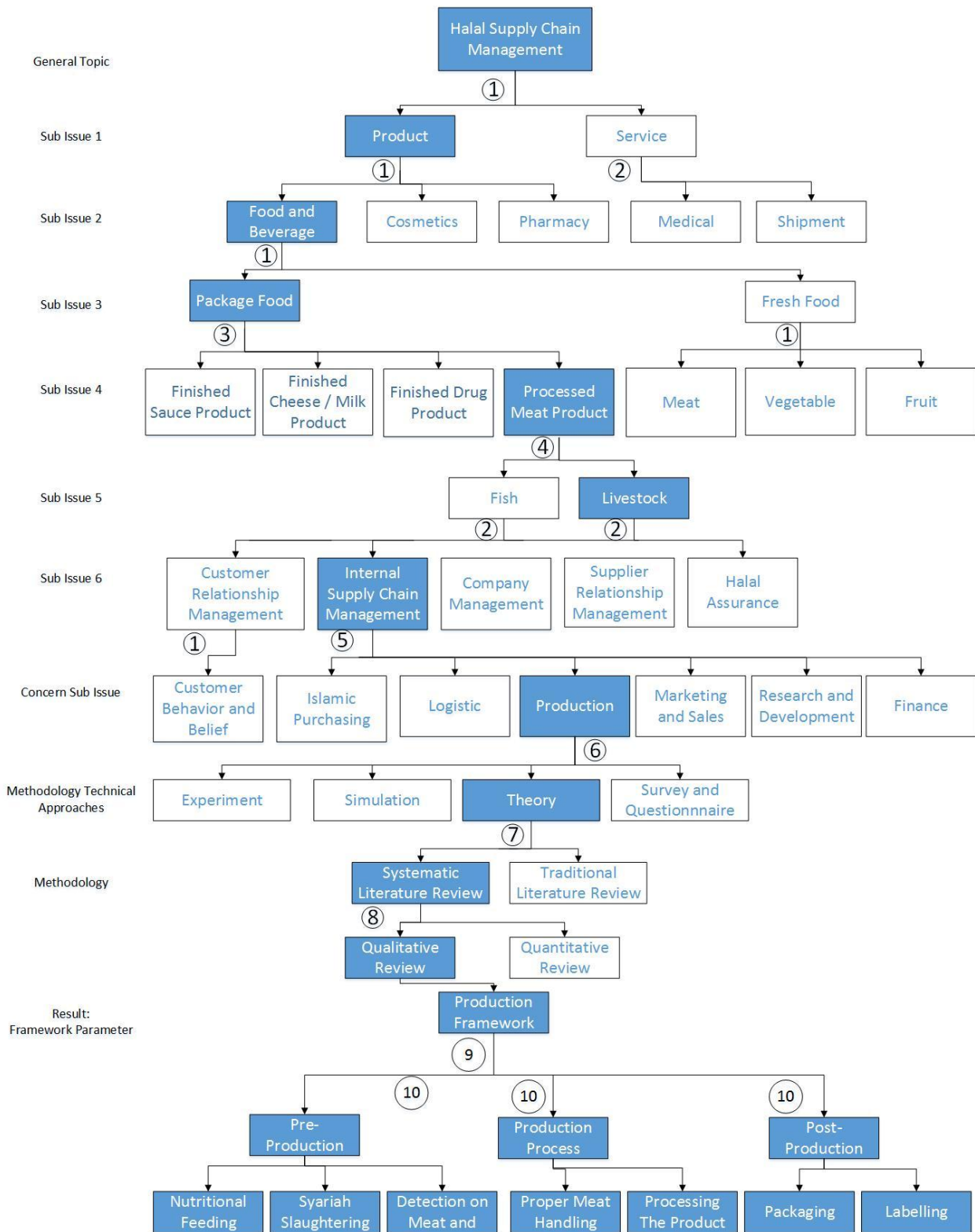


Figure 3.1. K-Chart of research

#### Sources Description:

1. (Ulandari, 2016)
2. (Zasyana, 2016)
3. (Lubis, 2016)
4. (Farouk et al., 2014)
5. (Noordin et al., 2014)
6. (Zainudin, 2006)
7. (Siswanto., 2010)
8. (Kitchenham, 2004)
9. (Farouk, 2016)
10. (Farouk, 2013)

Based on Figure 3.1. above, the next sub on design parameters which is production. SLR then is chosen to be the method to do the research. Last, the k-chart will show the steps of SLR.

#### **3.4. Conceptual Model**

Focus on the topic that already mentioned in K-Chart above, then method and tools should be determined and prepare to review the literature systematically. Implementing the conceptual model of Garza-reyes (2015) to conduct systematic literature, so there are five phase that must be prepared. The picture below shows the step and tools that needed to conduct systematic literature based on the reference.

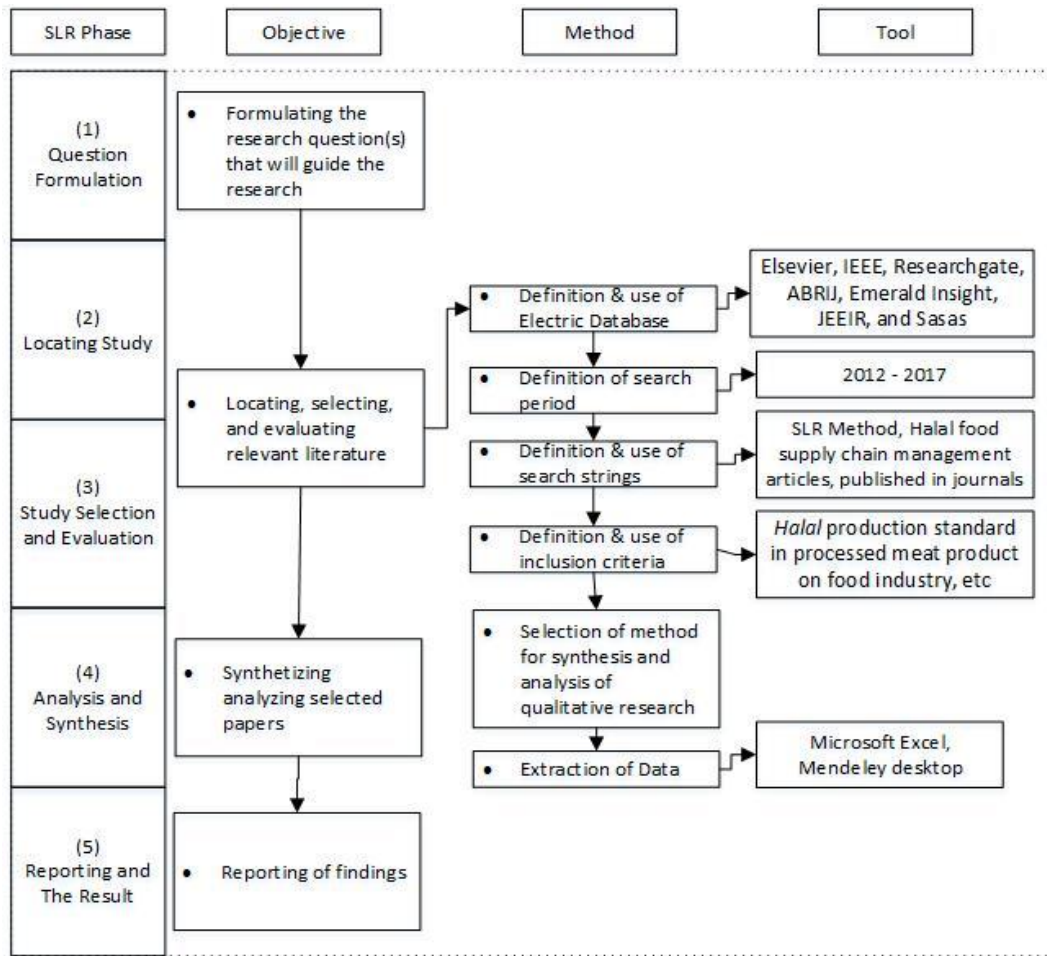


Figure 3.2. Step, Method, and Tools of Systematic Literature Review

Figure 3.2. above shows that there are five steps of systematic literature review and there are three points as the step stone to get the result, those are objective, method and tool. Objective is the specific explanation of what to do in the phase, and then method is the further information of how the phase will be performed and the last tool will be applied to complete the method. Further information of each steps will be explained below:

### 1. Question formulation

It will formulate research question that will guide the research on standards in *halal* supply chain management for food industry.

### 2. Locating Study

This phase is designated to choose the electronic databases which are Elsevier and IEEE to find the papers and its search period which starts from 2011 until 2015.

### 3. Study selection and evaluation

This phase will define inclusion criteria and search strings. Then, in terms of the search strings, they were specified based on the main topics of the phenomena under investigation (Garza-Reyes, 2015). There are following search string was eventually used: (SLR OR literature review) AND (synthesis OR analysis review) AND (halal SCM OR halal meat OR halal processed meat product OR halal production) AND (traceability) AND (syariah production meat process OR syariah slaughtering) AND (halal packaging OR halal labelling OR certification). The search string was subsequently adjusted to suit the specific requirements of each database. They will cover only articles that published in academic journals and proceedings of international conferences with reference to *halal* global standards in whole process of supply chain in food industry.

### 4. Synthesis and analysis

This phase will synthesize and analyze the selected papers. The papers will be synthesized into macro processes of *halal* SCM, publication journal, and publication year. It will also analyze whole process of *halal* SCM in food industry in order to ensure the *halal* integrity.

### 6. Reporting and using the report for further research.

This phase will report the result of analysis and use it for further research.

## 3.5. Tools Analysis

This research uses some tools in synthesizing and analyzing the relevant papers, which are mentioned as follows:

#### 1. Microsoft Excel®

This tool is used for the synthesis of data and paper. The formula used is basic formula to sum and make graphics that has been provided by this software.

#### 2. Mendeley Desktop®

The tool is used to collect and arrange papers, then select and analyze those papers and journals, it also helps to create the references and citations

#### 3. K-Chart

The K-chart is used to analyze the position of this research. The method is developed by Khazani et al., (2006), and K-Chart can be seen in Figure 3.1.

#### 4. Visio 2016

In order to arrange the figure of step, k-chart, and other, researcher use Visio as the tool.

### 3.6. Flow of Research

The flow of research will be shown in Figure 3.3 below, it shows all steps in systematic literature step on this research.

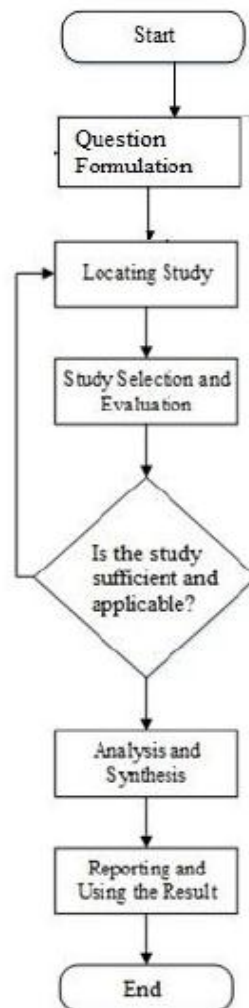


Figure 3.3. Research Flowchart

The research starts from question formulation in order to know the objective of the research. Then it will be preceded to the locating study, study selection and evaluation in order to find related studies to the topic. The collected data will be selected and evaluated, if the paper can be

used to support the study then it will transfer to next stage but if the paper is inappropriate then re-collecting paper is needed. The appropriate studies then will be synthesized and analyzed in order to get a proper result. In the end, the result of reporting stage will be used as the reference for further research.

## CHAPTER IV

### DATA SYNTHESIS AND ANALYSIS

This chapter will explain about the data synthesis and data analysis which is a part of literature review. The explanation about method for these analysis and synthesis, and how the extraction data from several papers to find a new invention related topic.

#### 4.1. Data Synthesis

There are 62 papers suitable with the selection criteria. The papers referred to conduct the SLR method and production scope of *halal* processed meat product on food industry as well as related topics of *halal* production (including pre-production, production process, post-production), standards in *halal* certification, *halal* SCM, *halal* food industry, and *halal* certification. These papers that found, consist of some sub-topic that has correlation among each other which create a framework of *halal* supply chain of *halal* processed product meat, focus on production. Below it will be shown the synthesis data result that are derived from paper to conduct systematic literature review. Synthesizing is classified based on sub-topic, publication of journal and year of publication. Each sub-topic contribution, researcher make the percentages, it can be seen in Figure 2.3.

Figure 2.3. shows the distribution of journal complied with SLR method and *halal* meat processed product of *halal* SCM. In this study, there are 3% or 2 papers about *halal* parameters out of 62 papers, 16% or 10 papers explain about SLR scope and with the same amount about package food focused on *halal* meat product of 62 papers, and then 65% or 40 papers about production of *halal* processed meat product from total 62 papers.

Then on Figure 2.4 shows the publication year, it illustrates the publication year from the papers applied in this research, it employed papers that are taken from 2012 until 2017. From the 2012 publication, 12 papers were taken for the research, 8 papers from 2013, 13 papers from 2014, 8 papers from 2015, 12 papers from 2016, and 9 papers from 2017.

Later, Figure 2.5. shows the electronic publisher of papers that applied with the total papers are 62 that used in this thesis. In terms of number of publication paper, Elsevier (sciencedirect.com) is the most commonly with the amount 49 papers. Second, there are 4 papers from Researchgate. IEEE and Emerald Insight have taken amount, there are 2 papers. Lastly, researcher have taken 1 paper each of JEEIR, IJSSH, Sasas, MDPI, and ABRIJ.

Then, in order to find further research recommendation to explore better solution in processed meat product focusing on production on *halal* supply chain, researcher also classifies findings into their papers scope, as mentioned in Table 4.1. below.

