A model for assessment of Halal Good Manufacturing Practice in meat industry

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ABSTRACT
This research aimed to build an assessment model on the Halal Good Manufacturing Practices (HGMP) in the meat industry. Data collection was used at four slaughterhouses in Indonesia. This study collected data through two closed questionnaires involving a paired matrix as a priority setting for improved policies and filling in values using a Likert scale. Integrating the Analytical Hierarchy Process (AHP) and House of Quality (HOQ) was adopted to develop a slaughterhouse assessment model. HGMP provided 54 performance indicators for slaughterhouses from 5 variables as assessment criteria. This case study found that the slaughterhouse performance in Pekanbaru had a good category than others. In addition, many defined customer and technical requirements need to be improved to meet customer needs in the Building and Facility; Equipment, Employee; Maintenance; Halal. The provision of a benchmarking matrix aims to facilitate managers to make measurable performance improvements.

1. Introduction
The improvement of the business services performance aims to increase customer satisfaction in providing products. Kasim et al. (2018) argue that improving the quality of business services can be undertaken by improving performance and increasing efficiency. Furthermore, productivity is one of the measuring tools for business services in obtaining input to offer products or services in accordance with the expectations of consumers based on the quantity and quality of the product (Lin & Weng, 2019). Thus, any improvement in business services can increase business efficiency and productivity. However, business services have challenges in making performance improvements to increase efficiency and productivity in accordance with public service standards. Neely et al. (2000) state that each system has a different approach to improving its performance.

Moreover, the improvement of business service can be carried out by adopting a system performance measurement. Researchers stated that performance measurement aims to control, evaluate, and manage the system. Baird (2017) examines the strategic
performance measurement systems to control organizational processes and influence the effectiveness of the system. Finding shows managers need to focus on a set of performance measures relating to the selected variable. Halachmi (2005) study about managing performance through performance measurement. He found that research uses both quantitative and qualitative techniques in the social science of the enterprise able to manage a system. There are many obstacles to measuring system performance for improving business services to achieve public service standards. The suitability of the performance measurement method with the actual conditions of business services is expected to provide improvements in the input, process, and output stages of a system.

The result of performance measurement is expected to be able to become a standard in benchmarking several other business services. Broderick et al. (2010) study benchmarking in small business-to-business services. They found that benchmarking business services based on quality standards could improve system performance and increase a deeper understanding of service firms. The best practices of benchmarking can be used proactively as a strategic tool to enhance the effectiveness of the system (Asrofah et al., 2010). In addition, Benchmarking can also improve the performance of variable systems according to the standards set based on the voice of the customer and product development (Shen et al., 2000).

This case study aimed to improve business services in the slaughterhouse in Indonesia. The object of this study was carried out in the province of Riau in Indonesia. Riau has 12 cities with a total number of slaughterhouses of 20 units, and there is an increasing number of beef production every year (Central Bureau of Statistics, 2018). Furthermore, this product is distributed to several business actors, including retailers, traditional markets, and restaurants for sale to final consumers. This province has the majority of the Muslim population who are consumers of beef. Ambali and Bakar (2014) state that Muslim consumers have a perspective on consuming food based on the quality standardization of halal products. Halal products are an acknowledgment of product quality in accordance with the guarantees given to consumers through a series of inspections of raw materials, production processes, and product packaging to delivery to consumers (Soon et al., 2017). Thus, the concern and awareness of consumers to consume halal products have created a new standard for business services such as slaughterhouses in providing products for consumers. The Indonesian government has a program to manage Slaughterhouses as one of the business services in the provision meat of Safe, Healthy, Intact, and Halal (Udiata et al., 2020). Currently, the management of slaughterhouses in Indonesia is regulated based on government regulations regarding the Requirements of Slaughterhouse and Meat Cutting Plant to ensure product quality to consumers.

Slaughterhouses must meet the need of the consumer by improving business service performance according to Indonesian government standards. The government agency responsible for supervising the operation of slaughterhouses is the animal husbandry office. However, to meet the standards of Muslim consumers, the government appoints a halal certification agency as the auditor for the quality assurance process for food products. The determination of this standard is issued in a halal certificate as a guarantee that the product can be consumed by Muslim consumers in Indonesia. Furthermore, Riau province has 20 slaughterhouses, and only one slaughterhouse has a halal certificate to serve consumers. Thus, the slaughterhouse business services need to be evaluated to improve its performance. Data on slaughterhouses in Riau shows that a limited number
of slaughterhouses have halal certification. Even though there are a lot of them to supply the needs of consumers in Riau Province or other provinces in Indonesia, then, processed meat from slaughterhouses can also be delivered to the global market. This encourages slaughterhouses to improve quality standards to be accepted by local and international consumers. Not only Indonesia but even countries in Southeast Asia are also concerned about halal products for consumption by local Muslims or tourists. Thus, the concern and awareness of consumers in Southeast Asia to consume halal products has been high. A study stated that the current tourism sector for countries in Southeast Asia is the highest source of income (Wahyono & Razak, 2020). Thus, halal product services are a necessity to support tourism development strategies. Then, a study stated that a lot of penetration of halal products circulating in Southeast Asia is an opportunity and a threat for local halal products (Akim et al., 2019). Thus, the competitiveness of halal products is the main focus to be studied. Obviously, the study of halal implementation in slaughterhouses as the upstream sector of halal products is needed to increase productivity and expansion into the global market.

The need for beef products is high. Thus, the slaughterhouse must be able to meet the need of consumers in accordance with the quality standard that has been established. This case study requires an assessment model for improving the performance of slaughterhouses in Indonesia that can measure the performance and benchmarking of business services in accordance with public service standards. Thus, these improvements can help managers in a structured and systematic manner of improving their business processes. There are several methods of measuring organizational performance or systems including the Balanced Scorecard (BSC; Kaplan & Norton, 2001), The EFQM (European Foundation for Quality Management (EFQM) model (Santos-Vijande & Alvarez-Gonzalez, 2007), and the Analytical Hierarchy Process (AHP; Shahin & Mahbod, 2007). All of these methods have barriers and drivers in carrying out the operational process. The slaughterhouse case is measured based on several criteria in government regulations. Thus, the adoption of the AHP is required in this study. In addition, due to limitations on performance measurement, it is not possible to provide recommendations for improvements to system performance. Bourne et al. (2003) state that performance measurement is the initial basis for knowing the conditions of the existing system. Thus, this requires a combination of other methods to improve performance. This study requires a product benchmarking approach to find out the positioning to the needs of consumers in the market. The House of Quality (HOQ) matrix is an approach to benchmarking products that can be combined with several other methods (Shen et al., 2000). This method is used by translating targeted consumer needs to be met with new improvement strategies based on market research and benchmarking data. This method is designed to help focus on the characteristics of an existing product or service by paying attention to market segmentation. A study states that every company or business unit always uses data and information to assist in the company’s strategic planning process (Gaol et al., 2020). In addition, this method also uses a matrix format to capture a number of issues that are critical to the improvement planning process. Research also uses this method to be used in supplier selection which the company starts with the features that the purchased product must have to meet certain requirements that the company has set and then tries to identify which supplier attributes are the best (Mahfod et al., 2019). Research integration of the HOQ matrix with other studies that involve the
benchmarking process using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS; Cho et al., 2015). Lee et al. (2008) also combine the HOQ and ANP approaches for making an effective decision. This study requires product benchmarking based on competitors or other business services. Thus, the HOQ matrix approach needs to be adopted in this study. The existence of an assessment model based on system performance measurement and product benchmarking is expected to build a framework to improve the performance of slaughterhouses in Indonesia.

