Slaughtering System Design in Halal Beef Supply Chain Using Value Chain Analysis

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Abstract. People prioritize the taste of food more than the Halal status, while Islamic law requires Muslims to consume Halal food. Halal Supply Chain management system is the system that involves Islamic principles in all activities from farm to fork. These three factors must be a concern: direct contact with haram (forbidden), cross-contamination, and Muslim perception. In the slaughterhouse, all the processes in slaughtering and handling the carcass must be able to guarantee the Halal status of the product. This research was done in four slaughterhouses. The observation was made in cattle feedlot, from all activities at the slaughterhouses to the product sent to retailers. The value chain of the slaughter system in the beef supply chain can be a guide for preparing business process in slaughterhouses as a provider of beef in the Halal Supply Chain.

1. Introduction
Beef has the advantage of being a product that provides good nutrition [1]. Beef is an economic commodity that has strategic value and is a perishable product [2]. The issue of food safety and halal food in the supply chain has been widely studied [3]. Cattles are halal animals to consume, but many risks can affect the halalness of beef [4]. Most people prioritize the taste of food and pay less attention to its halal status [5], while the teachings of Islamic law contained in QS. Al-Baqarah verses 168 and 172, requires Muslims to consume halal products and purity guaranteed. The basic requirements for the Halal Food Supply Chain to improve the integrity of halal products have been studied by Tieman with the results of the study showing that avoiding contact with the haram, recognizing the risk...
of contamination, and being in line with Muslim perceptions are the basis of Halal Supply Chain Management [6]. The processing of foodstuffs can pose a risk to food safety, a risk to halalness or to create the two integrated risks. These risks need to be recognized to be avoided [7]. The risks to food safety and halal chicken products in Indonesia have been studied by Hana Catur Wahyuni et al [8].

The perception of the halal traceability of chicken has been studied [12] and the traceability system to ensure the halalness of raw materials has been studied by Vanany et al and tested in chicken processing companies [13]. The effect of the adoption of factors that affect HSCM on company business performance shows that the context of technology, organization, and environment can improve the performance of the Halal manufacturing business [14]. The vulnerability of HSC is influenced by product characteristics and market requirements. The implementation of halal control activities and halal assurance activities in the logistics process can reduce vulnerabilities [15].

Value chain analysis is an approach regarding systematic evaluation related to how companies serve consumers. Value chain analysis provides a systematic and rational framework for explaining and evaluating the roles and relationships of individuals and organizations [16]. To get halal meat products, a slaughtering system that is following Sharia principles in the beef supply chain needs to be designed in the Value Chain for these activities. This research aims to design the value chain of the slaughtering system according to the Sharia principle to deliver the halal beef product to the consumer.

2. Research Methodology
This study took place in 4 Slaughterhouses in 4 districts - cities in the Province of Sumatera Utara. This descriptive research includes analysis of all activities at the slaughterhouse. The required information was obtained from respondents with backgrounds: the leaders, employees, and workers on the production floor of the 4 slaughterhouses, as well as government veterinary services. The steps of data collection and processing, namely:
Observation of all activities at the slaughterhouse
- Mapping of slaughtering activities in slaughterhouses
- Categorizing Primary Activities in the Value Chain Model
- Designing a Value Chain Model

Observation is done as many as 3 times in each slaughterhouse. The first time is to collect all the activities by observing the worker’s activities, method, condition, and environment. The second time is to verify after mapping the slaughterhouse activities and subactivities from arrival to distribution. The last time is to validate the developed value chain model with the actual condition.

3. Results and Discussion

Based on observations of slaughtering activity in all slaughterhouses, it appears to have quite the same slaughtering process and carcass handling. The first step is to map the activity of slaughtering in the beef supply chain so that the same activity description is obtained from the slaughterhouses. Slaughtering activities in slaughterhouses can be seen in Table 1.

Table 1. Mapping of slaughtering activities in slaughterhouses

| Activity                          | Sub Activity                          |
|----------------------------------|---------------------------------------|
| The arrival of Cattles from Feedlot | Animal reception and storage          |
|                                   | Antemortem examination                 |
| Cattle Slaughtering              | Cattle herded to the slaughtering area |
|                                   | Slaughter according to Sharia law      |
| Handling of Slaughter Results     | Skinning                               |
|                                   | Abdominal Cleavage and Remove the innards |
|                                   | Carcass Cleavage                       |
|                                   | Postmortem examination                 |
|                                   | Beef Packing                           |
| Distribution                     | Carcass Transport                      |

From the mapping of slaughtering activities at the slaughterhouses above, it can be seen that the arrival of cattle from feedlot has 2 sub-activities namely animal reception and storage, and antemortem examination. Cattle slaughtering activity has 2 sub-activities, handling of slaughter result has 5 sub-activities, and distribution activity has carcass transportation sub-activity. After mapping the activity, the next step categorizes the primary activities of the value chain model whose results can be seen in Table 2.