Table 4.1. Conduct the SLR Method and *Halal* Processed Meat Product Paper Findings

Topic	Year	Author	Electronic Publication Database	Publication Journal	Title
Conducting SLR method	2013	Min Shi Wei Yu	Emerald Insight	International Journal of Operations & Production Management	Supply chain management and financial performance: literature review and future directions
	2014	Sunil Nair, Jose Luis de la Vara, Mehdrad Sabetzadeh, Lionel Briand	Elsevier	Information and Software Technology	An extended systematic literature review on provision of evidence for safety certification
	2015	Nooren N. A. Aziz, Nurul Aien Abd. Aziz, Nurul Ashykin Abd Aziz, Zurina Omar, Wan Haslin Aziah Wan Hassan	Elsevier	Economics and Finance	A Review on the Emergence and Growth of Halal Studies

	2016	Thomas E. Johnsen, Joe Miemczyk Mickey Howard	Elsevier	Industrial Marketing Management	A systematic literature review of sustainable purchasing and supply research: Theoretical perspectives and opportunities for IMP-based research
	2016	Rameshwar Dubey, Angappa Gunasekaran Thanos Papadopoulos, Stephen J. Childe, K.T. Shibin , Samuel Fosso Wamba	Elsevier	Journal of Cleaner Production	Sustainable supply chain management: framework and further research directions
	2016	Josenildo Brito Oliveira, Renato Silva Lima, JoséArnaldo Barra Montevechi	Elsevier	Simulation Modelling Practice and Theory	Perspectives and relationships in Supply Chain Simulation: A systematic literature review
	2017	T. Akhigbe, A. Zolnourian, D. Bulters	Elsevier	Journal of Clinical Neuroscience	Compliance of systematic reviews articles in brain arteriovenous
	2017	Maeve M. Henchioni, Mary McCarthy, Virginia C. Resconi	Elsevier	Meat Science	Beef quality attributes: A systematic review of consumer perspectives
	2017	Mohammed Ali, Eman S. Nasr, Mervat Geith	Elsevier	Future Computing and Informatics Journal	Benefits and Challenges of Cloud ERP Systems - A Systematic Literature Review
	2017	Daniela Quiñones, Cristian Rusu	Elsevier	Computer Standards & Interfaces	How to Develop Usability Heuristics: A Systematic Literature Review
Obedience to commands of Allah to obey the	2015	M. Farouk, J.M. Regenstein, M.R. Pirie, R. Najm, A.E.D. Bekhit, S.O. Knowles	Elsevier	Food Research International	Spiritual aspects of meat and nutritional security: Perspectives and responsibilities of the Abrahamic faiths

Qur'an and the Hadith of the Prophet	2017	Sira Abdul Rahman	MDPI	Animals	Religion and Animal Welfare – An Islamic Perspective
	2012	M.E. Ali, U. Hashim, S. Mustafa, Y.B. Che Man, Th.S. Dhahi, M. Kashif, Md. Kamal Uddin, S.B. Abd Hamid	Elsevier	Meat Science	Analysis of pork adulteration in commercial meatballs targeting porcine-specific mitochondrial cytochrome b gene by TaqMan probe real-time polymerase chain reaction
	2012	Emi N. Omar, Harlina Suzana Jaafar, Muhamad Rahimi Osman <sup>3</sup>	ABRIJ	Advances in Business Research International Journal	Halal Supply Chain: A Preliminary Study of Poultry Industry
	2012	Khadijah Nakyinsige, Yaakob Bin Che Man, Awis Qurni Sazili	Elsevier	Meat Science	Halal authenticity issues in meat and meat products
	2012	Nor Marini Mohtara, Nur Alia Amirnordin, Dr. Hazliza Haron	Elsevier	Procedia - Social and Behavioral Sciences	Ayamas Food Corporation Sdn. Bhd: A Study on the Factors of Consumer Behaviour towards Halal Product Selection
	2013	Morten T. Paulsen, Alexia Nys, Randi Kvarberg, Margrethe Hersleth	Elsevier	Meat Science	Effects of NaCl substitution on the sensory properties of sausages: Temporal aspects
Packaged Food Focused on Processed Meat Product	2015	M. E. Ali, Md. Abdur Razzak, Sharifah Bee Abd Hamid, Md. Mahfujur Rahman, Md. Al Amin, Nur	Elsevier	Food Chemistry	Multiplex PCR assay for the detection of five meat species forbidden in Islamic foods

		Raifana Abd Rashid, Asing			
	2016	Hamadah Nur Lubis, Noor Faizah Mohd-Naim, Nur Nazurah Alizul, Minhaz Uddin Ahmed	Elsevier	Trends in Food Science & Technology	From market to food plate: Current trusted technology and innovations in halal food analysis
	2017	Adam T. Perestam, Kayleigh K. Fujisaki, Omar Nava, Rosalee S. Hellberg	Elsevier	Food Control	Comparison of real-time PCR and ELISA-based methods for the detection of beef and pork in processed meat products
	2017	Massimo De Marchi, Carmen L. Manuelian, Sofia Tona, Davide Manfrin, Michele Meneghesso, Martino Cassandro, Mauro Penasa	Elsevier	Meat Science	Prediction of sodium content in commercial processed meat products using near infrared spectroscopy
	2017	Elena S. Inguglia, Zhihang Zhang, Brijesh K. Tiwari, Joseph P. Kerry, Catherine M. Burgess	Elsevier	Food Science & Technology	Salt reduction strategies in processed meat products e A review
	2012	Zurina Shafii, W.M.N. Wan Siti Khadijah	Elsevier	World Applied Sciences Journal	Halal Traceability Framework for Halal Food Production
	2012	B. Agbeniga & E.C. Webb	Sasas	South African Journal of Animal Science	Effect of slaughter technique on bleed-out, blood in the trachea and blood splash in the lungs of cattle
<i>Halal Product ion, including halal pre-product</i>	2012	N.G. Gregory, P. Schuster, L. Mirabito, R. Kolesar, T. McManus	Elsevier	Meat Science	Arrested blood flow during false aneurysm formation in the carotid arteries of cattle slaughtered with and without stunning

ion, <i>halal</i> product ion process	2012	E. Lambooi, J.T.N. van der Werf, H.G.M. Reimert, V.A. Hindle	Elsevier	Meat Science	Restraining and neck cutting or stunning and neck cutting of veal calves
, and <i>halal</i> post- product ion	2012	John Lever, Mara Miele	Elsevier	Journal of Rural Studies	The growth of halal meat markets in Europe: An exploration of the supply side theory of religion
	2012	Marzuki, S. Z. S., Hall, C. M. and Ballantine, P. W	Researchgate	Journal of Foodservice Business Research	Restaurant manager and halal certification in Malaysia
	2012	Rezai, G., Mohamed, Z. and Shamsudin, M. N.	IJSSH	Pertanika Journal of Social Science & Humanity	Assessment of consumers' confidence on halal labelled manufactured food in Malaysia
	2012	Van der Spiegel, M., van der Fels- Klerx, H. J., Sterrenburg, P., van Ruth, S. M., Scholtens-Toma, I. M. J., & Kok, E. J	Elsevier	Trends in Food Science & Technology	Halal assurance in food supply chains: Verification of halal certificates using audits and laboratory analysis
	2013	Fabrizio Dabbene a, Paolo Gay a,b,*, Cristina Tortia	Elsevier	Biosystems Engineering	Traceability issues in food supply chain management: A review
	2013	Tieman, M	JEEIR	Journal of Emerging Economies and Islamic Research	Establishing the principles in halal logistics
	2013	M. Farouk	Elsevier	Meat Science	Advances in the industrial production of halal and kosher red meat
	2013	K. Nakyinsige, Y.B. Che Man, Zeiad A. Aghwan, I. Zulkifli, Y.M. Goh, F. Abu Bakar, H.A. Al- Kahtanih, A.Q. Sazili	Elsevier	Meat Science	Stunning and animal welfare from Islamic and scientific perspectives

2013	Aziz, Y. A., and Chok, N. V	Researchgate	Journal of International Food & Agribusiness Marketing	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
2013	Ratanamaneichat, C., & Rakkarn, S	Elsevier	Procedia - Social and Behavioral Sciences	Quality Assurance Development of Halal Food Products for Export to Indonesia
2014	Ngah, A. H., Zainuddin, Y., & Thurasamy, R	Elsevier	Procedia - Social and Behavioral Sciences	Adoption of Halal Supply Chain among Malaysian Halal Manufacturers: An Exploratory Study
2014	Tieman, M., & Ghazali, M. C	Elsevier	Procedia - Social and Behavioral Sciences	Halal Control Activities and Assurance Activities in Halal Food Logistics
2014	H. Aidaros	Researchgate	Rev sci tech OIE	Drivers for animal welfare policies in the Middle East
2014	Murshidul Ahsan, Badrul Hasan, Magnus Algotsson, & Sirkku Sarenbo	Researchgate	Journal of Applied Animal Welfare Science	Handling and Welfare of Bovine Livestock at Local Abattoirs in Bangladesh
2014	M. Farouk, H.M. Al-Mazeedi, A.B. Sabow, A.E.D. Bekhit, K.D. Adeyemi, A.Q. Sazili, A. Ghani	Elsevier	Meat Science	Halal and Kosher slaughter methods and meat quality: A review
2014	Temple Grandin	Elsevier	Meat Science	Animal welfare and society concerns finding the missing link
2014	D.L. Hopkins, E.H. Clayton, T.A. Lamb, R.J. van de Ven, G. Refshauge, M.J. Kerr, K. Bailes, P.	Elsevier	Meat Science	The impact of supplementing lambs with algae on growth, meat traits and oxidative status

	Lewandowski, E.N. Ponnampalam			
2014	A. Velarde, P. Rodriguez, A. Dalmau, C. Fuentes, P. Lloncha, K.V. von Holleben, M.H. Anil, J.B. Lambooi, H. Pleiter, T. Yesildere, B.T. Cenci-Goga	Elsevier	Meat Science	Religious slaughter: Evaluation of current practices in selected countries
2014	Noordin, N., Noor, N. L. M., & Samicho, Z	Elsevier	Procedia - Social and Behavioral Sciences	Strategic Approach to Halal Certification System: An Ecosystem Perspective
2014	Shariff, S. M., & Lah, N. A. A	Elsevier	Procedia - Social and Behavioral Sciences	Halal Certification on Chocolate Products: A Case Study
2014	Fauzi, A. S., Hidayah, N. A., & Kumaladewi, N	IEEE	Cyber and IT Service Management	E-Service System Design in Registrating Certification and Presentating Halal Product Information on the Indonesian Olema Council ( Case Study : Indonesian Olema Council ( MUI ) Bogor Regency )
2014	Yunus, N. S. N. M., Rasyid, wan endura wan, Ariffin, N. M., & Rashid, N. M	Elsevier	Procedia - Social and Behavioral Sciences	Muslim's Purchase Intention towards Non- Muslim's Halal Packaged Food Manufacturer
2015	Delma Poniman, Sharon Purchase, Joanne Sneddon	Emerald Insight	Asia Pacific Journal of Marketing and Logistics	Traceability systems in the Western Australia halal food supply chain
2015	Ikhsan Bani Bukhoria, Kuncoro Harto Widodo, Dyah Ismoyowati	Elsevier	Procedia - Agriculture and Agricultural Science	Evaluation of Poultry Supply Chain Performance in XYZ Slaughtering House Yogyakarta using SCOR

				and AHP Method
2015	Al-Busaidi, M. A., & Jukes, D. J	Elsevier	Food Control	Assessment of the food control systems in the Sultanate of Oman
2015	Kadir, E. A., Shamsuddin, S. M., Kamal, S., & Rahim, A.	IEEE	Information and Communication Technology	Application of NFC Technology for Premise Halal Certification
2015	M. Rocío Teruel, M. Dolores Garrido, Miriam C. Espinosa, M. Belén Linares	Elsevier	Food Chemistry	Effect of different format-solvent rosemary extracts ( <i>Rosmarinus officinalis</i> ) on frozen chicken nuggets quality
2016	Azmawani Abd Rahman, Hassan Barau Singhry, Mohd Hizam Hanafiah, Mohani Abdul31	Elsevier	Food Control	Influence of Perceived Benefits and Traceability System on The Readiness for Halal Assurance System Implementation Among Food Manufacturers
2016	Z.A. Aghwan, A.U. Bello, A.A. Abubakar, J.C. Imlan, A.Q. Sazili	Elsevier	Meat Science	Efficient halal bleeding, animal handling, and welfare: A holistic approach for meat quality
2016	Cristina Alamprese, José Manuel Amigo, Ernestina Casiraghi, Søren Balling Engelsen	Elsevier	Meat Science	Identification and quantification of turkey meat adulteration in fresh, frozen-thawed and cooked minced beef by FT-NIR spectroscopy and chemometrics
2016	M. Farouk, K.M. Pufpaff, M. Amir	Elsevier	Meat Science	Industrial halal meat production and animal welfare: A review
2016	Awal Fuseini, Toby G. Knowles, Phil J. Hadley, Steve B. Wotton	Elsevier	Meat Science	Halal stunning and slaughter: Criteria for the assessment of dead animals
2016	Hamadah Nur Lubis, Noor Faizah Mohd-Naim, Nur Nazurah Alizul, Minhaz Uddin Ahmed	Elsevier	Trends in Food Science & Technology	From market to food plate: Current trusted technology and innovations in halal food analysis
2016	Wan Rusni Binti	Elsevier	Procedia	Halal Malaysia Logo or

	Wan Ismail, Mohhidin Othman, Russly Abdul Rahman, Nitty Hirawaty Kamarulzaman, and Suhaimi Ab. Rahman		Economics and Finance	Brand: The Hidden Gap
2016	Evelin Francine Wigmann, Rafael Chelala Moreira, Veronica Ortiz Alvarenga, Anderson S. Sant'Ana, Marina Venturini Copetti	Elsevier	Food Microbiology	Survival of <i>Penicillium</i> spp. conidia during deep- frying and baking steps of frozen chicken nuggets processing
2017	Awal Fuseini, Steve B. Wotton, Phil J. Hadley, Toby G. Knowles	Elsevier	Meat Science	The perception and acceptability of pre- slaughter and post- slaughter stunning for Halal production: The views of UK Islamic scholars and Halal consumers

## 4.2. Data Analysis

Based total 62 papers that relate to research topic, which are SLR method, package food, *halal* production. These papers are selected using SLR method. A SLR is a means of identifying, evaluating and interpreting available research relevant to a particular research question or topic area. Then researcher has sub-topic of the research which creates a *halal* processed meat product framework focusing on *halal* production and the framework of the use of SLR. In sub-topic of *halal* processed meat product focusing on *halal* production scopes consist of pre-production, production process, and post-production. The framework of production can be seen in Figure 4.5.

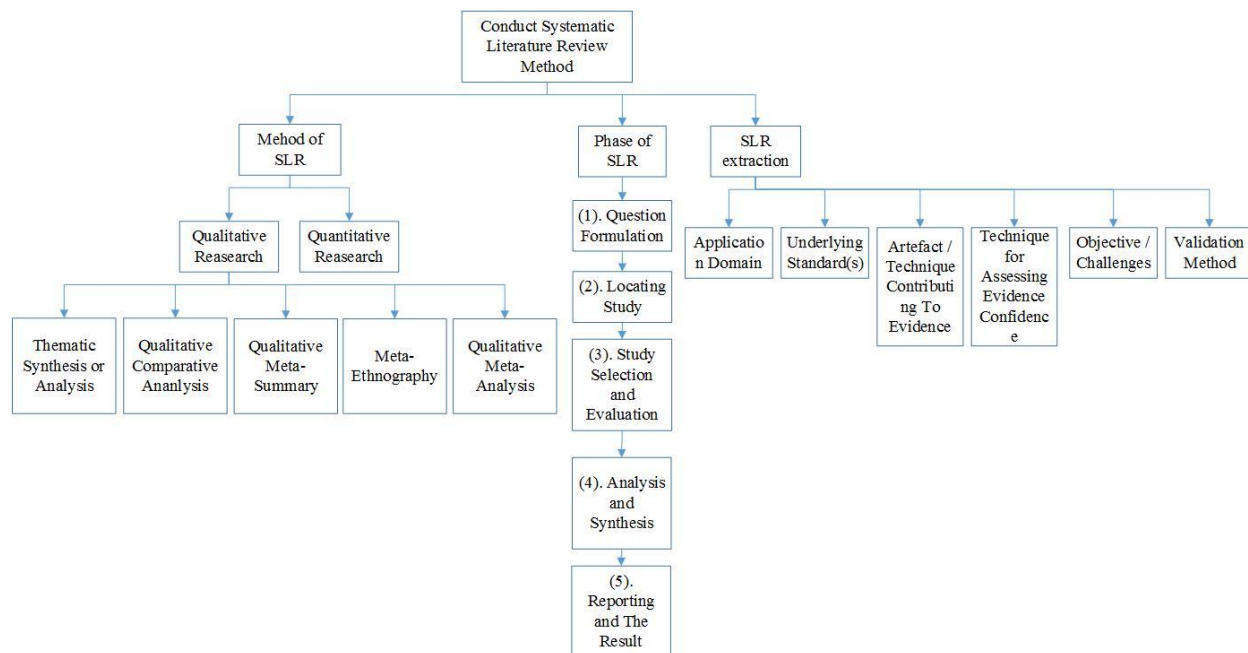


Figure 4.1. Conduct SLR Method Framework

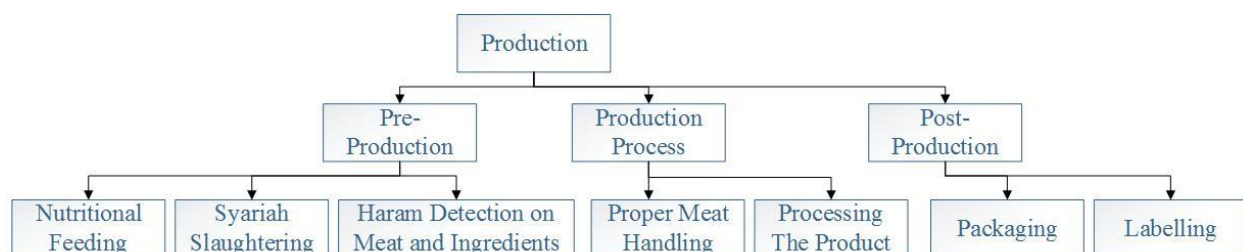


Figure 4.2. Production Framework

Figure 4.1. shows the framework of SLR method, which consists of technique method in SLR, phase of SLR, SLR extraction. It shows that are some technique methods that can be used on SLR, that are qualitative and quantitative. In qualitative scope, it will be divided into various methods can be included to perform systematic literature review which are thematic synthesis or analysis, qualitative comparative analysis, qualitative meta-summary, meta-ethnography, qualitative meta-analysis (Garza-Reyes, 2015). In this research, the researcher using qualitative research with thematic synthesis analysis. Then the phase of SLR and extraction will be discussed below.