This study requires an assessment model for performance improvement in slaughterhouses. Thus, this paper provides several objectives for improving the system. Firstly, this study aims to determine indicators for improving the performance of slaughterhouses based on regulations and quality standards in Indonesia. Second, this study also aims to measure the performance of slaughterhouses based on the indicators that are most need to improve. Lastly, this study aims to benchmark business services for the proposed system improvement targets. In addition, the scope of this study covers quality standards in Indonesia, and it involves the requirements of the slaughterhouse, Good Manufacturing Practices (GMP), and Halal assurance quality. Indeed, this study proposes an assessment model to improve system performance, which is formulated in the Halal Good Manufacturing Practice (HGMP) Framework. Obviously, this research needs to assist government agencies in improving the performance of slaughterhouses in meeting consumer needs and increasing system performance with the addition of halal certification to business services in Indonesia.

2. HGMP for slaughterhouse

The quality standardization of business services aims to achieve the same quality of goods or services. Khudri and Sultana (2015) assert that quality is the whole character of a good or service that has its ability to fulfill a stated or implied need. Pakurár et al. (2019) also state that similarity in the quality of business services can be achieved by meeting certain standards that have been enforced compulsorily. Thus, business service providers can compete in achieving efficiency and productivity due to production costs, and product selling prices do not differ significantly. Minh et al. (2015) conduct the standardization of the Hotel Industry in Vietnam with the aim that customers have confidence in the quality assurance of business services. Furthermore, standardization of business service quality is also needed in hospital services due to the safety of the patient is a top priority for maintaining the issue of quality and hospital image (Rose et al., 2004). Obviously, the assurance of the quality of business services for all planned and systematic actions is needed to provide confidence that a product or service can meet certain quality requirements. This study develops a standardization of business service quality through the Halal Good Manufacturing Practices (HGMP) framework for slaughterhouses that are used in performance improvement assessments. In addition, Halal Good Manufacturing Practices (HGMP) is developed through Indonesian government regulations involving Requirements of Slaughterhouse; Good Manufacturing Practices (GMP); and Halal Assurance System (HAS).
2.1. Government regulation

Government Regulation in Indonesia which regulates slaughterhouses is listed in the Regulation of the Minister of Agriculture of the Republic of Indonesia No. 13/PERMENTAN/OT.140/1/2010 regarding the Requirement of Slaughterhouse and Meat Cutting Plant. This is the regulation by the Indonesian Central Government regarding the Requirements of Slaughterhouse and Meat Cutting Plants. For this technical implementation, the local government feels the need to issue regional regulations regarding the Requirements of Slaughterhouse. Thus, several local government regulations (districts) related to this regulation were found. Bandung Regency through Regional Regulation Number 20 of 2011 explains Slaughterhouses. Then, North Barito Regency No. 4 of 2020 also explained slaughterhouses. Mamuju Regency also released Regional Regulation No. 13 of 2011 concerning Slaughterhouses. Obviously, some areas in Indonesia require regulations on Slaughterhouses that can be implemented to meet consumer needs. In addition, the slaughterhouse is a business service for consumers in providing safe and healthy meat. The slaughterhouse has the function of slaughtering animals in accordance with the requirements of veterinary consumer health and animal welfare. Then it is also used for animal health checks and carcass and offal checks to prevent disease transmission to humans. Then, the regulations regarding food production activities in the form of Good Manufacturing Practices are listed in the Regulation of the Minister of Industry of the Republic of Indonesia No. 75/M-IND/PER/7/2010 concerning Guidelines for Good Manufacturing Practices. This is intended as a general guideline for producing processed food for the food processing industry, supervisor of the food processing industry, and supervisor of the quality and safety of processed food. Thus, this concept encourages business services to manage products carefully. Regulations regarding the obligation stages for the halal product based on product type are regulated in Government Regulation No. 39 the Year of 2021 regarding Implementation of Halal Product Assurance. Halal products are goods and or services related to food, beverages, medicines, cosmetics, chemical products, biological products, genetically engineered products, and consumer goods that are used or utilized by consumers. To ensure the halal product, the inspection process focuses on the stages of providing materials, processing, storing, packaging, distributing, selling, and serving the product. The provision of halal products involves several integrated elements in ensuring product quality. It includes the Indonesian Ministry of Religion (BPJPH) as the organizer of the Halal Product Guarantee (JPH), the Indonesian Ulama Council (MUI) as a fatwa institution for deliberation by the ulama, the Halal Inspection Agency (LPH) as halal product inspection and testing agency, business actor as a business service and Halal Supervisor as the person responsible for the Halal product.

The regulations above have similarities and differences in emphasis on the scope of their operational implementation. Thus, Indonesia needs regulation from the Indonesian central government regarding slaughterhouses applying the halal concept. Currently, the Government Regulation in Indonesia, which regulates Halal slaughtering, is listed in the Indonesia National Standard (SNI) 99,003:2018 in the year 2018. Several regulations related to Halal slaughtering were revealed in SNI 99002:2016 about Halal slaughter of poultry in 2016 and guidelines of Halal Assurance System criteria on slaughterhouse on HAS 23103 in 2012. Muslim consumers in Indonesia hope that regulations regarding the
operational implementation of slaughterhouses have halal standards to ensure that the upstream sector of food products has been processed with the halal concept. Thus, this study needs to review the regulations above into a halal framework for good manufacturing practices in Slaughterhouse. Figure 1 is a framework of Halal good manufacturing practices for the slaughterhouse in Indonesia.

3. Research method

3.1. Object of research

This study aimed to support policy managers and business people in the slaughterhouse business process in providing quality services to consumers. Furthermore, users of this model are policymakers who are represented by institutions that provide halal certification and business services including slaughterhouses. The framework of Halal Good Manufacturing Practice in the slaughterhouse was established to assess the business process towards continuous improvement. This research was conducted in several slaughterhouses in Indonesia, especially in Riau Province. LPPOM (2018) states that Riau only has one slaughterhouse that is halal certified. To achieve the objectives of this study, this study adopted non-probability sampling. This aimed to be able to formulate a model in the assessment of slaughterhouses for the performance improvement process for slaughterhouses that do not have halal certification. The non-probability sampling approach can be used for the process of improving the performance of two or more business services (Taherdoost, 2016). Furthermore, the purposive sampling approach was used to determine the slaughterhouses to be the object of this study, including four slaughterhouses in Pekanbaru, Bangkinang, Rengat, and Dumai. Goncharuk et al. (2015) explain that purposive sampling can be used based on the needs of researchers in improving system performance through a benchmarking process on business services. Obviously, this research was needed to benchmark slaughterhouses with halal certification and not yet receiving halal certification. It aimed to standardize the quality of slaughterhouse services to achieve the requirement of halal certification in Indonesia.