Primary activities of the value chain model consist of inbound logistics, operations, and outbound logistics. Inbound logistics is the movement of material into a company that shows the flow of material from suppliers to factories or operations [17]. The activities included in the inbound logistics value chain model of the slaughter system in the halal beef supply chain are:
Procuring is an activity carried out by slaughterhouses when conducting transactions or proposing the purchase of cattle to the feedlot.

Receiving is an activity carried out by the slaughterhouse when receiving cattle according to the purchase from the feedlot.

At the time of receiving, the slaughterhouse will count and check the conformity of the cattle received from the feedlot.

Cattle that have been examined for eligibility and health will be placed by the slaughterhouse according to location, weight and then a recapitulation of the number of cattle from inbound logistics will be carried out into the system.

### Table 2. Primary activities model value chain

| Sub Activity                                      | Process    |
|--------------------------------------------------|------------|
| Animal Reception and storage                     | Inbound    |
| Antemortem examination                           | Logistics  |
| Cattle herded to the slaughtering area            |            |
| Slaughter according to Sharia law                |            |
| Skinning                                         |            |
| Abdominal Cleavage and remove the innards        | Operations |
| Carcass Cleavage                                 |            |
| Postmortem examination                           |            |
| Beef Packing                                     |            |
| Carcass Transport                                | Outbound   |
|                                                  | Logistics  |

Operations are activities that convert inputs into outputs. The activities included in the operation management of slaughterhouse business processes in halal beef products are:

- The antemortem check is the health check of each animal that will be slaughtered.
- Animal slaughtering techniques are divided into two, namely slaughtering techniques that can be done directly and indirect techniques (stunning).
- The process of skinning begins with making long slices of the skin along the inner surface (the legs).
- The process of abdominal division and innards expenditure can be divided into 2 types, namely red innards (liver, heart, kidney, and lungs) and green innards (intestine).
- Carcass Cleavage is a dissection that is done after the head and legs are separated from the slaughtered animal. The dissection is carried out by dividing the carcass into right and left parts by using a saw right on the midline of the back.
- Postmortem examination is a health examination of meat after cutting. Examination especially on carcasses, lymph nodes, head on the mouth, tongue, lips, muscles, and examination of the lungs, heart, kidneys, liver, and spleen.
- Withering Meat/ Carcass is handling fresh meat after slaughter by hanging or storing for a certain time at temperatures below freezing (-1.50C).
Outbound logistics is the movement of products outside the factory or operating service to customers or consumers [17-18]. The activities included in the outbound logistics for managing slaughterhouse business processes in halal beef products are:

- **Replenishment** is an activity where slaughterhouses fulfill or supply beef to the distributor according to the agreement.
- **Dispatch** is an activity of determining the transporter after the beef product is ready to be sent by the distributor.
- **Delivery** is the activity of sending beef by a slaughterhouse distributor to retail (market or consumer).

The value chain model of the slaughter system can be seen in Figure 1.

![Value chain model slaughtering system in beef supply chain](image)

**Figure 1.** Value chain model slaughtering system in beef supply chain

A value chain model for the slaughter system in the halal beef supply chain consisting of primary activities containing inbound logistics, operations, and outbound logistics as well as support activities containing firm infrastructure, technology, and human resource management.

Based on Figure 1, it can be seen the value chain design of the slaughter system in the halal beef supply chain, which can be implied by designing the Operating model Canvas.
and so the business process design will be obtained at the slaughterhouses for halal beef. The benefit of the value chain serves as guidance in preparing the Halal slaughterhouses business process so that later slaughterhouses that comply with the business process can maintain the halalness of their products.

4. Conclusion
From the results of the design of the value chain model, it can be seen all primary activities and supporting activities of the slaughter system in the beef supply chain at the slaughterhouse. This research concludes there are many activities and subactivities in slaughterhouses and could be categorized as inbound logistics (2 subactivities), operations (7 subactivities), and outbound logistics (1 subactivity). All the subactivities above are the primary activities, describe all subactivities executed from the arrival of the cattle to the final distribution of halal beef.

The design of the value chain model shown all primary activities and supporting activities of the slaughterhouse system in the Halal beef supply chain, and the research focus to the slaughterhouse. The contribution of this research is the use of value chain analysis in developing the halal process business in slaughterhouses.

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