Figure 4.2. shows the sub-topic of studies which create a framework of *halal* production for *halal* processed meat product. It shows that there several aspects that must be concerned and considered about in order to create a supply chain production framework and production framework to keep the *halal*-level since the source such as meat, ingredients, nutrition for livestock, the tools, the process, packaging, distributing, etc., still *halal* until it touched by customer 's hand. Below is the short explanation on the contribution of each sub-topic in order to create a production framework and production framework of *halal* supply chain for *halal* processed meat product.

#### 4.2.1. Conduct Systematic Literature Review Identify

Researcher performed study selection and evaluation on published in academic journals and proceedings of international conferences. Researcher found discussion on the way to conduct SLR method in 10 papers, consists of Yu (2013), Nair et al. (2014), Nooren et al. (2015), Johnsen et al. (2016), Dubey et al. (2016), Oliveira et al. (2016), Akhigbe et al. (2017), HENCHIONI et al. (2017), Mohammed et al. (2017), Quiñones and Rusu (2017). The extracted findings of SLR identification can be seen on Table 4.2. All of researches above, use SLR method that according to Tranfield et al. (2003) and Khan et al. (2003) has five phase processes. First is formulating topic. Second is selecting location studies of journal article. Third, the researcher performs study selection and evaluation. Hence, if search string is valid, researcher can continue the phase, that is synthesis and analysis. In the end of fifth phase, this research will meet the research finding.

Table 4.2. Extracted Data for The use of SLR Findings

Authors	Topic Domains	Location Studies	Journal Period	Keyword Use	Finding
Yu (2013)	Financial Impact of SCM	ABI/INFORM S, Business Source Premier, Emerald	1990 - 2011	“supply chain performance”, “supply chain financial performance”,	SC sourcing strategy, information technology, system

		Fulltext, JSTOR, ScienceDirect, and Wiley Online Library		“supply chain financial metrics”, “supply chain and shareholder value”, “supply chain and firm value”, and “financial impact of supply chain management”	integration, and external relationship are positively affecting financial of firm
Akhigbe et al. (2017)	Health Care - Brain Arterioven ous Malformat ion (AVM)	Medline, Embase	1st of May 2011 and 30th April 2016	“SLR”, “meta- analysis”, “human studies”, “brain AVM management”, “PRISMA”	Examined the article with PRISMA statement guidelines.
Dubey (2016)	SSCM	Proquest, Science Direct, EBSCO, SCOPUS, Emerald, Springer, Inspec, and Compendex.	2000 - 2016	“sustainable supply Chain”, “green supply chain”, “sustainability”, “drivers”, and “strategic Framework”	the relationship among drivers of SSCM practices and develop a theoretical SSCM drivers' framework
Nooren et al. (2015)	Theory of Planned Behavior (TPB) and specificall	Emerald, Science Direct, Google Sccholar	2007 - 2014	“Halal Study”, “Theory of Planned Behaviour”	the greatest intentions led him to study Halal Food / Food Outlet /

	y on halal studies				Meat, compared to other halal studies such as cosmetics, labeling, and certification.
Henchioni et al. (2017)	Food – Beef Quality	ISI Web of Knowledge and ProQuest (FSTA® and CAB ABSTRACTS databases)	January 2000 to September 2013	“quality & consumer and meat”, “beef”, “quality attribute”, “quality cue”, “consumer expect”	consumers’ attitudes towards meat quality encompassed a large number of attributes
Quiñones and Rusu (2017)	Usability Heuristic	Science Direct; ACM Digital Library; IEEE Xplore Digital Library; Springer Link; Scopus; and Google Scholar	January 2006 to April 2016	"usability", "heuristic", “usability heuristic”, “usability heuristics”, "heuristic evaluation"	the development of usability heuristics for specific domains.
Johnsen et al. (2016)	Sustainable Purchasing and Supply	Academy of Management Perspectives Journal, International Journal of Retail & Distribution Management	Didn’t specify a start date (identified the first article as published in 1978,	purchase, procure, source, supply, supplier, network, (AND) green, social, environment, sustainable, responsible and stakeholder.	The IMP perspective is an opportunity for sustainability researchers seeking to better understand firm interaction in a network

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			until May 2015)		environment and vice versa sustainable purchasing and supply management
Nair et al. (2014)	SLR method	ACM, IEEE, Springer, Elsevier, Wiley, Google Scholar	1990 – January 2012	“safety certification”, “safety standards”, “safety requirements”, “evidence”, “critical software”, “critical system”	the evidence taxonomy developed, provide a concrete reference for learning and tailoring the various types of evidence that may be required during certification.

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SLR is increasingly used on many researches to critically appraise and summarize all empirical evidences from multiple research studies or papers. SLR method can be used on several domains of research to more evaluate and review further problems. The application domains such as food, medical, financial, SCM, automotive, robotics, maritime and others (Nair et al., 2014). The example use of SLR is contained in Yu (2013) research, with evaluation and sample review of the literature relating to the financial impacts of SCM and suggest future research directions.

Then, SLR become significance in Akhigbe et al. (2017) research with health care problem, where their research is to compliance of SLR articles in brain arteriovenous

malformation (AVM). They developed compliance SLR using meta-analyzes based on QUORUM Guidelines, once used by Moher D. et al. (1999). This study was updated by the Preferred Reporting Items for Systematic Reviews and Meta-analyses statement (PRISMA) (Moher D. et al., 2009). PRISMA provides a guideline of twenty-seven items that are recommended in order to be equipped to review or appraise existing literatures based on known deficit to look for or expect. It will improve quality and full reporting of systematic reviews ultimately improving quality of evidence in the management of brain AVM. First they taken strictly paper filtering on Medline (4236 papers) and Embase (2407 papers) as journal publisher that related to brain AVM. Then found 23 papers out of the total papers, which were considered feasible full-text relevant to the focus and years of the papers, they finally got the 7 papers where the papers were also used SLR in research methods. Finally, the mean percentage result of applicable PRISMA items that were met across all studies was 74% (range 67–93%). This shows that systematic review published in leading journals do not necessarily comply fully with all domain of PRISMA statement guidelines.

Then the article from Dubey (2016) which revealed about SLR by illustrating the use of Total Interpretive Structural Modelling (TISM) in SSCM problem. This paper pointed out the approaches and techniques that involved the dynamic nature of SSCM and bridged the existing quantitative/qualitative gap. To address this gap, this paper firstly systematically reviewed the literature on SSCM drivers; secondly, it argued the use of alternative methods research to address questions related to SSCM drivers; and thirdly, it proposed and illustrated the use of TISM and Cross Impact Matrix-multiplication applied to classification (MICMAC) analysis to test a framework that extrapolates SSCM drivers and their relationships. That article used TISM to understand more on the relationship among drivers of SSCM practices and develop a theoretical SSCM drivers' framework.

The next research from Nooren et al. (2015) tended to use rules SLR based on Theory of Planned Behavior (TPB) with specifically on halal studies, difference with advanced SLR above. TPB had widely been practiced and proven as the best way in predicting individual intention on consumption, then still in this article from Nooren, TPB has been an important model in determining food related behavior (Cook, 2000). This was evidenced by the results of such

research, which conditioning the 17 papers that cover the halal topic and the use of SLR method. Steps include making decisive keywords in the journal database, selecting the publication year between 2007-2014 restrictions on halal research, and with thematic systematic review and analysis to find the intentions of researchers on halal scope, and then decrypt them into the results. At the end, from the all seventeen papers studied, the greatest intentions led him to study Halal Food / Food Outlet / Meat, compared to other halal studies such as cosmetics, labeling, and certification.

In fact, the opinion from HENCHIONI et al. (2017), the research tended to use systematic review synthesis and analysis, provided an opportunity to identify these studies and to collate and synthesis the findings as to provide a holistic view on the meat quality attributes of importance result. Then on SLR process found 15 papers to use in research, published in International journal between 2000-2013. The systematic review undertaken for this paper followed the five steps described by Khan et al. (2003), i.e. 1) framing the question; 2) identifying relevant publications; 3) assessing study quality with search string; 4) summarizing the evidence; and 5) interpreting the findings. Another research that use this standard is from Quiñones and Rusu (2017) about Develop Usability Heuristics, Johnsen et al. (2016) about Sustainable Purchasing and Supply, and Mohammed et al. (2017) about Benefits and Challenges of Cloud ERP Systems.

Then, research from Nair et al. (2014) also used SLR method and the standard steps to discuss deeply about a research that uses SLR method in further, and the research recommended safety certification with the advance extracted from the primary studies, which consist of:

- a. Application domain; To show the scope of research within SLR
- b. Underlying standard; Some of scope have the standard of application. If the research has the standard, researcher should to cite it.
- c. Contributing to evidence; It is important to make the following clarifications about the structuring technique. Such as qualitative assessment, checklist, logic based assessment.
- d. Technique for assessing evidence confidence; to determine how the evidence collected can be assessed for its adequacy and to obtain confidence that satisfies the standard of safety

requirements, and thereby confidence in the overall safety of a system. Such as argumentation, model, or textual template

- e. Supporting Tool; The tools that will assist to find the result. The examples of tools are Ms. Excel, Visio, Matlab, and other supporting tools.

Objective/challenges; The results obtained will be useful to identify emerging trends and provide an overall view of the problems tackled in the literature.

- f. Validation method.; Which was assigned based on how a given study had been validated. The studies were classified as: case study (validated during projects by practitioners different from the authors), field study (validated with data from real projects, but not during the execution of the projects), action research (validated during real projects by the authors themselves), survey (validated on the basis of practitioners' opinion and perspectives), or none.

#### **4.2.2. Processed Meat Product**

Referring to Nooren et al. (2015) research, the most important concept in Islam is the concept of halal. Halal industry plays an important role in the whole world, especially for Muslim society. The result of their review research show that most of the articles written on the halal studies focused on halal food, and need from other researcher to contribute and develop of halal food industry.

The demand for *halal* food consumption is increasing annually as a result of the rising number of Muslim population globally, which is approximately 1.8 billion, beat other industrial markets, such as pharmaceuticals, health products, cosmetics, travel and tourism. Table 2.2. shows the halal food market and the consumption of halal food, with a population of 1.8 billion Muslims in the world, in over ten years approximately 140% of the growth of Muslims in Europe and 1 billion Muslims living in Asia (Omar, et al., 2012). Yousef (2010) highlighted that the *halal* food market constituted about 16 percent of the world food trade in which the trade value has been estimated as US\$547 billion in the global *halal* market. Consequently, the trend has attracted the attention of all countries to generate more *halal* food producers.

According to Omar et al., (2012) that has been completed his research in Malaysia. The National Product and Expenditure Accounts reported Malaysia as one of the countries with a majority Muslim population, approximately of 6.9 percent growth in the agricultural sector in the Fourth Quarter of 2011. Most of the growth was contributed by palm oil (16.4 percent), livestock (9.6 percent) and other agriculture such as vegetables and a fruit subsectors (6.4 percent). The poultry industry has been the major contributor of the growth from the livestock products due to its highest consumption, thus reflecting the substantial importance of the products. According to Farouk (2013), beside the consumption of people, the needs value from imported halal and kosher red meat and co-products of some selected countries/regions in 2011 are high, based on Table 2.3.

Once the magnitude of the consumption of poultry products is one of the animals, researchers focused more on these dairy products. Some researchers such as Ali et al. (2012), Omar et al. (2012), Nakyinsige et al. (2012), Mochtar et al. (2012), Paulsen et al. (2013), Perestam et al. (2017), Marchi et al. (2017), and Inguglia et al. (2017), express an opinion on the amount of meat products derived from animals, such as meatballs, nuggets, sausages, hamburgers, cured meat, smoked beef, hot dog, minced meat etc., which is included in the processed meat products and includes packaged food products.

### **4.2.3. Production**

From total number 30 papers complied with selection criteria, it selected which correlated with production for *halal* processed meat product which are pre-production, production process, and post-production. In the following sections, will be explanation from the different study of *halal* supply chain focus on *halal* meat.

#### **4.2.3.1.Pre-Production**

##### **a. Nutritional Feeding on Animals Permitted**

Feeding and vaccine are permitted to animals by Qur'an and hadith (Farouk et. al, 2016). There are feeding ways for herbivore animal that are natural and morally acceptable in

Islam. By Islamic law, to feed a herbivores animals could be equated to feed them filth and eat the filth food is forbidden (“Hadith 3785”. Sunan Abu Dawud, Books of Foods. Chapter 25, Book 28, Hadith Number 50 & “Hadith 3786”. Sunan Abu Dawud, Books of Foods. Chapter 25, Book 28, Hadith Number 51). According to it, giving good feed, feeding the animals with food that is good and nourishing, is a necessity. Because it will impact directly to the production of future *halal* meat, as well as the consumer.

Meat and refuse are considered unlawful for animals to consume. There are various opinions among researchers about the required neutralized period between when an animal has eaten unclean food and when it can be slaughtered. This period can vary from 3 days for some animals to up to 40 days for cattle and camels (Ibn-al-Qayyem, undated).

In accordance with strict Islamic law and guidelines, a slaughtered animal is considered halal when its feed is also considered halal; feed therefore plays an important role in halal classification. Feed for animals must be from a vegetable source; no meat feed is allowed.



Figure 4.3. Illustration of Halal Nutritious feed

b. *Syariah* Slaughtering

*Syariah* slaughter is none other than to execute the command of Islam, but indirectly accordance with the standards of OIE (World Organisation for Animal Health) to meet animal welfare meanings (Velarde et al., 2014). All food can be consumed by Muslims except those that are made of or contain the following: carrion or dead animals, blood (flowing or congealed), swine and all its derivatives, animals slaughtered in the name of any other than Allah (how Muslims refer to their God) or not according to Islamic law, animals that were killed accidentally or on purpose through means such as strangling or beating, intoxicants (alcohol and drugs), carnivorous animals, predator birds, and certain land animals (Lubis et.al, 2016). The slaughtering procedure needs to be performed by a sane Muslim who invokes Allah's name while slaughtering and cut the animal's jugular vein in the neck with a sharp knife. This is to allow the rapid draining of blood in order to ensure the quickest death for the animal.