3.2. Instrument dan measurement

Assessment of Halal Good Manufacturing Practices for slaughterhouses was carried out by testing performance measurement instruments and benchmarking business services. The instruments represented actual conditions based on the standardization set by the Indonesian government and the need of the consumer. Furthermore, this instrument was validated by experts and business people before being distributed to respondents involving 15 respondents in Pekanbaru, 4 respondents in Bangkinang, 5 respondents in Rengat, and 5 respondents in Dumai. Respondent classification included expert or management of slaughterhouse, veterinarian, butcher, worker, and cleaner. The profile of the slaughterhouse in this study can be seen in Table 1. This was undertaken through validity and reliability tests and with a Likert scale of 1–5. A validation test is used to test every point in the questionnaire that has been given to respondents. To determine whether each question or statement on the questionnaire is valid or not. The criteria that must be met in the form of r count is higher than the r table, then the statement or
| Variable (Main Criteria) | Attribute (Sub Criteria) | X   | Y   | Z   |
|--------------------------|--------------------------|-----|-----|-----|
| Building and Facilities (BF) | Location (BFA)           | ✓  | ✓   | -   |
|                          | Building (BFB)           | ✓  | ✓   | -   |
|                          | Facility (BFC)           | ✓  | ✓   | ✓   |
| Equipment (EQ)           | Equipment requirements (EQA) | ✓  | ✓   | ✓   |
|                          | Equipment availability (EQB) | ✓  | ✓   | -   |
| Employee (EM)            | Employee health (EMA)    | -  | ✓   | -   |
|                          | Work equipment (EMB)     | ✓  | ✓   | -   |
|                          | Work attitude (EMC)      | ✓  | ✓   | -   |
|                          | Employee training (EMD)  | ✓  | ✓   | -   |
| Maintenance (MA)         | Building (MAA)           | ✓  | ✓   | -   |
|                          | Waste (MAB)              | ✓  | ✓   | -   |
|                          | Cleanliness (MAC)        | ✓  | ✓   | ✓   |
|                          | Tools and equipment (MAD) | ✓  | ✓   | ✓   |
| Halal (HA)               | The animal slaughter (HAA) | ✓  | -   | ✓   |
|                          | Building and facilities (HAB) | ✓  | -   | -   |
|                          | Equipment (HAC)          | ✓  | -   | ✓   |

* X: Regulation of the Minister of Agriculture of the Republic of Indonesia (No.13/PERMENTAN/OT.140/1/2010); Y: Regulation of the Minister of Industry of the Republic of Indonesia (No.75/M-IND/P-7/2010); Z: Law of the Republic of Indonesia (No. 33 of 2014).

Figure 1. Framework of Halal good manufacturing practice for the slaughterhouse* X: Regulation of the Minister of Agriculture of the Republic of Indonesia (No.13/PERMENTAN/OT.140/1/2010); Y: Regulation of the Minister of Industry of the Republic of Indonesia (No.75/M-IND/P-7/2010); Z: Law of the Republic of Indonesia (No. 33 of 2014).
question is declared valid. Then, the reliability test is an analysis used to determine the consistency of the measuring instrument after it has been carried out repeatedly on the subject and under the same conditions. Questionnaires are reliable when they provide consistent results with the same measurements. Cronbach’s alpha value must be greater than 0.6. An instrument is considered reliable if the alpha coefficient is above 0.6. The criteria for the preparation of this research instrument were determined based on Indonesian government regulations including Government Regulation in Indonesia regarding Halal Slaughtering within the Indonesia National Standard (SNI) 99,003:2018 in the year 2018, Minister of Industry Regulation No. 75/M-IND/PER/7/2010 concerning Good Manufacturing Practice and Government Regulation No. 39 the Year of 2021 regarding implementation of Halal Product Assurance.

In addition, 54 indicators were used in the study based on five variables consisting of 16 attributes, including buildings and facilities (15 indicators), equipment (7 indicators), employees (11 indicators), maintenance (11 indicators), and halal (10 indicators). These 54 indicators have also taken into account the Animal welfare factor, which is a principle of welfare and an aspect that must be met in the care and use of animals. It was developed as an effort to meet the demands of the community both nationally and internationally. In Indonesia, Law No. 41 of 2014 concerning Animal Husbandry and Animal Health explains that animal welfare has three aspects including science to measure the physical condition of animals and their environment, ethics for handling and maintaining animals, and laws to regulate human rules in treating animals. Then, this indicator has

| Slaughterhouse | Production unit per month (carcases) | Halal certification | Respondent | Job description | Experience (Year) |
|----------------|-------------------------------------|---------------------|------------|----------------|------------------|
| Pekanbaru      | 300–450                             | Certified           | 1          | Head of Dept   | 2                |
|                |                                     |                     | 2          | Manager        | 3                |
|                |                                     |                     | 3          | Worker         | 3                |
|                |                                     |                     | 4          | Worker         | 8                |
|                |                                     |                     | 5          | Cleaner        | 3                |
|                |                                     |                     | 6          | Cleaner        | 3                |
|                |                                     |                     | 7          | Worker         | 4                |
|                |                                     |                     | 8          | Worker         | 4                |
|                |                                     |                     | 9          | Veterinarian   | 10               |
|                |                                     |                     | 10         | Veterinarian   | 1                |
|                |                                     |                     | 11         | Butcher        | 4                |
|                |                                     |                     | 12         | Butcher        | 12               |
|                |                                     |                     | 13         | Worker         | 4                |
|                |                                     |                     | 14         | Worker         | 1                |
|                |                                     |                     | 15         | Worker         | 4                |
| Bangkinang     | 30–150                              | Non certified       | 1          | Butcher        | 8                |
|                |                                     |                     | 2          | Veterinarian   | 7                |
|                |                                     |                     | 3          | Worker         | 8                |
|                |                                     |                     | 4          | Worker         | 7                |
| Rengat         | 30–90                               | Non certified       | 1          | Veterinarian   | 5                |
|                |                                     |                     | 2          | Worker         | 30               |
|                |                                     |                     | 3          | Butcher        | 4                |
|                |                                     |                     | 4          | Butcher        | 24               |
|                |                                     |                     | 5          | Worker         | 8                |
| Dumai          | 30–90                               | Non certified       | 1          | Butcher        | 15               |
|                |                                     |                     | 2          | Veterinarian   | 4                |
|                |                                     |                     | 3          | worker         | 15               |
|                |                                     |                     | 4          | worker         | 15               |
|                |                                     |                     | 5          | worker         | 15               |
referred to ISO 9001:2008 on animal welfare. ISO 9001:2008 is a regulation on Quality Management systems. This regulation directs companies to produce products in the form of goods and services with guaranteed quality because quality assurance is a standardization required by customers. Animal welfare affects the quality of products provided to customers. In general, livestock is kept in a cage system to meet production needs. Management of livestock must prioritize processes that are efficient and consider animal welfare. Thus, livestock brought to the slaughterhouse must be verified by the manager that they treat their animals properly. In addition, several studies have stated that this regulation is a standard for animal welfare and slaughterhouse (Govender, 2013; Maisana et al., 2012; Shariff & Ahmad, 2019). In Indonesia, the emphasis on animal welfare applications focuses on the five freedoms used in livestock management, including freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury and disease, freedom to express normal behavior and freedom from fear and distress. These five freedoms are translated into animal welfare applications in management activities. The Building and facility indicator explain the condition of the building for livestock cages, slaughter rooms and meat handling. Then, the room and building specifications meet production floor standards including the availability of drinking water for livestock, sanitation processes, and the availability of space to maintain the quality of animal feed. The equipment Indicator describes that the equipment used for the maintenance and slaughter of livestock is not mixed with other materials, has good hygiene, good in sufficient quantity to assist the production process and is always available in a clean condition. Then, employee indicators on animal welfare in the form of officers must have good skills to improve the quality of handling livestock and place expert employees in animal handling through training and workshops. The maintenance indicator explains the maintenance of buildings and facilities to support the business process at the slaughterhouse. Finally, the Halal indicator emphasizes the handling of livestock in the slaughtering process including animal health before slaughter, the equipment used, the slaughtering process does not torture livestock and the selection of a slaughterer who has been trained through the passing of a certificate of expertise.

The instrument for Halal Good Manufacturing Practice in slaughterhouses in this study can be seen in Table 2. Then, it adopted two types of closed questionnaires:

1. The first questionnaire adopted an Analytical Hierarchy Process (AHP) approach (Saaty & Vargas, 1991). This questionnaire formed a paired matrix to discover the level of importance between variables (level 1), attribute (level 2), and indicator (level 3). The rating scale on this questionnaire was divided into 9 points with a range of 1 (two elements have the same influence on the goal) to 9 (evidence that supports one element against another element has the highest level of affirmation that is possible). Furthermore, this stage describes the values in the range that are possible of 1 to 9 and 1/9 to 1.

2. The second questionnaire was used for benchmarking slaughterhouses as a policy priority for improvements to the slaughterhouses as outlined in the House of Quality (HOQ) matrix (Shen et al., 2000). This questionnaire contained 54 indicators, 16 attributes, and 5 variables based on Indonesian government...
Table 2. Instrument Halal Good Manufacturing Practice for slaughterhouse.

| Variable              | Attribute                           | Indicator                                                                                           | Code |
|-----------------------|-------------------------------------|----------------------------------------------------------------------------------------------------|------|
| Building and facility | Location                            | the slaughterhouse is not located in an industrial area                                               | BFA1 |
|                       |                                     | There is good road access to the slaughterhouse                                                        | BFA2 |
|                       |                                     | slaughterhouses are not located on land prone to flooding                                              | BFA3 |
|                       |                                     | Activities in the slaughterhouse do not cause environmental disturbances                                | BFA4 |
| Building              | Building                            | Buildings and rooms meet the requirements as slaughterhouses                                           | BFB1 |
|                       |                                     | The arrangement of room layout can support the smooth process of cutting and handling meat            | BFB2 |
|                       |                                     | Slaughter and meat handling rooms are clearly separated                                                | BFB3 |
|                       |                                     | Buildings are made of materials that are durable and easy to maintain                                  | BFB4 |
| Facility              | Facility                            | There is a place to collect and handle waste properly                                                | BFC1 |
|                       |                                     | Has sufficient clean water supply facilities for the process of slaughtering animals and cleaning activities | BFC2 |
|                       |                                     | Has complete cleaning facilities (tools and materials) for slaughterhouses                             | BFC3 |
|                       |                                     | It has sufficient bathrooms and toilets                                                                | BFC4 |
|                       |                                     | Have a warning (display) about cleanliness                                                             | BFC5 |
|                       |                                     | Have sufficient power source                                                                           | BFC6 |
|                       |                                     | There is a special means of transportation for sending meat to consumers                               | BFC7 |
| Equipment             | Equipment requirements              | The equipment used is made of safe and durable materials                                              | EQA1 |
|                       |                                     | Equipment in direct contact with meat does not rust easily, is not poisonous                           | EQA2 |
|                       |                                     | The equipment has function properly                                                                  | EQA3 |
|                       |                                     | The equipment used does not contaminate the production (meat)                                         | EQA4 |
|                       |                                     | The equipment used is easy to be cleaned                                                               | EQA5 |
|                       |                                     | Equipment is available in sufficient quantity                                                          | EQB1 |
|                       |                                     | The equipment is always available in clean condition when it is to be used                             | EQB2 |
| Employee              | Employee’s health                   | Employees who work in good health                                                                    | EMA1 |
|                       |                                     | Every employee who is injured must cover that part of the wound                                        | EMA2 |
|                       |                                     | Periodically, employee health checks are carried out                                                   | EMA3 |
|                       | Work equipment                      | There is a place to store personal belongings and workers’ clothes                                    | EMB1 |
|                       |                                     | When working, workers wear work uniforms                                                                | EMB2 |
|                       | Work attitude                       | During work, employees do not eat, drink and smoke while doing work                                   | EMC1 |
|                       |                                     | Employees wash their hands before and after doing work                                               | EMC2 |
|                       | Employee training                   | Employees have been given training or understanding of meat handling procedures                       | EMD1 |
|                       |                                     | Employees have been given training on the basics of employee hygiene and meat handling hygiene         | EMD2 |
|                       |                                     | Employees have been given training on factors that can reduce the quality of the meat                | EMD3 |
|                       |                                     | Employees have been given training on basic cleaning and sanitizing the equipment, buildings, and facilities that used | EMD4 |
| Maintenance           | Building                            | Prevent the entry of insects or other animals into the building                                       | MAA1 |
|                       | Waste                               | Control of insect micro-organisms using chemicals                                                      | MAA2 |
|                       | Cleanliness                         | Waste handling is done well                                                                          | MAB1 |
|                       |                                     | The waste collection site is always supervised                                                        | MAB2 |
|                       | Tools and equipment                 | The environmental cleanliness and personal hygiene of workers are always maintained                   | MAC1 |
|                       |                                     | Equipment is cleaned regularly                                                                       | MAC2 |
|                       |                                     | Meat tool is cleaned regularly                                                                        | MAC3 |
|                       |                                     | The building is cleaned regularly                                                                     | MAC4 |
|                       |                                     | After using, the equipment is cleaned and put back in place                                           | MAD1 |
|                       |                                     | Unused equipment must be in pristine condition                                                        | MAD2 |
|                       |                                     | Equipment is always cleaned                                                                           | MAD3 |

(Continued)
3.3. Data analysis

Analysis data was carried out by adopting the Mixed Method (Leech et al., 2010) to describe the real situation in assessing the business process of slaughterhouses. This analysis technique was divided into two stages including a qualitative and quantitative approach. The first stage was a qualitative approach by analyzing the implementation of the Halal Good Manufacturing Practice by determining indicators in analyzing business processes at slaughterhouses based on predetermined variables on Indonesian government policies covering Requirements of Slaughterhouse; Good Manufacturing Practice; Halal Assurance System. Then, for data analysis in order to obtain the right indicators, this study adopted a thematic analysis approach (Nowell et al., 2017). The second stage was the quantitative approach. The analysis was used to assess the implementation of the suitability level of the Halal Good Manufacturing Practice in the slaughterhouse in this case study. Furthermore, to test the normality of the data, it used the Kolmogorov-Smirnov test method. Data processing using SPSS software was used to test the normality of the data through the Kolmogorov-Smirnov test method. A normality test was conducted to determine whether the significance value was more significant than 0.05. Thus, it is concluded that these data are normally distributed. Then, to validate the data, it used the measuring instrument reliability test and validation test. Then, it was proceeded with performance measurement to determine the scoring of the slaughterhouse business process and benchmarking products with other business services. An assessment model was processed through seven (7) stages in the Halal Good Manufacturing Practice (HGMP), which can be seen in Figure 2. Figure 2 is a model for the assessment of HGMP in the slaughterhouse.