Cattle to be slaughtered must be properly restrained. This is particularly important in *halal* and kosher methods where the animal's neck needs to be presented to the knife and held relatively still until the slaughtering is complete (Agbeniga, 2012). Secure restraint spares the animal from distress, pain, bruises and injury (Lambooij et al., 2012; Velarde et al., 2014). Slaughtering knives were sharp and of different sizes (not measured) and shapes. According to the OIE guidelines, one key requirement for full frontal cutting across the throat is that the blade or knife be of sufficient length so that the point of the knife remains outside the incision during the cut. Instead, the point of the knife was used for stabbing the throat region while cutting. In addition, it was found that short knives required more time than long knives to perform the slaughter, and a sawing motion was applied during the cutting procedure. Applying a larger number of cuts to the neck increases the risk for stimulating free nerve endings in the skin and at the cut edge of the skin, which can induce pain. According to the OIE regulations, after incision of the blood vessels, no carcass-scalding treatment or dressing procedures should be done on the animals for at least 30 s, or in any case, until all brainstem reflexes have ceased. This is based on correctly severing both arteries and veins and the absence of reflexes as a criterion of brain death (Murshidul Ahsan et al., 2014).

The basic requirements for the *halal* slaughter of animals defined by the GCC Member States and contained in Gulf Standards Update (GSO 993/1998), Indonesia (MUI HAS 23103, 2012), Malaysia (MS 1500:2009) and The Islamic Food & Nutrition Council of America, quoted from Farouk (2013) there is the basic requirement for *halal* slaughter, among other: (1) the animal should be alive at the time of slaughter; pre-slaughter treatment such as stunning must not result in the death of the animal before it is slaughtered. Stunned animals, if not slaughtered, must be able to make a full recovery; (2) Allah's (God) name and glorification must be uttered by the slaughterer at the time of the slaughter of each animal; (3) effort should be made to slaughter the animal with one stroke using a very sharp knife; (4) the slaughtering shall be carried out from the front side (towards the chest) and not from behind (towards the back); (5) the head should not be severed from the neck during slaughter; and (6) manipulating the carcass – such as skinning or cutting off the hocks – is not allowed to commence before the animal is completely dead.

Still focus on the slaughtering, several researches are deal with stunning before slaughtering. Stunning of large animals is acceptable as long as it can be demonstrated that the process does not kill the animal prior to slaughter and does not inflict unnecessary pain over and above the act of slaughter itself. Electrical head-only stunning does not kill the animal, and it is also not painful at the initiation stage and during the stun period. Leach et al. (1980) assessed the physiological response of sheep to electrical stunning in order to determine whether it is painful to the sheep. If it is proven that the stunning does not kill the animal but only temporarily makes it unconscious (reversible) for the purposes of minimizing pain and distress, then this aspect is acceptable and also considered as *ihsaan* (humane), which is highly desirable in Islamic Shariah (Yaqoob, 2010). For further food industry, the example of equipment about this sub-topic was developed by Jarvis Ltd. to make easier stunning and halal slaughter process. The Jarvis sequence described the traditional head-only stun system which applies an alternating sinusoidal waveform with varying voltages (350–550 V) to deliver constant pre-set current, usually 1–2 amps. The frequency with which the current alternates is 50 cycles per second or 50 Hz similar to the frequency in household mains (Weaver & Wotton,

2009). After stunning process, the next is slaughtered. A stunning device renders the animal senseless, a worker slits the throat and then the animal is hung by its hind feet to bleed. The blood is allowed to drain, and then workers skin the animal and remove its head. Skinning is done with care, keeping it in one piece so the hide can be sold for leather goods manufacturing. After skinning, they open the carcass to remove the internal organs and split the carcass in half. They spray the carcass with water to rinse away the blood and bone chips caused by the saws.

c. *Haram* Contaminate Detection on Meat and Ingredients

In the recent years, Muslims have become increasingly concerned about the meat they eat. Proper product description is very crucial for consumers to make informed choices and to ensure fair trade, particularly in the ever-growing halal food market. Globally, Muslim consumers are concerned about a number of issues concerning meat and meat products such as pork substitution or another forbidden contaminate on finished product. Beside this, in Islamic law, although the product has a bit of *haram* content, then the product is also unlawful for consumption

Food industry should develop the process of *haram* contaminate detection, when use third party of abattoirs who give fresh meat stock. Because meat product usually contained pork, rat, dog, gelatin, blood plasma etc., to substitute of original beef with lower value. Thus, a number of analytical methods have been proposed for the analysis of pork and/or lard, such as PCR-electrophoresis (Man et al., 2012), PCRRFLP (Ali et al., 2011), enzyme-linked immunosorbent assay (ELISA) (Asensio et al., 2008), electronic nose coupled to gas chromatography–mass spectrometry (Nurjuliana et al. 2011), fourier transform infrared spectroscopy (Rahman et al., 2011), TaqMan probe realtime PCR (Köppel et al., 2011), molecular beacon realtime PCR (Yusop et al., 2011), SYBR green real-time PCR (Farrokhi & Joozani, 2011), and nanoparticle sensors coupled with optical or fluorescence spectroscopy (Ali et al., 2012).

One of them is PCR (Polymerase Chain Reaction), PRC is one of method that can be used to detect *haram* contamination by detecting its DNA (Ali et al., 2012, 2015).

Based on Nakyinsige et al., (2012) there are some analytical techniques to detect *haram* contamination in meat based on authenticity issues that want to be detected. Pork adulteration can be detected using PDR-RELP, Real time PCR, species-specific PCR, RAPD and PCR Sequencing, pork protein can be detected using ELISA, Chromatography, Peptide examination and Isoelectric focusing, pork fat (lard) can be detected using FTIR spectroscopy, DSC and Electronic nose while blood plasma can be detected using Isoelectric focusing, ELISA, Immunodiffusion and LC-M5/MS. All the method above can be used to detect contamination in *halal* meat, but is will not explain specifically since it is containing of chemical process which exclude in industrial engineering studies.

Based on these processes, it is more hygienic than the conventional foods since it must meet both the religious and health requirements. Consequently, the prices of halal foods are significantly higher than the conventional ones and thus it offers a significant scope of adulteration (illegal mixing of low priced items). But meat industry can guarantee the *halal* level of meat product that will be further produced.

#### **4.2.3.2. Production Process**

##### **a. Mixing / Processing The Product**

The other main process of industry is production process. Before the process, abattoir or meat industry can cut the skinned cattle according to the end of beef product (Kaur et al. 2017). Besides the above processing stages, the beef cuts processing involves a wide range of treatments, including the following processing technologies: chopping, seasoning, mixing or tumbling, stuffing into casings, and smoking, etc. and along with the utilization of modern specialized meat processing equipment, like meat grinding machine, brine injector, meat tumbling machine, meat mixing machine, sausage machine, patty machine and smoking oven etc. These products are meat mixes composed of comminuted muscle meat, with varying quantities of animal fat. Products are salted only, curing is not practiced. Non-meat ingredients are added in smaller quantities for improvement of flavor and binding, in low-cost versions larger quantities are added for

volume extension. All meat and non-meat ingredients are added fresh (raw). Heat treatment (frying, cooking) is applied immediately prior to consumption to make the products palatable. If the fresh meat mixes are filled in casings, they are defined as sausages (e.g. frying sausages). If other portioning is customary, the products are known as patties, kebab, etc. Convenience products, such as nuggets, have a similar processing technology and can also be included in this group. In contrast to the rest of the group, nuggets etc. are already fried in oil at the manufacturing stage during the last step of production. With optimized of cut, that also optimizing in production, so the effect not suffered *mubadzir* (redundant) and increase the benefit of industry (Jung et al., 2016). Below are several processes with different product of processed meat (FAO Corporate, nd):

a.) Cured-cooked products

The meat pieces are treated with small amounts of nitrite, either as dry salt or as salt solution in water. After the curing process of the raw muscle meat, always undergo heat treatment to achieve the desired palatability.

b.) Raw-cooked meat products

The product components muscle meat, fat and non-meat ingredients which are processed raw, i.e. uncooked by comminuting and mixing. The resulting viscous mix/batter is portioned in sausages or otherwise and thereafter submitted to heat treatment, i.e. cooked. The heat treatment induces protein coagulation which results in a typical firm-elastic texture for raw-cooked products. In addition to the typical texture the desired palatability and a certain degree of bacterial stability is achieved.

c.) Precooked-cooked meat products

Precooked-cooked meat products contain mixes of lower-grade muscle trimmings, fatty tissues, head meat, cattle feet, animal skin, blood, liver and other edible slaughter by-products. There are two heat treatment procedures involved in the manufacture of precooked-cooked products. The first heat treatment is the precooking of raw meat materials and the second heat treatment the cooking of the finished product mix at the end of the processing stage. Precooked-cooked meat products are distinguished from the other categories of processed meat products by

precooking the raw materials prior to grinding or chopping. The example of this type is corned beef in cans.

d.) Dried meat products

Dried meat products are the result of the simple dehydration or drying of lean meat in natural conditions or in an artificially created environment. Their processing is based on the experience that dehydrated meat, from which a substantial part of the natural tissue fluid was evaporated, will not easily spoil. Pieces of lean meat without adherent fat are cut to a specific uniform shape that permits the gradual and equal drying of whole batches of meat. The example of this type is *abon* (shredded meat).

Teruel (2015) conducted the research about the processing one of processed product examples, that is nugget. All material components from nugget, were thoroughly mixed to provide an uniform blend, and the meat samples were prepared in characteristic shapes of 5x3x1 cm, each weighing 25 g, and frozen at 18 °C. The pieces were dipped in the prepared batter (wheat flour 93.57%, salt 1.17% bicarbonate 0.24%, yeast 2.34% and xanthan gum 1.17%) for 15 s. Chicken nuggets were distributed into five different batches according to the following formulas: a control batch without any extract (1) and a batch with tocopherol extract (2) were used to check the rosemary extract effect. Tocopherol was selected because it is a commonly antioxidant used in food matrixes. The doses of the three different rosemary extracts were selected to ensure 150 ppm of carnosic acid and carnosol expressed as fat basic in products according to European Union Directive 2010/69/EU on food additives. Given the differences in the composition and antioxidant capacity of the three of extracts, the following doses were used doses to reach 150 ppm carnosic acid and carnosol: 600 ppm powder- acetone (3), 900 ppm liquid-methanol (4) and 300 ppm liquid acetone and liquid-tocopherol (5).

Teruel suggested that all the production processes included mixing process, cooked, and make proper size, from raw material until finished, should maintain halal integrity, quality, honesty, food safety, and health. Equipment and facilities should be located, designed and constructed to ensure minimum contamination, easy maintenance

and cleaning, and regularly disinfected and protected against pest and haram contaminants.

b. Proper Meat Handling

Lubis (2016) revealed on his research, there is a concern on *halal* food industry which is a food market which is growing globally. One of these concerns the need for accuracy in processing and handling the manufacturing process of the meat. So, can be ascertained the food will have an end result that is *halal*. The example of meat handling is from positioning to slaughter (Lambooi et al., 2012; Velarde et al., 2014) to decrease the stress, pain, bruises and injury of cattle; skinning the cattle after slaughter (Murshidul Ahsan et al., 2014) to improve the hygienic of meat quality (C. O Gill & J. C McGinnis., 1999); proper cutting of meat (Jung et al., 2016) to avoid *mubadzir* (redundant) process; proper production process (Teruel, 2015., and FAO Corporate, nd), to increase the the *halal* treatment and taste characteristic.

At a closer look, however, it turns out that many of the different handling with different product process. This issue can be even better understood and becomes more transparent when the processing technologies are analyzed. Based on the processing technologies used and the phase, it is possible to enable the improper handling that caused *haram* on products.

#### 4.2.3.3. Post-Production

a. Packaging

Production of processed meat is not yet complete. Meat that has been finished processed, must immediately enter the packing process. But the main concern on packaging is handling and storing (Omar & Jaafar, 2011).

Handling of the packaging process should also be focused on maintaining the *halal* quality of meat, such as a vacuum packed to avoid bacterial contamination; then separating the basic meat (like poultry with cow or goat or duck) to maintain the

authenticity of meat; be wary of being mixed with raw materials or additives so that quality is maintained; if the meat industry has non-halal by-products, it must be separated on boxing, pallet, load and etc. to avoid the slightest contamination (Omar & Jaafar 2011; Kamaruddin et al., 2012; Tieman, 2013; Ngah et al. 2014)

Another concern on packaging is storing, means that the processed meat both unpackage or after package boxing should be maintained in proper room (cold room) to avoid increasingly rotten of meat, and monitoring when the meat product should be sold; also segregate the storing place with other non-halal product. (Ibrahim et al., 2012; Omar et al., 2012; and Tieman et al., 2013).

Basically, the meat industry must maintain halal meat by using *halalan thoyyiban* principles, means any products, which are not harmful and safe to be consumed as underlined by the Syariah law (QS. Al-Maidah:4,88), thus is allowable and permissible, including in the packaging process.

All *halal* meat products should be packaged in clean containers and proper labels affixed to identify the *halal* markings. During storage and display, *halal* products must be segregated from non-*halal* ones so as to prevent cross contamination (Nakyinsige, 2012). Package is the way of communication. Special package for *halal* meat must be attached with the logo or label and it will be discussing on another sub-bab. Yunus et al., (2014) and Kamaruddin et al (2012) said that descriptively, majority of the customer will see the statement of *halal* and product ingredient on the package which encourages the willingness to buy the product.

#### b. *Halal* Labelling

Some issues surrounding *halal* meat accreditation, certification, auditing and authentication and the supporting structures and processes such as laboratories and analyses have been previously researched by Farouk (2013). the world and the increased demand for assurance by the consumers of these foods, a number of regulatory and certifying bodies have sprung up in both producing and importing countries to ensure the

compliance of these products to the *halal* requirements. The number of *halal* certifying bodies around the world to be 111 and growing. Although these *halal* certifying/regulatory bodies differ in their standards for certification (See Figure 2.9 for symbols of some *halal* certifying bodies around the world), the differences tend to be minor and largely reflect variations in the way the preferred, but not the obligatory practices laid down in Islamic religious texts are interpreted (Farouk et al., 2013). Because of that, the processed meat product shall be having the *Halal* label in packaging. After all process is done, the processed product will back to logistic or warehouse keeping.

Beside labelling the certification of *halal*, food industry should to give the sign that give information on all the other ingredients used are also *halal* . The sign of traceability can be use RFID technology or unique barcode. There are about 4 papers that focused on traceability. Traceability as a way to give guarantee on the products in order to track and trace them along the food supply chain. Tracking is the ability to follow the downstream path of a product along the supply chain, while tracing refers to the ability to determine the origin and characteristics of a particular product, obtained by referring to records held upstream in the supply chain. Traceability as an important part of SCM in order to guarantee a good quality to the consumer. Traceability is the ability to trace the history, application or location of a product by means of recorded identification, this is in line with ISO standardization about the needs of traceability in *halal* SCM (Shafii et. al., 2012). In SCM focus, traceability will provide the clear of *halal* ingredients information that will be used to be mixed with the meat product. Besides, this tracker can help to track and trace the product later

Then, Rahman et al. (2016) that have been completed their research about traceability in 139 food manufacturers in Malaysia said that traceability systems are fully needed to bridge the connection between perceived benefits and readiness for *Halal* Assurance System.