3.3.1. Phase 1: matrix of HGMP for a slaughterhouse

The first step in the assessment model was to determine the matric of the HGMP Framework. This matrix was used by determining the variables and attributes of the
Figure 2. A model for assessment of HGMP in slaughterhouse.
3.3.2. **Phase 2: Weighting matrix.** The weighting matrix on the HGMP assessment was carried out through the Analytical Hierarchy Process (AHP) method. This weighting matrix was determined based on several levels and formed a pair matrix (Saaty & Vargas, 1991), which can be seen in Table 3. To discover the level of importance, it was divided into 3 levels including level 1 (variable), level 2 (attribute), and level 3 (indicator). The indicator was built through in-depth interviews with several experts related to business processes at slaughterhouses in Indonesia. Thus, this study developed 54 indicators to be measured in slaughterhouses. The calculation of the weighting matrix adopted the modification of the Analytical Hierarchy Process approach (Dong et al., 2010) and can be found in Equations 1–7. Then, calculating the Consistency Ratio (CR) is carried out to test the consistency of the respondent’s answer with the condition that the value of CR ≤ 0.1 is acceptable.

\[
A_{m \times n} = \begin{bmatrix}
  a_{11} & a_{12} & \ldots & a_{1n} \\
  a_{21} & a_{22} & \ldots & a_{2n} \\
  \vdots & \vdots & \ddots & \vdots \\
  a_{n1} & a_{n2} & \ldots & a_{nn}
\end{bmatrix}
\]  

(1)

The matrix ‘A’ represents the criteria as \( m \times n \) matrix, where ‘n’ is the number of criteria that are calculated. In addition, \( a_{ij} \) are the value between the two alternatives \( i \) and \( j \) from the numerical comparison scale, while \( m \) is the number of respondents on the case study. Then, it is continued to determine the geometric mean (GM).

\[
GM = \sqrt[m]{\prod_{i=1}^{m} a_{ii}}
\]  

(2)

Where: index 1 attach to ‘a’ shows the column of criteria. Moreover, if we want to determine GM for column 2, then 1 is replaced by 2.

Matrix ‘B’ represented value from GM.

| Table 3. Numeric comparison scale. |
|-----------------------------------|
| **Intensity of importance** | **Definition** |
| 1 | Equal importance |
| 2 | Weak or slight |
| 3 | Moderate importance |
| 4 | Moderate plus |
| 5 | Strong importance |
| 6 | Strong plus |
| 7 | Very strong |
| 8 | Very very strong |
| 9 | Extreme importance |
\[
B = \begin{bmatrix}
  b_{11} & b_{12} & \ldots & b_{1n} \\
  b_{21} & b_{22} & \ldots & b_{2n} \\
  \vdots & \vdots & \ddots & \vdots \\
  b_{n1} & b_{n1} & \ldots & b_{nn}
\end{bmatrix}
\]

Where:

\[ b_{ij} = 1 \iff i = j \quad (4) \]

And each row shows the GM for each criteria.

Then, we define Matrix ‘C’ for normalization the matrix

\[
C = \begin{bmatrix}
  c_{11} & c_{12} & \ldots & c_{1n} \\
  c_{21} & c_{22} & \ldots & c_{2n} \\
  \vdots & \vdots & \ddots & \vdots \\
  c_{n1} & c_{n1} & \ldots & c_{nn}
\end{bmatrix}
\]

Where:

\[ C_{ij} = \frac{C_{ij}}{\sum_{i=1}^{n} C_{ij}} \quad (6) \]

Finally, we obtain weighting (W) with the form

\[ w_1 = \frac{\sum_{i=1}^{n} c_{ij}}{n} \quad (7) \]

Where: \[ W = (w_1, w_2, w_3, w_4, \ldots, w_n)^T \]

### 3.3.3. Phase 3: Snorm de boer for normalization

Normalization calculations were carried out as a process of equating parameters according to the previous weights. This aims to determine the target value and the realization of each assessment indicator. The calculation of normalization used the Snorm de boer formula (Trienekens & Hvolby, 2000) in Equation 8.

\[
\text{Normalization of each indicator } (R_i) = \frac{S_i - S_{\text{min}}}{S_{\text{max}} - S_{\text{min}}} \times 100\% \quad (8)
\]

Where:
- \( S_i \) = actual score of each indicator
- \( S_{\text{min}} \) = minimum scale
- \( S_{\text{max}} \) = maximum scale

### 3.3.4. Phase 4: Performance measurement for the slaughterhouse

The measurement of the overall performance of the slaughterhouse based on the HGMP framework was determined by calculating the final attribute value and the final variable value, which can be seen in Equations 9–11. (Trienekens & Hvolby, 2000) state that the performance measurement cluster can be determined based on Table 4.

Attribute value \((U)\)
Table 4. Cluster of normalization.

| Value | Performance |
|-------|-------------|
| ≤ 40  | Poor        |
| 40–50 | Marginal    |
| 51–70 | Average     |
| 71–90 | Good        |
| > 90  | Excellent   |

\[
U_{each\ attribute} = \sum_{i=1}^{x} (R_i \cdot W_i)
\]  
(9)

Where:
- \(R_i\) = normalization of each indicator
- \(W_i\) = weighting of each indicator
- \(x\) = number of indicators

Variable value \((H)\)

\[
H_{each\ attribute} = \sum_{i=1}^{k} (U_{each\ attribute} \cdot Q_i)
\]  
(10)

Where:
- \(Q_i\) = weighting of each attribute
- \(k\) = number of attributes

Finally, the slaughterhouse performance we define as

\[
\text{Slaughterhouse Performance} = \sum_{i=1}^{z} (H_{each\ variable} \cdot T_i)
\]  
(11)

Where:
- \(T_i\) = weighting of each variable
- \(z\) = number of variables

3.3.5. Phases 5: Customer requirement and its prioritized

The benchmarking process was carried out by adopting the HOQ approach. The determination of customer requirements was carried out by calculating the Importance Rate (IR) and calculating the frequency of each element based on the level of importance. The calculation of importance rating used the mode, namely by looking at the value or weight that appears the most. Then, conducting a customer competitive evaluation by benchmarking the business processes of 4 slaughterhouses in this study by distributing questionnaires to compare the slaughterhouses to be developed with halal-certified slaughterhouses. It aims to identify improvement recommendations for slaughterhouses to be developed. Analysis and selection of priority items in the matrix were carried out to determine the concept development of a product to be developed. This was determined by setting goals 1 to 5 where the goal was the value of customer satisfaction value to be achieved for the services being developed. Then, determining the Improvement Point, which is an attribute that has a high selling value, especially for sales. Improvement point
value consisted of, 1 = no need for service improvement; 1.2 = need for service improvement; 1.5 = Urgently need for service improvement. The final stage in determining priority values was carried out by adopting the Normalized Row Weight (NRW) through Equations 12–14.

\[
\text{Importance Rate (IR)} = \frac{1}{mxv} \left( \sum_{j=1}^{m} \left( \sum_{i=1}^{v} M_{ij} \right) \right)
\]  

(12)

Where:
- \( M_{ij} \) = value linked scale
- \( j \) = respondent \( j \) (\( j = 1, 2, 3 \ldots, m \))
- \( m \) = number of respondents
- \( i \) = indicator \( i \) (\( i = 1, 2, 3 \ldots, v \))
- \( v \) = number of indicators

Row Weight (RW)

\[
RW = \left( \text{IR. Improvement service. Goal customer competitive evaluation} \right)
\]  

(13)

Where:
- Improvement service (1, 1.2, 1.5)
- Goal (1, 2, 3, 4, 5)

Finally, Normalized Row Weight (NRW) is obtained as

\[
\text{NRW} = \left( \frac{\text{Row Weight}}{\sum_{r=1}^{k} \text{Row Weight}_r} \right)
\]  

(14)

Where:
- \( r \) = attribute \( r \) (\( r = 1, 2, 3 \ldots, k \))
- \( k \) = number of attributes

3.3.6. Phase 6: Relationship between customer requirement and technical target requirement

This was translated into the technical requirements that will be applied to the current slaughterhouse. Then, it is compared with the needs or targets desired by consumers. This matrix was adopted from indicators that have been determined in the Analytical Hierarchy Process approach. Basically, technical requirements showed the relationship between attributes and indicators in business strategy. The value of this relationship is converted into a symbol provision including Strong (●), Moderate (○), and Weak (Δ).

Phase 7: Priority technical requirement and its new target. This stage was carried out by adding up the column weights with the Importance Rate (IR) in accordance with the provisions of each variable. The value of this relationship was converted based on the values of strong (9), moderate (3), and weak (1). The determination of Absolute Importance was calculated based on the accumulation of importance rating and relationship factor in Equation 15. Then, the results of Absolute Importance (AI) were compared with several other animal pot houses where AI was the smallest priority for improvement.
where: 
\[ r = \text{attribute } r \ (r = 1, 2, 3 \ldots , k) \]
\[ k = \text{number of attributes} \]
\[ S = \text{weight of technical requirement (strong = 9, moderate = 3, weak = 1)} \]

4. Finding

The case study in this research was conducted at four slaughterhouses in Indonesia, including the slaughterhouses of Pekanbaru, Bangkinang, Rengat, and Dumai. The slaughterhouse of Pekanbaru was located in the capital city of Riau. This business service had the largest production capacity in this case study which can be seen in Table 1. Furthermore, the business service provider had registered a Halal certification to get quality assurance from the authorized agency.

4.1. Flow process chart of slaughterhouse

A slaughterhouse is a building or complex with certain designs and conditions that are used as a place for slaughtering to produce meat for public consumption. The total of farm animals at the slaughterhouse indicates the amount of consumer demand for beef products. Its production activities include slaughtering, meat handling, and selling meat to consumers. The activities of production are based on the flow process chart of the slaughterhouse in Indonesia in several stages. A flow process chart is a map that describes all activities in the process of implementing work. This map also describes the sequence of operations, inspection, transportation (material handling), delay/idle, and storage during a process or procedure. Thus, Figure 3 is an activity map or work diagram that occurs at the slaughterhouse.

4.2. Performance measurement

Performance measurement in this study was determined based on several stages including weighting matrix, normalization, and performance measurement. Table 5–6 is the result of the weighting matrix at three criteria levels, including variables, attributes, and indicators. In addition, Table 5 aims to determine the consistency ratio (CR) value for the variable. The CR is carried out to test the consistency of the respondent’s answer with the condition that the value of CR \( \leq 0.1 \). Then, Table 6 is a compilation of the overall Weighting matrix in the slaughterhouse. The slaughterhouse in Pekanbaru shows that two variables are prioritized building and facilities and Halal variables with values of 0.29 and 0.24. This is due to the location of the slaughterhouse is not in an industrial area and far from residential areas. Then, these business services provide shelter with good waste handling and a sufficient amount of equipment. This aims to anticipate the increase in demand for slaughter animals in the production capacity of slaughterhouses. Furthermore, the slaughterhouses of Bangkinang, Rengat, and Dumai had the biggest
Table 5. Comparison matrix and priority vector for the main criteria (variable) in Pekanbaru.

| Main Criteria | BF  | EQ  | EM  | MA  | HA  | Priority Vector | CR  |
|---------------|-----|-----|-----|-----|-----|-----------------|-----|
| BF            | 1.00| 2.37| 1.98| 1.98| 0.86| 0.29            | 0.03|
| EQ            | 0.42| 1.00| 1.20| 2.14| 0.68| 0.18            |     |
| EM            | 0.51| 1.00| 1.00| 1.00| 0.79| 0.14            |     |
| MA            | 0.51| 0.46| 1.00| 1.00| 0.79| 0.14            |     |
| HA            | 1.15| 1.48| 1.47| 1.25| 1.00| 0.24            |     |

* BF: Building and Facility; EQ: Equipment, EM: Employee, MA: Maintenance, HA: Halal.
Table 6. Weighting matrix in the slaughterhouse.

| Variable                  | Weighting | Weighting | Weighting |
|---------------------------|-----------|-----------|-----------|
|                           | Slaughter | Slaughter | Slaughter |
|                           | A B C D    | A B C D    | A B C D    |
| Building and Facility     | 0.29 0.15 0.12 0.13 | Location 0.39 0.34 0.33 0.33 | BFL1 0.26 0.17 0.21 0.25 |
|                           |           | Building 0.31 0.33 0.33 0.33 | BFL2 0.25 0.26 0.19 0.25 |
|                           |           | Facility 0.29 0.33 0.33 0.33 | BFL3 0.27 0.21 0.26 0.25 |
|                           |           |           | BFL4 0.23 0.36 0.34 0.25 |
| Equipment                 | 0.18 0.1 0.12 0.13 | Equipment requirements 0.47 0.32 0.39 0.5 | APP1 0.26 0.1 0.19 0.2 |
|                           |           |           | APP2 0.25 0.18 0.21 0.2 |
|                           |           |           | APP3 0.17 0.21 0.19 0.2 |
|                           |           |           | APP4 0.19 0.28 0.2 0.2 |
|                           |           |           | APP5 0.13 0.24 0.21 0.2 |
| Employee                  | 0.15 0.19 0.13 0.14 | Employee’s health 0.31 0.45 0.32 0.31 | KPK1 0.25 0.18 0.19 0.21 |
|                           |           |           | KKK1 0.39 0.51 0.41 0.36 |
|                           |           |           | KKK2 0.3 0.31 0.26 0.25 |
|                           |           |           | KKK3 0.3 0.24 0.24 0.34 |
| Maintenance               | 0.14 0.12 0.12 0.14 | Building 0.27 0.33 0.25 0.25 | PB1 0.61 0.79 0.53 0.5 |
|                           |           | Waste 0.25 0.14 0.29 0.26 | PL1 0.6 0.72 0.58 0.5 |
|                           |           | Cleanliness 0.27 0.26 0.24 0.24 | PL2 0.4 0.28 0.42 0.5 |
|                           |           | Tools and equipments 0.2 0.28 0.23 0.25 | PK1 0.32 0.3 0.31 0.27 |
|                           |           |           | PK2 0.24 0.2 0.29 0.26 |
|                           |           |           | PK3 0.16 0.14 0.13 0.18 |
| Halal                     | 0.24 0.43 0.5 0.46 | Animal slaughter 0.41 0.4 0.48 0.58 | HPH1 0.2 0.18 0.18 0.2 |
|                           |           | Building and facility 0.33 0.28 0.25 0.2 | HPH2 0.25 0.22 0.21 0.2 |
|                           |           | Equipment 0.26 0.32 0.28 0.22 | HPH3 0.21 0.14 0.21 0.2 |
|                           |           |           | HPH4 0.18 0.27 0.2 0.2 |
|                           |           |           | HPH5 0.16 0.2 0.2 0.2 |
|                           |           |           | HBF1 0.41 0.32 0.33 0.33 |
|                           |           |           | HBF2 0.33 0.31 0.33 0.33 |
|                           |           |           | HBF3 0.26 0.38 0.33 0.33 |
|                           |           |           | HA1 0.59 0.5 0.5 0.5 |
|                           |           |           | HA2 0.41 0.5 0.5 0.5 |

* A: Pekanbaru; B: Bangkinang; C: Rengat; D: Dumai.
variables on Halal, namely 0.43, 0.5, and 0.46, which can be seen in Table 5. These variables stated that the slaughterhouse had performed the right procedure because the slaughtered animal has clear ownership, standardized slaughter, sharp tools, professional staff, and hygienic equipment according to standards. This is interpreted based on the calculation of the paired matrix value using the AHP approach. Then, the results of observations and interviews with the slaughterhouse management concluded that the management had implemented work procedures and also the animal slaughterer had a certification recognized by the Indonesian government.