## CHAPTER V

### RESULT AND DISCUSSION

This chapter will discuss the research in a whole to discuss problem of *halal* processed meat and discuss the data analysis from Study Literature Review (SLR) phases. Moreover, in this chapter there will be a new framework of *halal* production of processed meat product in food industry.

#### 5.1. Conduct Systematic Literature Review

Systematic review focusses on a specific research with a duplicate methodology to identify, critically appraise and summarize all empirical evidence from multiple research studies or papers. Systematic reviews and meta-analyses have become increasingly of great significance in health care. The reporting transparency of systematic reviews is important to the readers to be able to assess the conduct and quality of the reviews. According to Garza-Reyes (2015) stated that various methods can be included to perform systematic literature review are thematic synthesis or analysis, qualitative comparative analysis, qualitative meta-summary, meta-ethnography, qualitative meta-analysis. In this research, the researcher using qualitative research with thematic synthesis analysis.

It is supported by Nooren (2015) research and by Bohari (2013), stated that as the increasing number of awareness among Muslim population, it is a need for them to consume the products that based on Islamic requirements and as a result it will increase the demand on halal products among Muslim population all over the world.

More deeply about SLR, Nair et al. (2014) extracted its research on extended SLRs on provision of evidence for safety certification. In this research process, Nair extends the

discussion into some of the required SLR data, as in Table x. Next, to increase the validity of the SLR research, they suggest the following: (1) limit knowledge venue to avoid publication bias; (2) selection of primary studies; (3) data extraction. In data extraction itself, contains several information to show the deepness of paper that researcher use. The example of data extraction from Nair (2014) research will see on Table 5.1.

Table 5.1. The Example of Extraction Data on SLR method

Bibliographic Information	Application Domain	Underlying Standard (s)	Artefact / technique contributing to evidence	Technique for assessing evidence confidence	Tool Support	Objective / Challenges	Validation Method
Name of researcher	Automotive, Railway, Oil, Energy, Food, etc	UK defense standard 00-56, and compare them with civil standards such as DO-178B, ARP4754, ARP4761, and IEC 61508. Dittel & Aryus (2010) discuss the challenges of interpretation, implementation, and identification of the right level of detail when building safety cases for compliance with ISO	Qualitative Assessment, Checklist, Logic Based Assessment	Argumentation, Model, or Textual Template	Which assists in the provision of evidence (collection, structuring, and assessment) for certification or safety assurance purposes.	Specification of evidence content; Construction of safety cases; Capturing the degree of credibility or relevance of the evidence; Better development processes and better evidence about process Compliance; Ambiguities of safety standards; Demonstration of compliance for novel	The studies were classified as: case study (validated during projects by practitioners different from the authors), field study (validated with data from real projects, but not during the execution of the projects), action research (validated during real projects by the authors themselves), survey (validated

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technologies; and First-time certification or recertification of “proven-in-use” systems on the basis of practitioners’ opinion and perspectives), or none.

After the discussion above, the researcher can make the framework of conducting the SLR method. The framework to use the SLR method can see on Figure 5.1.

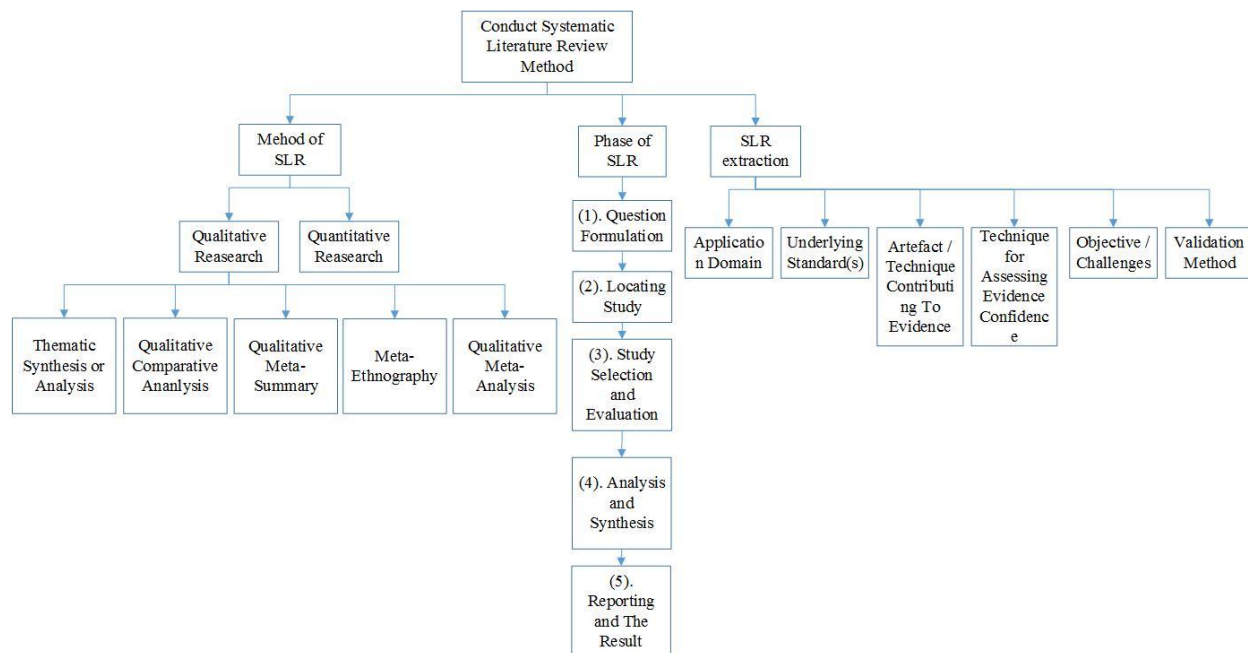


Figure 5.1. Framework for Conduct SLR Method

Although having a different object of research, many researchers such as Oliveira et al. (2016), Yu (2013), Akhigbe et al. (2017), Nooren et al. (2015), Henchioni et al. (2017), Quiñones and Rusu (2017), Johnsen et al. (2016), and Mohammed et al. (2017) had followed the step phases to conduct the SLR by Khan et al. (2003), which consist of question formulation, locating studies, study selection and evaluation, synthesis and analysis, then final phase which is reporting.

Then, the extraction data for this research will be shown in Table 5.2., where the application domain is food (halal processed meat), the standard is using Islamic standard for meat, including from Al-Qur'an, Sunnah, Ijma', Qiyas. After that, researcher challenging on better development processes and better evidence about process compliance; with the scope about halal standard for processed meat product in production process. But in this research no advance validation had been used. Generally, the simulation is an imitation of a system. (Banks et al., 2010) explained that the simulation model is built on the behavioral system by taking some guesses. When a model has been established and authorized, a model capable of assessing potential changes to predict its impression of system performance. The simulation is useful as it saves the simulator's period and is easy to use. Examples of simulation tools are like ProModel, Technomatix Plant Simulation 11, WITNESS, SIMFACTORY, Arena, Total Interpretive Structural Modeling (TISM) and others.

Table 5.2. Extraction Data for This Research

Application Domain	Underlying Standard (s)	Information / artefact / technique contributing to evidence	Technique for assessing evidence confidence	Tool Support	Objective / Challenges	Validation Method
Food on Production of Halal Processed Meat	Islamic standard for meat, including from Al-Qur'an, Sunnah, Ijma', Qiyas	Qualitative research	Thematic Synthesis Analysis	Ms. Excel, Mendley Desktop, K-Chart, Visio 2016	Better development processes and better evidence about process compliance; with the scope about halal standard for processed meat product in production process	None

## 5.2. Halal Processed Meat Product Framework in Food Industry

The demand for *halal* food consumption is increasing annually as a result of the rising number of Muslim population globally, which is approximately 1.8 billion, 140% of the growth of Muslims in Europe and 1 billion Muslims living in Asia. that the *halal* food market constituted about 16 percent of the world food trade in which the trade value has been estimated as US\$547 billion in

the global *halal* market. Consequently, the trend has attracted the attention of all countries to generate more *halal* food producers. *Halal* and haram are usually referring to food, but presently, it goes beyond food consumption and pervades other areas for instance supply chain. A proper framework of halal supply chain management in food industry is needed to ensure halal integrity, including production scope.

There are some researches explains about the production of meat, especially for *halal* pre-production of livestock's meat, but lack to care and concern about *halal* production process of processed meat product and post-production. This study will try constructing framework of *halal* production of processed meat product on food industry SCM. Finding the good framework of *halal* processed meat product can be helped by SLR. It can ensure a rigorous review of research results. Existing contributions on global standards in halal SCM will be systematically collected and critically analyzed by SLR in order or make a good framework of halal SCM in food industry.

Choosing livestock's meat as the object of research, is due to some researches that says poultry industry has been the major contributor of the growth from the livestock products due to its highest consumption, thus reflecting the substantial importance of the products. Once the magnitude of the consumption of poultry products is one of the animals, researchers focused more on these dairy products, such as meatballs, nuggets, sausages, hamburgers, cured meat, smoked beef, hot dog, minced meat etc., which is included in the processed meat products and includes packaged food products to construct the proper framework.

Researcher to finding the good framework of *halal* production can be helped by SLR. It can ensure a rigorous review of research results. Existing contributions on parameters in *halal* meat, and *halal* production about the processed meat since the livestock animal until the package, it will be systematically collected and critically analyzed by SLR in order or make a good framework of *halal* processed meat in food industry.

SLR is used to analyze the production of *halal* processed meat in food industry, the steps to conduct SLR have been explained in chapter three which are question formulation, locating

studies, study selection and evaluation, synthesis and analysis, and then reporting. In the end, the report is for further research. The question formulation, locating studies and study selection and evaluating have been explained in chapter one and two, and for the synthesis and analysis have been explained in chapter two and four. The final phase which is reporting and using the result will be explained in this chapter, that is chapter five. Question formulation related to SLR method, thematic synthesis analysis, *halal* processed meat is the main topic to conduct SLR about the production in part of processes on *halal* food industry supply chain.

The entire reviewed papers in this research are taken from Elsevier (sciencedirect.com), IEEE (ieeexplore.ieee.org), Researchgate, Advances in Business Research International Journal (ABRIJ), Emerald Insight, Journal of Emerging Economies and Islamic Research (JEEIR), and The South African Society for Animal Science (Sasas), an MDPI as an electronic database. 62 articles of production for *halal* processed meat are selected and separated based on the sub-topic of research, publication of the journal, and year of publication. Based on sub-topic of studies consist of 10 articles or 16% about use of SLR which consist of technique of SLR, phase of SLR, and extraction of SLR. Then 2 articles or 3% about *halal* parameters of processed meat product framework; 10 articles or 16% explain about package food focused on *halal* meat product; 40 articles or 65% about *halal* production in processed meat product including pre-production (nutritional feed, *syariah* slaughtering, haram detection), production process (proper meat handling and mix processing), and post-production (packaging and labelling).

In terms of number of publication paper, Elsevier (sciencedirect.com) is the most commonly with the amount 40 papers. Second, there are 4 papers from Researchgate. After that, IEEE have similar amount, there is 2 papers. The rest, researcher take 1 paper each of Emerald Insight, JEEIR, IJSSH, Sasas, MDPI, and ABRIJ. Then, based on the year of publication, the journal that reviewed are derived from those that published above 2012 in order to get more valid data and according to current issues of problem. From 62 papers, 12 papers are taken from year 2012, 8 papers from 2013, 13 papers from 2014, 8 papers from 2015, 12 papers from 2016, and 9 papers from 2017.

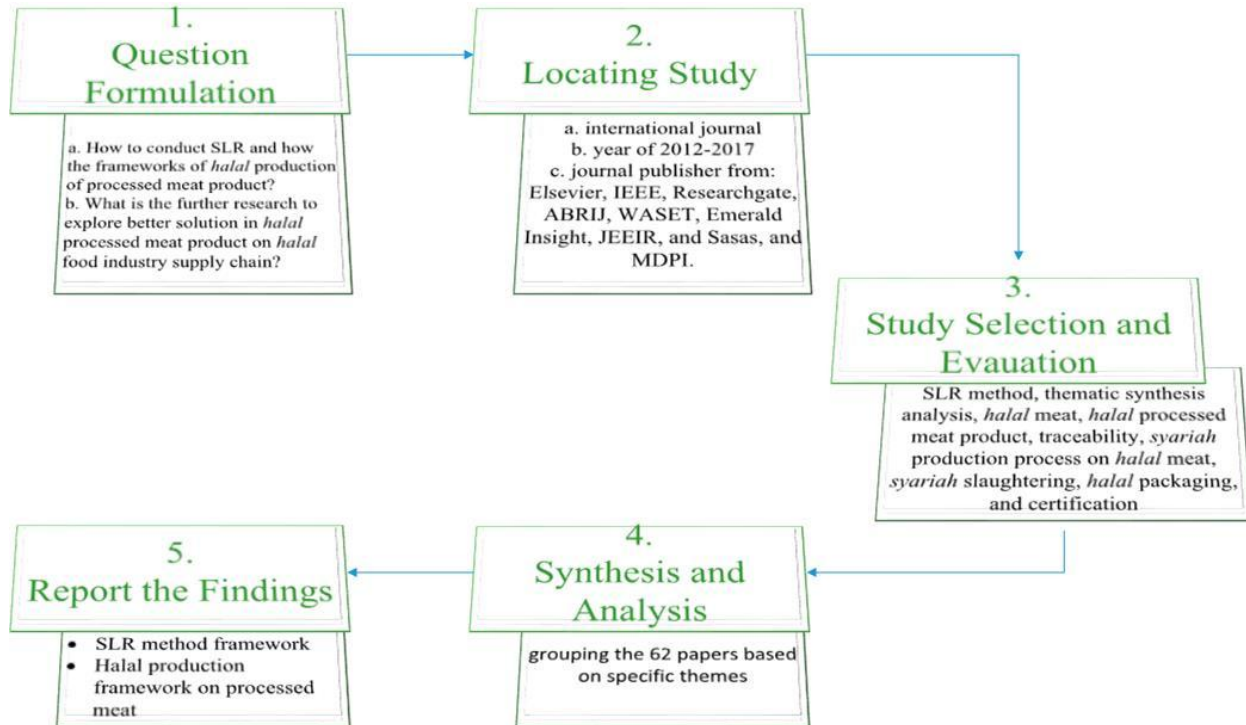


Figure 5.2. SLR phase and result in each phase

After using systematic literature review (SLR), which is the papers were synthesized and analyzed, whole of papers discusses about the *halal* processed meat product with having sub-topic *halal* Supply Chain including *halal* production, that has been mentioned and explained in chapter two and four.

Many researchers mentioned, the countries with majority of Muslim population, contribute the high consumption demand and export import demand of *halal* meat. Many food industries based the researches from Mohtara et al. (2012), Nakyinsige et al. (2012), Bukhoria et al. (2015), Wigmann et al. (2016), and Teruel et al. (2015), used fish and livestock as the base material for making processed meat product. Islam permitted in using both of meats (Farouk et al, 2015, and Sira Abdul Rahman, 2017). Furthermore, livestock animals such as poultry, goat, sheep, cattle, cow, which are all ruminants are permitted by Islamic religion. Even so, *halal* handling from the start of production, namely the provision of appropriate food, until the packaging process are always required to maintain *halal* level of meat products, including when its process involves SCM processes.

This framework is the result of SLR in order to unify two phase of halal SCM namely production on processed meat product in food industry based on Quran, Sunnah, *ijma'*, and *qiyas*. This framework will be divided based on *halal* supply chain focus, which are previously mentioned. Hopefully, it will maintain *halal* integrity in production process of *halal* SCM on processed meat industry. Table 5.3 will show the framework of *halal* SCM focusing on production in food industry.

Table 5.3. Proposed Framework of *Halal* SCM at Production in Food Industry with The *Halal* Requirements

<i>Halal</i> SCM focused on <i>Halal</i> Production	<i>Halal</i> Requirement
<b>a. Pre-production</b>	
i. Nutritional feed	<ol style="list-style-type: none"> <li>1. Give good feed for livestock, based from plants, not from other animals.</li> <li>2. Give good nutrition for livestock, will affect to consumer</li> <li>3. The environment of livestock life, also clean (no filth), so then no eaten by livestock</li> </ol>
ii. <i>Syariah</i> slaughtering	<ol style="list-style-type: none"> <li>1. Livestock's animals should life (breathing) when slaughtering</li> <li>2. Stunning is permitted, as long as the animal still alive</li> <li>3. Reciting Bismillah or says the name of Allah</li> <li>4. Flowing blood</li> <li>5. Slaughter the animal with one stroke using a very sharp knife</li> <li>6. Slaughtering shall be carried out from the front side</li> </ol>

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(towards

7. The chest) and not from behind (towards the back)
8. The head should not be severed from the neck during slaughter
9. Skinning or cutting off the hocks – is not allowed to commence before the animal is completely dead
10. In technology advance, the slaughter also can recite Bismillah when put the button of knife
11. The slaughter should Muslim or his religion is from *Samawi* religion
12. Minimalized the animal's pain
13. To faster the slaughtering, slaughter cut position should proper. The suggestion is in throat (oesophagus and jugularveins). Also can cutting downward to the top of the chest (for bigger animal, like chamel)
14. No mutilations

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iii. Haram Detection on Meat and Ingredients

1. The ingredients is pure from any *najis* or another material that contain *haram*
  2. No doubted about any material
-

- 
3. In logistic phase, the company should check first about any material that use
  4. The company should make controlling about any material that use
  5. Detect *haram* contamination in meat that can be used is PRC, PDR-RELP, Real time PCR, species-specific PCR, RAPD, PCR Sequencing, ELISA, Chromatography, Peptide examination, Isoelectric focusing, Immunodiffusion and LC-M5/MS.
- 

#### **b. Production Process**

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##### a) Proper Meat Handling

1. The tools, equipment, user, place, should clean, pure, and safe.
  2. Segregate *halal* and *haram* material or products
  3. Not use the meat and any ingredients that expired
  4. Use the meat and any ingredients that available firstly, or also can say FIFO system
  5. Easy maintenance
- 

##### b) Processing and Mixing the Product

1. Differentiate the type of meat
  2. No use or resulting the prohibit reaction
-

- 
3. Proper processes
  4. No use preservatives are banned
  5. Proper lipid oxidation, color and pH
  6. Using flours which have high quality
  7. To avoid the bacterial, fungi, and microbial which easily arise, the half-finished of processed meat product treatment with deep-frying and baking (70-78 °C), then frozen
- 

### **c. Post-production**

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#### *a)* Packaging

1. Using packaged in polyethylene bags
  2. No defect on packaged, that caused another microbial or bacterizes will enter
- 

#### *b)* Labelling

1. Firms have to follow the regulations and steps from halal certification body.
  2. *Halal* certification bodies should have laws and policies about halal certification and logo.
  3. *Halal* certification bodies should control and monitor regularly the certified firms.
  4. *Halal* certification bodies can
-

use technologies and laboratory tests to ensure the halal integrity of firm.

5. Firm has to follow the requirements for imported and exported food products of every country's *halal* certification bodies.
6. Use RFID technology as traceability to the product

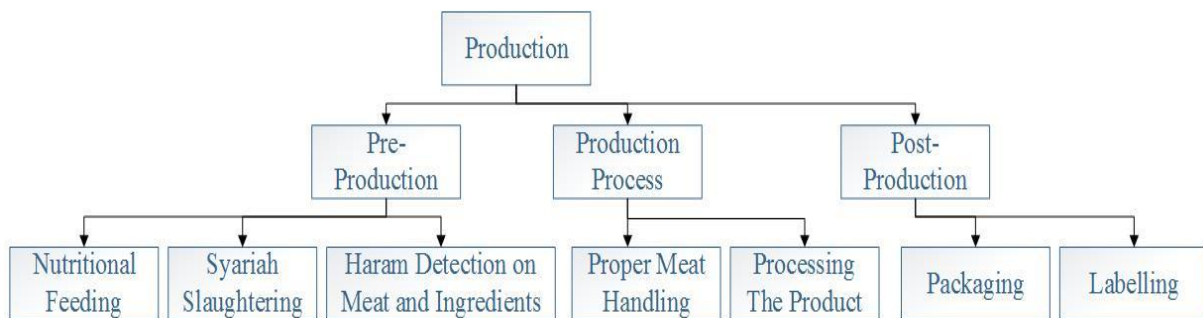


Figure 5.3. Halal Production Framework on This Research

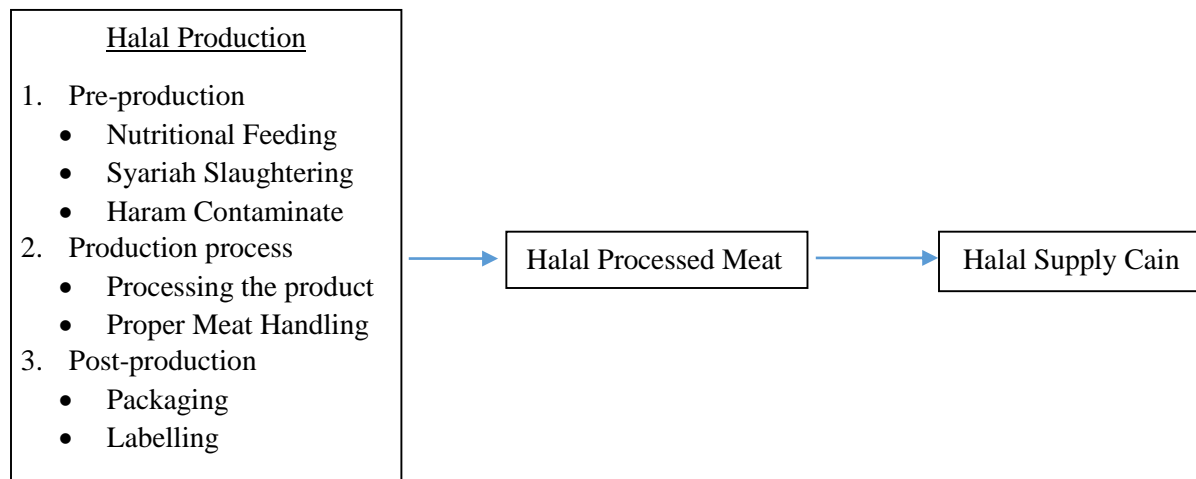


Figure 5.4. Halal production framework effecting the Halal SCM

### **5.3. Halal Pre-Production**

#### **5.3.1. Proper Feeding Animals**

feeding ways for herbivore animal that are natural and morally acceptable in Islam. According to it, giving good feed, feeding the animals with food that is good and nourishing, is a necessity. Because it will impact on the future of *halal* meat, as well as the consumer

Livestock animals will be slaughtered and the meat that will be processed, it is better to do treatment such as giving food and water, even with adequate nutrition or vaccine. Occurrences granting excessive water on the animal, in order to make the meat look fatter, because it contains an element of coercion and untruths, which resulted in a decrease in the quality of the meat. The feeding generally ceased 12 hour before slaughter (Ahsan et al., 2014). Livestock animals should be treated in such a way that they are not stressed or excited prior to slaughter

In accordance with strict Islamic law and guidelines, a slaughtered animal is considered halal when its feed is also considered halal; feed therefore plays an important role in halal classification. Feed for animals must be from a vegetable source; no meat feed is allowed.

#### **5.3.2. Syariah Slaughtering**

Many research says the animal welfare in slaughtering become an arise issue for every type of production of meat. Animal welfare in the meaning for *syariah* slaughtering including proper the procedure of preparations, handling, previous slaughtering, slaughtering process, and after slaughtering. Company need to avoid unnecessary suffering to animals, the need to observe basic health and hygiene rules and the need to perform in authorized abattoirs.

Many researches that conducted the agree on stunning, before slaughtering the livestock. Stunning is permitted as long as the animal is still alive. The type of stunning are mechanical stunning, and electrical stunning. In mechanical stunning, with non-penetrative captive bolt

(percussion or mushroom stunning), the percussion-bolt has a blunt end which looks like a mushroom, designed to concuss without penetrating the brain. This stun is essentially similar in its effect to the use of penetrative captive bolt stunning (Gregory, 2007, cited by Farouk, 2013). Then, in advances on meat industries, to meet halal requirements, research from Farouk (2013), the company used automatic reversible head-only electric stunner. This equipment was subsequently further developed by Jarvis Equipment (N.Z.) Ltd. and became the Jarvis Electric Beef and Sheep Stunners. Then, operator pushes the stun bottom and the chin lifter rises putting the animals' head into the stun position. The nose electrode activates. Electric stun then occurs from nose to neck [Voltage 550VAC (supply); time 3.5 s; current 2.0–4.0 amp]. The Operator continues to push the stun bottom until the stun current has been recorded, the ammeter gives visual indication of stun current.

Before doing the slaughtering, the company or abattoir is also preparing equipment, supplies slaughterer, and the place is clean, so that the quality of meat, its halal status is maintained. The knife should sharpen, to minimalized the injuries of livestock. Slaughter the animal with one stroke using a very sharp knife. Slaughtering shall be carried out from the front side of neck (towards the chest) and not from behind (towards the back). The head should not be severed from the neck during slaughter Skinning or cutting off the hocks – is not allowed to commence before the animal is completely dead. The blood of animal slaughtered should to flow. Based on analysis page, stunning method should to meet halal requirement, after this process, the livestock is slaughtered by using automatic machine as illustrated on Figure 5.5.

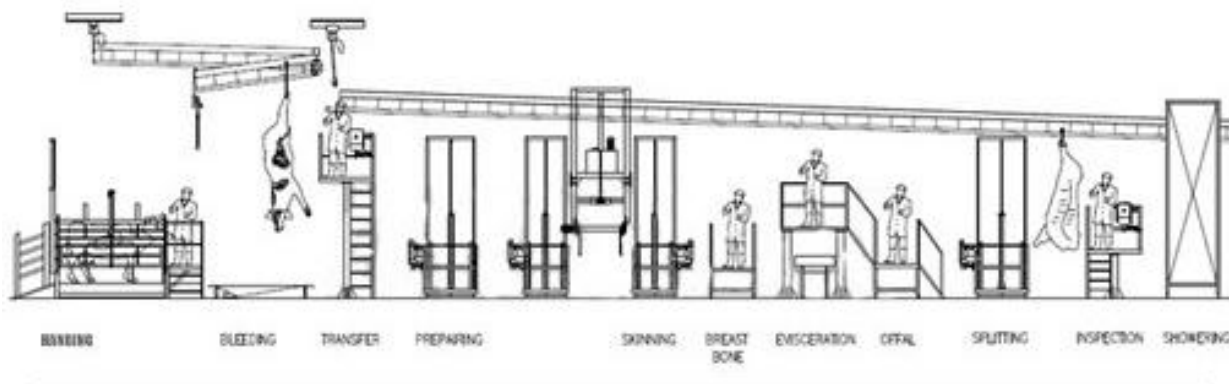


Figure 5.5. The Illustration of Internal Meat Industry Doing Slaughtering

In Figure 5.5. are illustration for the slaughtering process that did from internal meat industry, not from third party or abattoirs. This machine line is suitable for cattle slaughtering since bleeding process, skinning, breast bone saw, evisceration offal, splitting, until final rinsing to ensure the cleanness of the meat.

### 5.3.3. *Haram* Contaminate Detection on Meat and Ingredients

Some method that can be used to detect whether that *halal* meat before the production is contaminate with *haram* material or not, there are use PCR (Polymerase Chain Reaction). PRC is one of method that can be used to detect *haram* contamination by detecting its DNA. Nakyinsige et al., (2012) add some techniques to detect *haram* contamination in meat based on authenticity issues that want to be detected. Pork adulteration, can be detected using Restriction fragment length polymorphism (RFLP), Real time PCR, species-specific PCR, Single Strand Conformation Polimorphim (SSCP) and PCR Sequencing. Another that, pork protein can be detected using ELISA, Chromatography, Peptide examination and Isoelectric focusing, Amplified Fragment Lengh Polymorphism (AFLP), Random Amplified Polymorphic DNA (RAPD). Then, pork fat (lard) can be detected using FTIR spectroscopy, DSC and Electronic nose while blood plasma can be detected using Isoelectric focusing, ELISA, Immunodiffusion and LC-M5/MS. All the method above can be used to detect contamination in *halal* meat, but is will not explain specifically since it is containing of chemical process which exclude in industrial engineering studies. Regarding to haram contamination detection, in Table 5.4. will show the authentication issue.

Table 5.4. Authenticity issue detection to detect the haram contaminate

Authenticity Issue Detection	Techniques Used
Pork adulteration	Restriction fragment length polymorphism (RFLP)
	Real time PCR
	species-specific PCR,
	Single Strand Conformation Polimorphim (SSCP), PCR Sequencing
Pork protein	Amplified Fragment Lengh Polymorphism (AFLP)
	Random Amplified Polymorphic DNA (RAPD)

	ELISA
	Chromatography
	Peptide examination
	Isoelectric focusing
Pork fat	FTIR spectroscopy
	DSC
	Electronic nose
Pork blood plasma	Isoelectric focusing
	ELISA
	Immunodiffusion
	LC-M5/MS

#### 5.4. *Halal* Production Process

##### 5.4.1. Mixing / Processing The Product

The product examples of processed meat are meatballs, nuggets, sausages, hamburgers, cured meat, smoked beef, hot dog, minced meat. Actually, all the production processes include mixing process, cooked, and make proper size, from raw material until finished, should maintain halal integrity, quality, honesty, food safety, and health. Equipment and facilities should be located, designed and constructed to ensure minimum contamination, easy maintenance and cleaning, and regularly disinfected and protected against pest and haram contaminants.

##### 5.4.2. Proper Meat Handling

Lubis (2016) revealed on his research, there is a concern on *halal* food industry which is a food market which is growing globally. One of these concerns the need for accuracy in processing and handling in the manufacturing process the meat later. So, can be ascertained the food will have an end result that is *halal*.

There should be have proper control and audit program in halal production. Workers in halal production should also apply good hygiene assurance and halal education. The audit may be checking the handling, the hygiene, equipment maintenance, appropriate the quality of specification (raw material, semi-processed product, finished product).

## 5.5. Post-Production

### 5.5.1. Packaging

Production of processed meat is not yet complete. Meat that has been finished processed, must immediately enter the packing process. But the main concern on packaging is handling and storing. All *halal* meat products should be packaged in clean containers and proper labels affixed to identify the *halal* markings. During storage and display, *halal* products must be segregated from non-*halal* ones so as to prevent cross contamination (Nakyinsige, 2012). Package is the way of communication. Special package for *halal* meat must be attached with the logo or label. Yunus et al., (2014) said that descriptively, majority of the customer will see the statement of *halal* and product ingredient on the package which encourages the willingness to buy the product.