Normalization is determined by the level of indicators to find out in detail the target and operational realization in slaughterhouses. Table 7 is the normality for four slaughterhouses in Riau. The results of normalization show that it is divided into several categories including excellent, good, average, marginal, and poor. Slaughterhouses in Pekanbaru have special attention to increasing the quality of human resources which is indicated by the category excellent. Workers are given the training to improve business services according to meat handler standards, hygiene, product quality, cleanliness, and sanitation of the equipment, buildings, and facilities used. Furthermore, animal slaughter officers have passed the certification of halal slaughtering training at official institutions in Indonesia. However, the results of normality also provide recommendations to four slaughterhouse managers that the health of the employees is a concern. Periodic health check indicators and cover the injured body part, and it is still in the poor category. Determination of the results of performance measurement can be seen in Table 8 which indicates that the slaughterhouse in Pekanbaru is categorized as good with a value of 71.5%. However, Bangkinang, Rengat and Dumai are still in the average category.

4.3. Benchmarking matrix

The benchmarking process adopted the House of Quality (HOQ) matrix approach, which explained the needs or expectations of slaughterhouse managers in meeting business service standards in Indonesia. Table 9 shows the results of the Importance Rate (IR) and Normalized Row Weight (NRW) for determining customer requirements and its prioritized. Then, this is continued to determine the technical requirements and new targets, which can be seen in Table 10.

Table 10 shows the results of the relationship between the need of the customer and current variables in the form of strong, medium, and weak relationships. Then, the need of the customer is translated into target improvements that can be done by slaughterhouses. The final step in benchmarking business services is determining absolute importance. This section will show the priority improvements that will be made. Table 11 is the benchmarking matrix for all slaughterhouses in this study. Pekanbaru is the rule model in this benchmarking process because its performance is better than the others. Recommendations for improvements to the HGMP indicator are carried out based on the biggest value. The halal variable has the highest value on the animal slaughter indicator at 58.00. Animals are slaughtered according to Islamic law are supervised is a priority to be repaired. Then, the matrix below also provides information to the
Bangkinang, Rengat and Dumai slaughterhouses that a positive sign is a recommendation for improvement based on the Pekanbaru slaughterhouse standards.

Table 7. Snorm de boer for normalization.

| No | Indicator | Pekanbaru | Bangkinang | Rengat | Dumai |
|----|-----------|-----------|------------|--------|-------|
| 1  | BFA1      | 50.00     | 58.33      | 33.33  | 66.67 |
| 2  | BFA2      | 80.00     | 60.00      | 63.64  | 60.00 |
| 3  | BFA3      | 81.82     | 63.64      | 50.00  | 54.55 |
| 4  | BFA4      | 50.00     | 60.00      | 45.45  | 50.00 |
| 5  | BF1       | 63.64     | 45.45      | 41.67  | 36.36 |
| 6  | BF2       | 63.64     | 45.45      | 33.33  | 36.36 |
| 7  | BF3       | 50.00     | 33.33      | 33.33  | 33.33 |
| 8  | BF4       | 63.64     | 54.55      | 50.00  | 45.45 |
| 9  | BFC1      | 60.00     | 41.67      | 50.00  | 50.00 |
| 10 | BFC2      | 80.00     | 50.00      | 41.67  | 38.46 |
| 11 | BFC3      | 80.00     | 40.00      | 50.00  | 45.45 |
| 12 | BFC4      | 80.00     | 40.00      | 41.67  | 45.45 |
| 13 | BFC5      | 80.00     | 16.67      | 33.33  | 16.67 |
| 14 | BFC6      | 80.00     | 33.33      | 41.67  | 41.67 |
| 15 | BFC7      | 45.45     | 9.09       | 23.08  | 8.33  |
| 16 | EFA1      | 72.73     | 50.00      | 45.45  | 50.00 |
| 17 | EFA2      | 66.67     | 58.33      | 33.33  | 50.00 |
| 18 | EFA3      | 58.33     | 50.00      | 66.67  | 58.33 |
| 19 | EFA4      | 60.00     | 45.45      | 30.00  | 45.45 |
| 20 | EFA5      | 63.64     | 63.64      | 45.45  | 63.64 |
| 21 | EFA6      | 60.00     | 45.45      | 40.00  | 50.00 |
| 22 | EQB1      | 80.00     | 40.00      | 41.67  | 45.45 |
| 23 | EQB2      | 80.00     | 16.67      | 33.33  | 16.67 |
| 24 | EQB3      | 80.00     | 33.33      | 41.67  | 41.67 |
| 25 | EQB4      | 45.45     | 9.09       | 23.08  | 8.33  |
| 26 | EQB5      | 72.73     | 50.00      | 45.45  | 50.00 |
| 27 | EQB6      | 66.67     | 58.33      | 33.33  | 50.00 |
| 28 | EQB7      | 58.33     | 33.33      | 33.33  | 33.33 |
| 29 | EQB8      | 50.00     | 50.00      | 50.00  | 50.00 |
| 30 | EQB9      | 33.33     | 33.33      | 50.00  | 33.33 |
| 31 | EQB10     | 33.33     | 33.33      | 50.00  | 33.33 |
| 32 | EQB11     | 33.33     | 33.33      | 50.00  | 33.33 |
| 33 | EQB12     | 33.33     | 33.33      | 50.00  | 33.33 |
| 34 | EQB13     | 33.33     | 33.33      | 50.00  | 33.33 |
| 35 | EQB14     | 33.33     | 33.33      | 50.00  | 33.33 |
| 36 | EQB15     | 33.33     | 33.33      | 50.00  | 33.33 |
| 37 | EQB16     | 33.33     | 33.33      | 50.00  | 33.33 |
| 38 | EQB17     | 33.33     | 33.33      | 50.00  | 33.33 |
| 39 | EQB18     | 33.33     | 33.33      | 50.00  | 33.33 |
| 40 | EQB19     | 33.33     | 33.33      | 50.00  | 33.33 |
| 41 | EQB20     | 33.33     | 33.33      | 50.00  | 33.33 |
| 42 | EQB21     | 33.33     | 33.33      | 50.00  | 33.33 |
| 43 | EQB22     | 33.33     | 33.33      | 50.00  | 33.33 |
| 44 | EQB23     | 33.33     | 33.33      | 50.00  | 33.33 |
| 45 | EQB24     | 33.33     | 33.33      | 50.00  | 33.33 |
| 46 | EQB25     | 33.33     | 33.33      | 50.00  | 33.33 |
| 47 | EQB26     | 33.33     | 33.33      | 50.00  | 33.33 |
| 48 | EQB27     | 33.33     | 33.33      | 50.00  | 33.33 |
| 49 | EQB28     | 33.33     | 33.33      | 50.00  | 33.33 |
| 50 | EQB29     | 33.33     | 33.33      | 50.00  | 33.33 |
| 51 | EQB30     | 33.33     | 33.33      | 50.00  | 33.33 |
| 52 | EQB31     | 33.33     | 33.33      | 50.00  | 33.33 |
| 53 | EQB32     | 33.33     | 33.33      | 50.00  | 33.33 |
| 54 | EQB33     | 33.33     | 33.33      | 50.00  | 33.33 |
5. Discussion