Packaging is one of important activity to keep the *halal* level and quality of processed meat product, segregate from non-halal contamination, and also avoid the risk from fungi or bacteria which usually occurs in processed meat product that not proper in packaging. The illustration of packaging can we see on Figure 5.6.



Figure 5.6. The example of packaging in some product of processed meat

Handling of the packaging process should also be focused on maintaining the halal quality of meat, which is like a vacuum packed to avoid bacterial contamination; then separating the basic meat (like poultry with cow or goat or duck) to maintain the authenticity of meat; be wary of being mixed with raw materials or additives so that quality is maintained; if the meat industry has non-halal by-products, it must be separated on boxing, pallet, load and etc. to avoid the slightest contamination. Another concern on packaging is storing, means the processed meat both unpackage or after package boxing should maintain on proper room (cold room) to avoid increasingly rotten of meat, and monitoring when the meat product should to sell; also segregate the storing place with other non-halal product if the meat industry produce.

### **5.5.2. Halal Labelling**

Many international Muslim bodies – including the Organization of Islamic Countries (OIC), World Muslim League (WML), World Halal Forum (WHF), World Halal Food Council (WHFC), International Halal Integrity Alliance (HIA) and the Kuwait Institute for Scientific Research surrounding *halal* meat accreditation, certification, auditing and authentication and the supporting structures and processes such as laboratories and analyses have been previously researched. the world and the increased demand for assurance by the consumers of these foods, a number of regulatory and certifying bodies have sprung up in both producing and importing countries to ensure the compliance of these products to the *halal* requirements.

The number of *halal* certifying bodies around the world to be 111 and growing. Although these *halal* certifying/regulatory bodies differ in their standards for certification (See Figure 2.8 for symbols of some *halal* certifying bodies around the world)

In labelling phase, to increasing the awareness, to trace the Halal status are unreliable, lack of security, not real-time basis and take longer time to race, the product also gives the sign of traceability that show the information track is use *halal* ingredient also. The traceability tools can be use RFID technology, or unique barcode. This technology as a way to give guarantee that meat products in moving along the food supply chain are both tracked and traced. Tracking is the ability to follow the downstream path of a product along the supply chain, while tracing refers to the ability to determine the origin and characteristics of a particular product, obtained by

referring to records held upstream in the supply chain. Traceability as an important part of SCM in order to guarantee a good quality to the consumer. Last but not least, another important think on labelling is giving the reliable information about ingredients and expired of the product. It will minimize the problem that arises when humans consume on expired food.

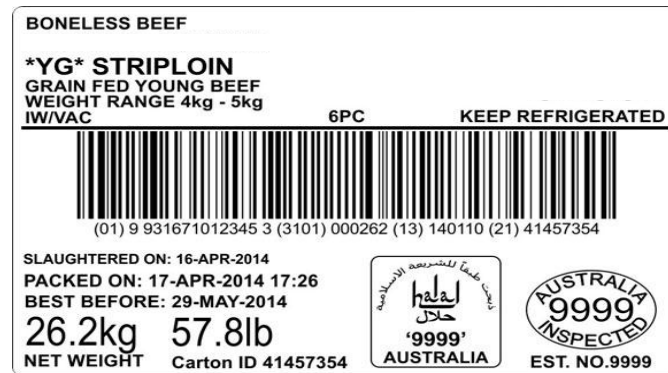


Figure 5.7. The example of barcode, ingredient info, weight info, expired info, and halal label on processed meat product

Based from Figure 5.7. we can see the illustration of reliable information for labelling in the product of processed meat. The reliable information consists of unique barcode, true ingredient, true weight, true expired, and halal certification.

## 5.6. Further Research Related The Problem

Basically, many scopes on this discussion analysis research not discussed in dept. First, in the future, researcher would like to further analyze the different technique on SLR finding, including qualitative comparative analysis, qualitative meta-summary, meta-ethnography, qualitative meta-analysis.

To further ground this result of the SLR in industrial needs, researcher plan to validate the findings of the review by (1) conducting new empirical studies (e.g., surveys) for investigating how practitioners provide evidence for safety certification and (2) comparing the results developed between industries. From the study, it is also possible to compare the theory with the circumstances of practice, in terms of what practitioners do and what halal standards are

indicated. Moreover, with these data, further research can do simulate as an imitation of a system. Simulation model is built on the behavioral system by taking some guess. When a model has been established and authorized, a model capable of assessing potential changes to predict its impression of system performance. The simulation is useful as it saves the simulator's period and is easy to use. Examples of simulation tools are like ProModel, Technomatix Plant Simulation 11, WITNESS, SIMFACTORY, Arena, Total Interpretive Structural Modeling (TISM) and others.

Researchers further, may also use different application domains other than halal food or meat, because is very wide product there are still many products that need to be studied about halal standard.

Moreover, the Supply Chain in the world food industry, not only has the production focus only, such as logistic, purchasing, marketing and sales, and also research and development. More broadly, in industry has focus on supplier relationship management and customer relationship management (Zasyana, 2016). These focuses which no discuss before, can be used as a further research later, but still covering the halal issue.

## CHAPTER VI

### CONCLUSION AND RECOMMENDATION

This chapter will describe the overall conclusions from the results of study and the suggestion for the future research.

#### 6.1. Conclusion

The problem solving of problem formulation is already mention in chapter five and based on the result, the study will be concluded as follows:

- a. SLR method framework consists of technique method, step of SLR, and the extraction of SLR. The technique method of SLR is divided into quantitative and qualitative (thematic synthesis analysis, qualitative comparative analysis, qualitative meta-summary, meta-ethnography, qualitative meta-analysis). Step in conducting SLR are as follows: question formulation, locating study, selection and evaluation, data synthesis analysis, then report result. The extraction of SLR consists of application domain, underlying standard, technique contributing to evidence, technique for assessing evidence confidence, tool support, objective/challenges, and validation method.
- b. Question formulation of this research is to find the best way to conduct the SLR method framework, and halal production framework of processed meat product with using SLR and also find the further from this research. For locating study, this research results are found by using electronic databases which are Elsevier, IEEE, Researchgate, ABRIJ, WASET, Emerald Insight, JEEIR, The South African Society for Animal Science (Sasas), an MDPI. Third is study selection and evaluation, the researcher decides to only using academic journals and proceedings of international conferences in years between 2012-2017. Fourth is about data synthesis and analysis, researcher determine the topic criteria of papers, including

SLR method, synthesis analysis, halal parameters, package food, *halal* meat, pre-production of *halal* meat, production process of processed meat, post-production of processed meat. Then in fifth phase is result of SLR which create two frameworks consist of SLR method framework and *halal* production for *halal* processed meat product in food industry SCM, that have some sub-topics, which is discussed above. All the productions have some parameters to keep halal standards based on Qur'an, Hadith, *ijma'*, and *qiyas*. The result of halal parameters can be seen on Table 5.1, and the result of proposed *halal* production framework can be seen on Figure 6.2. From that halal production, will effect on halal SCM as described on Figure 6.3.

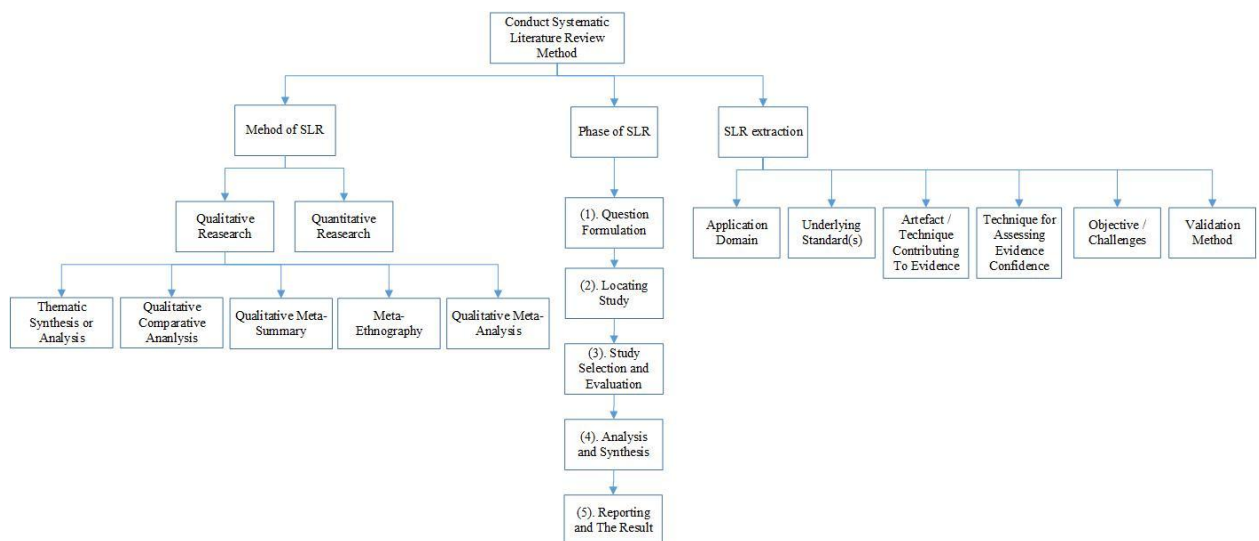


Figure 6.1. The Use of SLR Framework

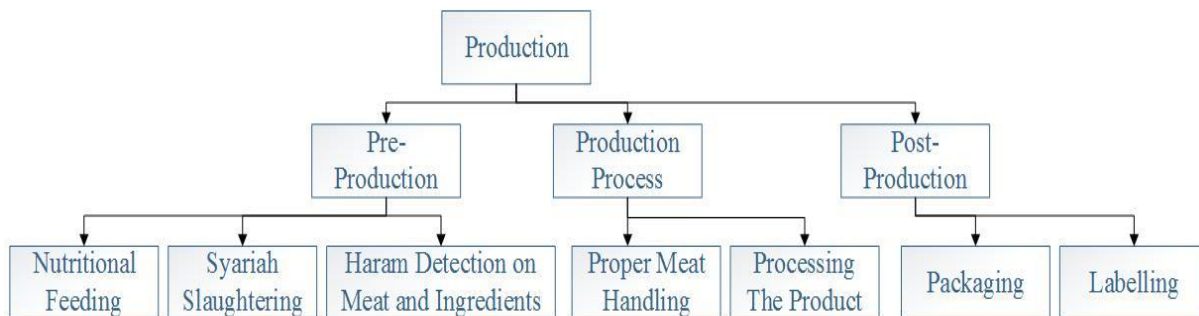


Figure 6.2. Halal production framework on this research

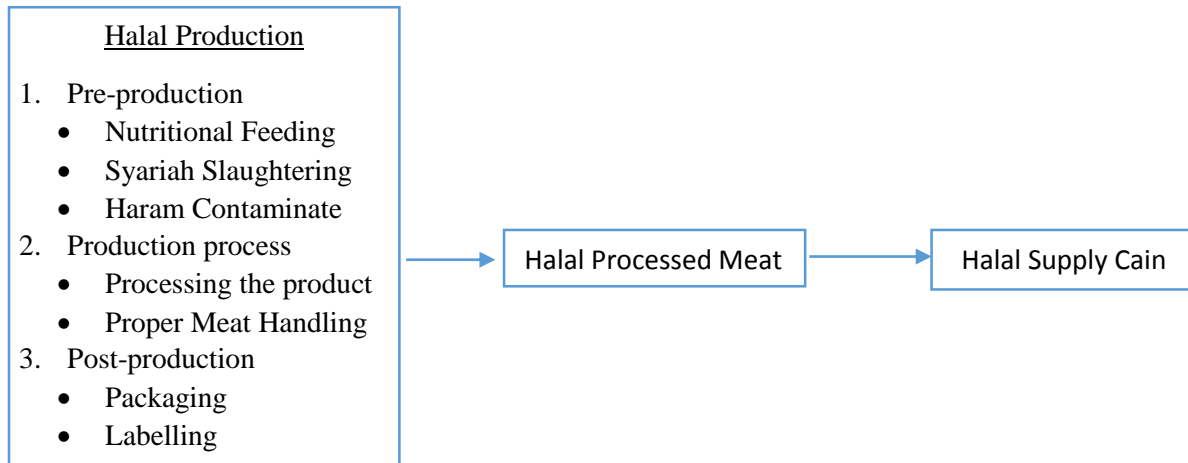


Figure 6.3. Halal production framework effecting the Halal SCM

- c. Further research can analyze the different technique on SLR finding; conducting new empirical studies (e.g., surveys) for investigating how practitioners provide evidence for safety certification and; comparing the results developed between industries; next researcher can plan to validate the findings of the review; further research can do simulation as an imitation of a system; further research, may also use different application domains other than halal food or meat.

## 6.2. Recommendation

SLR and Halal Supply Chain is increasingly becoming the trend in recent research. In order to make better knowledge and the standard relate the SLR research method and halal processed meat product, the recommendations are suggested, which are:

1. Validate the theory result on real condition in food industry.
2. The sub-topic of *halal* supply chain is quite wide to discuss, especially production. Further research can discuss more on every sub-topic of production in processed meat.
3. Another research also can examine more or differentiating, between using third party as supplier of meat or using internal slaughtering, to optimize the effectiveness of production.
4. Further research can discuss more about the scope of different product from processed meat product (such as meatball, nugget, hamburgers, cured meat, smoked beef, hot dog, minced meat), also have different treatment to maintain the proper condition of package and place of product, to ensure the *halal* level or make better quality of product.

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## APPENDIX

### A. Halal Parameters

1) Obedience to commands of Allah to obey the Qur'an and the Hadith of the Prophet Muhammad, and also follow the advices of *qiyas* and *ijma'* which existing:

a. [Hadith narrated by al-Thabrani (see: al-Mu'jam al-Kabir, Juz 15), p 96].

عَنْ مُعَاذِ بْنِ جَبَلٍ، أَنَّ النَّبِيَّ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ لَمَّا بَعَثَهُ إِلَى الْيَمَنِ، قَالَ لَهُ: "كَيْفَ تَقْضِي  
إِنْ عَرَضَ لَكَ قَضَاءٌ؟"، قَالَ: أَقْضِي بِكِتَابِ اللَّهِ، قَالَ: "فَإِنْ لَمْ يَكُنْ فِي كِتَابِ اللَّهِ؟" قَالَ:  
فَبِسُنَّةِ رَسُولِ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ، قَالَ: "فَإِنْ لَمْ يَكُنْ فِي سُنَّةِ رَسُولِ اللَّهِ صَلَّى اللَّهُ  
عَلَيْهِ وَسَلَّمَ؟" قَالَ: أَجْتَهِدُ رَأْيِي وَلَا أَلُو، قَالَ: فَضَرَبَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ  
صَدْرَهُ، وَقَالَ: "الْحَمْدُ لِلَّهِ الَّذِي وَفَّقَ رَسُولَ رَسُولِ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ لِمَا يُرْضِي  
رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ"

b. (QS 5: 3)

وَالْمَوْفُودَةَ وَالْمُنْخَفِقَةَ بِهِنَّ اللَّهُ لِعَیْرِ أَهْلِهَا وَمَا الْخَنِزِيرَ وَالْحَمَّ وَالِدَّمَ الْمَيْتَةَ عَلَيْكُمْ حُرِّمَتْ  
تَسْتَفْسِمُوا وَأَنَّ النَّصْبَ عَلَى ذُبْحٍ وَمَا ذَكَّيْتُمْ مَا إِلَّا السَّبْعُ أَكَلٌ وَمَا حَتُّو النَّطِيدِ وَالْمُتَرَدِّیَّةِ  
الْيَوْمَ ۖ وَآخِشُونَ تَخْشَوْهُمْ فَلَا دِينَكُمْ مِنْ كَفَرُوا الَّذِينَ يَبْسُ الْيَوْمَ ۖ فَسُقُ ذَلِكُمْ ۖ بِالْأَزْلَامِ  
فِي اضْطِرَّ فَمَنْ ۖ دِينًا لِإِسْلَامِكُمْ وَرَضِيْتُمْ نِعْمَتِي عَلَيْكُمْ وَأَتَمَمْتُ مَدِينَتَكُمْ أَكْمَلْتُ  
رَحِيمٍ غَفُورٌ اللَّهُ فَإِنَّ ۖ لِإِثْمٍ مُتَجَانِفٍ غَيْرَ مَخْمَصَةٍ

c. (QS 55:8–10)

وَضَعَهَا وَالْأَرْضَ ۙ (۹) الْمِيزَانَ تُخْسِرُوا وَلَا بِالْقِسْطِ الْوِزْنَ وَأَقِيمُوا ۙ (۸) الْمِيزَانَ فِي تَطَعُوا أَلَا  
ۙ (۱۰) لِلْأَنَامِ

d. (QS 10: 71)

.. تَوَكَّلْتُ اللَّهُ فَعَلَى ...

e. (QS 16:5)

تَأْكُلُونَ مِنْهَا وَمَنْفَعٌ دِفْءٌ فِيهَا لَكُمْ ۗ خَلَقَهَا وَالْأَنْعَامَ

2) Livestock's animal as a main ingredient for *halal* consumption is permissible species:

a. (QS 2:168)

لَكُمْ إِنَّهُ ۗ الشَّيْطَانِ خُطُوتٍ تَتَّبِعُوا وَلَا طَيِّبًا حَلَالًا الْأَرْضِ فِي مِمَّا كَلُوا النَّاسُ أَيُّهَا يَا مُبِينٌ عَدُوٌّ

b. 2:173

بَاغٍ غَيْرِ اضْطُرٍّ فَمَنْ ۗ اللَّهُ لِعَيْرٍ بِهِ أَهْلٌ وَمَا الْخِنْزِيرِ وَلَحْمٌ وَالدَّمُ الْمَيْتَةِ عَلَيْكُمْ حَرَّمَ إِنَّمَا رَحِيمٌ غَفُورٌ اللَّهُ إِنَّ ۗ عَلَيْهِ إِنْمْ فَلَا عَادٍ وَلَا

c. (QS 16:7)

رَحِيمٌ لِرَأُوفٌ رَبِّكُمْ إِنَّ ۗ الْأَنْفُسِ بِشِقِّ إِلَّا بِالْغَيْهِ تَكُونُوا لَمْ بَلَدٍ إِلَى أَثْقَالَكُمْ وَتَحْمِلُ

d. (QS 16:8)

تَعْلَمُونَ لَا مَا وَيَخْلُقُ ۗ وَزِينَةً لِتَرْكَبُوهَا وَالْحَمِيرَ وَالْبِغَالَ وَالْخَيْلَ

e. (QS 16: 80)

ظَعْنِكُمْ يَوْمَ تَسْتَخِفُّونَهَا بِيُوتًا الْأَنْعَامِ جُلُودٍ مِنْ لَكُمْ وَجَعَلَ سَكَنًا بِيُوتِكُمْ مِنْ لَكُمْ جَعَلَ وَاللَّهُ حِينَ إِلَى وَمَتَاعًا أَثَانًا وَأَشْعَارِهَا وَأُوبَارِهَا أَصْوَابِهَا وَمِنْ ۗ إِقَامَتِكُمْ وَيَوْمَ

f. (QS 23:21)

تَأْكُلُونَ وَمِنْهَا كَثِيرَةٌ مَنَافِعُ فِيهَا وَلَكُمْ بَطُونِهَا فِي مِمَّا نُسْقِيكُمْ ۗ لَعِبْرَةَ الْأَنْعَامِ فِي لَكُمْ وَإِنَّ

(QS 40:79)

تَأْكُلُونَ وَمِنْهَا مِنْهَا لِتَرْكَبُوا الْأَنْعَامَ لَكُمْ جَعَلَ الَّذِي اللَّهُ

g. (QS 22:34,

إِلَهُ فَالْهُكُمْ ۗ الْأَنْعَامِ بِهِيمَةٍ مِنْ رَزَقَهُمْ مَا عَلَى اللَّهِ اسْمَ لِيذْكُرُوا مَنْسَكًا جَعَلْنَا أُمَّةً وَلِكُلِّ الْمُخْبِتِينَ وَبَشَرٍ ۗ أَسْلَمُوا فَلَهُ وَاحِدٌ

فَإِذَا صَوَّافٌ عَلَيْهَا اللَّهُ اسْمَ فَادْكُرُوا ۗ خَيْرٌ فِيهَا لَكُمْ اللَّهُ شَعَائِرٍ مِنْ لَكُمْ جَعَلْنَاهَا وَالْبُدْنَ

لَعَلَّكُمْ لَكُمْ سَخَرْنَاهَا كَذَلِكَ ۖ وَالْمُعْتَرَّ الْقَانِعَ وَأَطْعِمُوا مِنْهَا فَكُلُوا جُنُوبَهَا وَجَبَّتْ  
تَشْكُرُونَ

h. (QS 24:45)

رَجُلَيْنِ عَلَى يَمَشِي مَنْ وَمِنْهُمْ بَطْنِهِ عَلَى يَمَشِي مَنْ فَمِنْهُمْ ۖ مَاءٍ مِنْ دَابَّةٍ كُلِّ خَلَقَ وَاللَّهُ  
قَدِيرٌ شَيْءٍ كُلِّ عَلَى اللَّهِ إِنَّ ۖ يَشَاءُ مَا اللَّهُ يَخْلُقُ ۖ أَرْبَعٍ عَلَى يَمَشِي مَنْ وَمِنْهُمْ

i. (QS 36:71)

مَالِكُونَ لَهَا فَهُمْ أَنْعَامًا أَيْدِينَا عَمِلَتْ مِمَّا لَهُمْ خَلَقْنَا أَنَا يَرَوَا أَوْلَمَ

j. (HR. Muslim no. 1015)

..لِذَلِكَ يُسْتَجَابُ فَأَنَّى بِالْحَرَامِ وَغُذِيَ حَرَامٌ وَمَلْبَسُهُ حَرَامٌ وَمَشْرَبُهُ حَرَامٌ وَمَطْعَمُهُ

### 3) Halal pre-production requirement

a. (QS 5:1)

يَا أَيُّهَا الَّذِينَ آمَنُوا أَوْفُوا بِالْعُقُودِ ۖ أُحِلَّتْ لَكُمْ بَهِيمَةُ الْأَنْعَامِ إِلَّا مَا يُنْتَلَىٰ عَلَيْكُمْ غَيْرَ مُحِلِّي  
الصَّيْدِ وَأَنْتُمْ حُرْمٌ ۗ إِنَّ اللَّهَ يَحْكُمُ مَا يُرِيدُ

b. (6:138)

ظُهُورُهَا حُرِّمَتْ وَأَنْعَامٌ بَزَعِمِهِمْ نَشَاءُ مَنْ إِلَّا يَطْعَمَهَا لَا حِجْرٌ وَحَرَّتْ أَنْعَامٌ هَذِهِ وَقَالُوا  
كَانُوا بِمَا سَيَجْزِيهِمْ ۖ عَلَيْهِ افْتِرَاءٌ عَلَيْهَا اللَّهُ اسْمٌ يَذْكُرُونَ لَا وَأَنْعَامٌ  
يَفْتَرُونَ

c. (QS 2:168)

مُبِينٌ عَدُوٌّ لَكُمْ إِنَّهُ ۖ الشَّيْطَانِ خُطُوتٍ تَتَّبِعُوا وَلَا طَيِّبًا حَلَالًا الْأَرْضِ فِي مِمَّا كُلُّوا النَّاسُ أَيُّهَا يَا

(QS 7:157)

وَالْإِنْجِيلِ التَّوْرَةِ فِي عِنْدَهُمْ مَكْتُوبًا يَجِدُونَهُ الَّذِي الْأُمِّيَّ النَّبِيِّ الرَّسُولَ يَتَّبِعُونَ الَّذِينَ  
وَيَضَعُ الْخَبَائِثَ عَلَيْهِمْ وَيَحْرِمُ الطَّيِّبَاتِ لَهُمْ وَيُحِلُّ الْمُنْكَرَ عَنَ وَيُنْهَاهُمْ بِالْمَعْرُوفِ يَا أَمْرُهُمْ

وَاتَّبَعُوا وَنَصَرُوهُ وَعَزَّرُوهُ بِهِ آمَنُوا فَالَّذِينَ ۖ عَلَيْهِمْ كَانَتْ الَّتِي وَالْأَعْلَالَ إِصْرَهُمْ عَنْهُمْ  
الْمُفْلِحُونَ هُمْ أَوْلَئِكَ ۗ مَعَهُ أَنْزَلَ الَّذِي النُّورَ

- d. Fear Allah in these silent animals, and ride them while they are suitable to be ridden, and let free when they need to rest' (Abu Dawud).

وعن سهل بن عمرو -وقيل سهل بن الربيع بن عمرو الأنصاري المعروف بابن الحنظلية، وهو من أهل بيعة الرضوان، رضي الله عنه، قال: مر رسول الله صلى الله عليه وسلم في هذه البهائم المعجمة، عليه وسلم ببعير قد لحق ظهره بطنه، فقال: "اتقوا الله في هذه البهائم المعجمة، عليه وسلم ببعير قد لحق ظهره بطنه، فقال: فاركبوها سالحة وكلوها سالحة" ((رواه أبو داود بإسناد صحيح)).

- e. (QS 6:121; 22:36)

أُولَئِكَ هُمُ إِلَى لِيُوحُونَ الشَّيَاطِينَ وَإِنَّ لَفِسْقٍ وَإِنَّهُ عَلَيْهِ اللَّهُ اسْمٌ يُذَكِّرُ لَمْ مِمَّا تَأْكُلُوا وَلَا لِمُشْرِكُونَ إِنَّكُمْ أَطَعْتُمُوهُمْ وَإِنَّ ۖ لِيُجَادِلُوكُمْ

- f. (Sahih Muslim, Book 21, Chapter 11, Number 4810)

حَدَّثَنَا أَبُو بَكْرِ بْنُ أَبِي شَيْبَةَ، حَدَّثَنَا إِسْمَاعِيلُ بْنُ عَبْدِ اللَّهِ، عَنْ خَالِدِ الْحَدَّادِ، عَنْ أَبِي قَالِبَةَ، عَنْ أَبِي الْأَسْعَثِ، عَنْ شَدَّادِ بْنِ أَوْسٍ، قَالَ تَنَانِ حَفِظْتُهُمَا عَنْ رَسُولِ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ قَالَ " إِنَّ اللَّهَ كَتَبَ الْإِحْسَانَ عَلَى كُلِّ شَيْءٍ فَإِذَا قَتَلْتُمْ فَأَحْسِنُوا الْقِتْلَةَ وَإِذَا ذَبَحْتُمْ وَسَلَّمْ قَالَ فَاحْسِنُوا الذَّبْحَ وَلِيُجِدَّ أَحَدُكُمْ شَفْرَتَهُ فَلْيُرِحْ ذَبِيحَتَهُ " .

#### 4) Halal production process

- a. (QS 16:5)

تَأْكُلُونَ وَمِنْهَا وَمَنَافِعُ دِفءٌ فِيهَا لَكُمْ ۗ خَلَقَهَا وَالْأَنْعَامَ

- (QS 16:80)

حِينَ إِلَى وَمَتَاعًا أَنَا وَأَشْعَارِهَا وَأَوْبَارِهَا أَصَوَافِهَا وَمِنْ

- (QS 22:34,36)

الْأَنْعَامَ بِهِيمَةٍ مِنْ رَزَقِهِمْ مَا عَلَى اللَّهِ اسْمٌ لِيُذَكَّرُوا مَنَسَكًا جَعَلْنَا أُمَّةً وَلِكُلِّ فَإِذَا ۖ صَوَافَّ عَلَيْهَا اللَّهُ اسْمٌ فَادْكُرُوا خَيْرٌ فِيهَا لَكُمْ اللَّهُ شَعَائِرٍ مِنْ لَكُمْ جَعَلْنَاهَا وَالْبُذُنَ وَالْمُعْتَرَّ الْقَانِعَ وَأَطْعَمُوا مِنْهَا فَكُلُوا جُنُوبُهَا وَجَبَتْ

b. (HR. Al-Bukhari no. 2057).

فَقَالَ ؟ لَا أَمَّ اللَّهُ اسْمَ أَذْكَرُوا نَذْرِي لَا بِاللَّحْمِ يَأْتُونَنَا قَوْمًا إِنَّ ،اللَّهُ رَسُولَ يَا : قَالُوا قَوْمًا إِنَّ  
وَكُلُّهُ عَلَيْهِ اللَّهُ سَمُّوا : وَسَلَّمْ عَلَيْهِ اللَّهُ صَلَّى اللَّهُ رَسُولُ

c. (QS 2:172)

تَعْبُدُونَ إِيَّاهُ كُنْتُمْ إِنْ لِلَّهِ وَاشْكُرُوا رَزَقْنَاكُمْ مَا طَيِّبَاتٍ مِنْ كُلِّ أَمْثَلِ الَّذِينَ أَيُّهَا يَا

d. (QS 23: 51)

عَلَيْمٌ تَعْمَلُونَ بِمَا إِنِّي ُ صَالِحًا وَاعْمَلُوا الطَّيِّبَاتِ مِنْ كُلِّ الرُّسُلِ أَيُّهَا يَا

5) *Halal* post-production requirement

a. (QS 9:119)

الصَّادِقِينَ مَعَ وَكُونُوا اللَّهُ اتَّقُوا أَمْثَلِ الَّذِينَ أَيُّهَا يَا

b. (QS 39:74)

فَنِعْمَ ُ نَشَاءُ حَيْثُ الْجَنَّةِ مِنْ نَنْبَوُا الْأَرْضِ وَأُورَثْنَا وَعَدَهُ صَدَقْنَا الَّذِي لِلَّهِ الْحَمْدُ وَقَالُوا  
الْعَامِلِينَ أَجْرُ

c. (Ṣaḥīḥ al-Bukhārī 5743, Ṣaḥīḥ Muslim 2607)

عَلَيْكُمْ بِالصَّدَقِ فَإِنَّ الصَّدَقَ يَهْدِي إِلَى عَنْ عَبْدِ اللَّهِ قَالَ قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ  
رَجُلٌ يَصْدُقُ وَيَتَحَرَّى الصَّدَقَ حَتَّى يُكْتَبَ عِنْدَ الْبِرِّ وَإِنَّ الْبِرَّ يَهْدِي إِلَى الْجَنَّةِ وَمَا يَزَالُ الـ  
ر وَمَا اللَّهُ صِدِّيقًا وَإِيَّاكُمْ وَالْكَذِبَ فَإِنَّ الْكَذِبَ يَهْدِي إِلَى الْفُجُورِ وَإِنَّ الْفُجُورَ يَهْدِي إِلَى النَّارِ  
كُتِبَ عِنْدَ اللَّهِ كَذَابًا يَزَالُ الرَّجُلُ يَكْذِبُ وَيَتَحَرَّى الْكَذِبَ حَتَّى يُـ