The problem in this case study was the existence of a policy in Indonesia regarding the management of slaughterhouses and the management of good manufacturing practices as a guide for the production of processed food for consumers. Furthermore, there was a consumer satisfaction factor in Indonesia to look for products with guaranteed halal quality. Thus, it is necessary to formulate an assessment model for performance improvement in slaughterhouses in Indonesia. This study builds a model based on the framework of the Halal Good Manufacturing Practices (HGMP) for slaughterhouses with Indonesian government regulations through several stages including determining performance indicators, measuring performance and benchmarking business services. The implications of HGMP are applied to a case study of slaughterhouses in Riau, Indonesia.
| Table 10. Technical requirement and new target. |
|-----------------------------------------------|
| **Indicator** | **BF** | **EQ** | **EM** | **MA** | **HA** | **New Target** |
|----------------|--------|--------|--------|--------|--------|----------------|
| BFA1           | ●      | ●      |        |        |        | Slaughterhouse is free from environmental pollution |
| BFA2           | ●      | ●      |        |        |        | The smoothness of animal transportation and meat delivery |
| BFA3           | ●      | △      |        |        |        | Free flood |
| BFA4           | ●      | ●      |        |        |        | Slaughterhouse Activity does not pollute the environment |
| BFB1           | ●      | ●      |        |        |        | The smoothness of animal slaughter and meat handling |
| BFB2           | ●      | ●      |        |        |        | The layout design which supports the meat handling process |
| BFB3           | ●      | △      |        |        |        | The classroom and the dirty room are separated clearly to prevent contamination |
| BFB4           | ●      | △      |        |        |        | Construction and building material are safe and long-lasting |
| BFC1           | ●      | ●      |        |        |        | Owning the place for shelter and handling of waste |
| BFC2           | △      | △      |        |        |        | Water is available in a sufficient number |
| BFC3           | ●      | ●      |        |        |        | The cleanliness facility is complete and sufficient |
| BFC4           | ●      | ●      |        |        |        | Sufficient bathroom |
| BFC5           | ●      | ●      |        |        |        | Cleanliness of Slaughterhouse |
| BFC6           | ●      | ●      |        |        |        | Good lighting |
| BFC7           | ●      | ●      |        |        |        | Ease transportation and prevent contamination |
| EQA1           | ●      | ●      |        |        |        | Tools are safe and long-lasting |
| EQA2           | ●      | ●      |        |        |        | Tools are not easily rusty and not poisonous |
| EQA3           | ●      | ●      |        |        |        | Tools function well |
| EQA4           | ●      | ●      |        |        |        | Tools do not pollute the production result (meat) |
| EQA5           | ●      | ●      |        |        |        | Tools are easy to be cleaned |
| EQB1           | ●      | ●      |        |        |        | Tools are sufficient |
| EQB2           | ●      | ●      |        |        |        | Tools are always in clean condition |
| EMA1           | ●      | ●      |        |        |        | The employee condition is healthy |
| EMA2           | ●      | ●      |        |        |        | Employee covers the wound during working |
| EMA3           | ●      | ●      |        |        |        | Routinely check the Employee’s Health |
| EMH1           | ●      | ●      |        |        |        | Locker is available for the employee |
| EMH2           | ●      | △      |        |        |        | Using work uniform |
| EMC1           | ●      | ●      |        |        |        | Focus during the work to prevent the contamination |
| EMC2           | ●      | ●      |        |        |        | Cleanliness of Employee |
| EMD1           | ●      | ●      |        |        |        | Understanding the way of handling meat |
| EMD2           | ●      | ●      |        |        |        | Keeping the employee’s self cleanliness and the meat cleanliness |
| EMD3           | ●      | ●      |        |        |        | Capable of maintaining the meat quality |
| EMD4           | ●      | ●      |        |        |        | Keeping the cleanliness and sanitation tools, building and facility |
| MAA1           | ●      | ●      |        |        |        | Preventing the animals from entering the building |
| MAA2           | ●      | ●      |        |        |        | Free of insects and micro-organisms |
| MAB1           | ●      | ●      |        |        |        | Waste management is conducted |
| MAB2           | ●      | ●      |        |        |        | Waste monitoring |
| MAC1           | ●      | ●      |        |        |        | Maintaining the environmental cleanliness and the worker’s body |
| MAC2           | ●      | ●      |        |        |        | Tools Cleanliness |
| MAC3           | ●      | ●      |        |        |        | Cleanliness transportation tools |
| MAC4           | ●      | ●      |        |        |        | Building cleanliness |
| MAD1           | ●      | ●      |        |        |        | Tools are cleaned after used |
| MAD2           | ●      | ●      |        |        |        | Tools are always in clean condition |
| MAD3           | ●      | ●      |        |        |        | Tools are routinely cleaned |
| HAA1           | ●      | ●      |        |        |        | Animal ownership is clear |
| HAA2           | ●      | ●      |        |        |        | The slaughter is in accordance with Islamic rules |
| HAA3           | ●      | ●      |        |        |        | The staffs understand the standardization of slaughter |
| HAA4           | ●      | ●      |        |        |        | Halal belief in the slaughter |
| HAB1           | ●      | ●      |        |        |        | Far from contamination |
| HAB2           | ●      | ●      |        |        |        | Free of dirt and dust |
| HAB3           | ●      | ●      |        |        |        | Slaughterhouse is special for halal meat |
| HAC1           | ●      | ●      |        |        |        | Slaughterhouse is easy to be cleaned |
| HAC2           | ●      | ●      |        |        |        | Tools are not contaminated |

* BFA: Location, BFB: Building, BFC: Facility, EQA: Equipment requirements, EQB: Equipment availability, EMA: Employee’s health, EMB: Work equipment, EMC: Work attitude, EMD: Employee training, MAA: Building, MAB: Waste, MAC: Cleanliness, MAD: Tools and equipment, HAA: Animal slaughter, HAB: Building dan facility, HAC: Equipment.
### Table 11. Benchmarking matrix.

| Variable          | Case | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
|-------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **Building and Facility** |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| A                 |      | 53.80 | 40.65 | 45.03 | 53.80 | 39.45 | 52.59 | 43.83 | 43.83 | 52.58 | 48.33 | 39.43 | 52.58 | 52.58 | 39.43 |
| B                 |      | 0.55 | 0.15 | 0.28 | 0.55 | 1.20 | 2.13 | 1.51 | 1.51 | 3.19 | 2.94 | 2.79 | 3.19 | 2.92 | 3.19 | 2.79 |
| C                 |      | 3.70 | 2.85 | 3.13 | 3.70 | 2.55 | 5.06 | 3.39 | 3.39 | 8.39 | 8.14 | 7.54 | 8.39 | 7.83 | 8.39 | 7.54 |
| D                 |      | 4.30 | 3.30 | 3.63 | 4.30 | 3.00 | 3.80 | 3.27 | 3.27 | 3.40 | 3.10 | 2.40 | 3.40 | 2.73 | 3.40 | 2.40 |
| **Equipment**     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| A                 |      | 39.96 | 39.96 | 39.96 | 39.96 | 44.46 | 44.94 | 53.82 |      |     |     |     |     |     |     |     |
| B                 |      | 2.61 | 2.61 | 2.61 | 2.61 | 3.11 | 4.79 |      |     |     |     |     |     |     |     |     |
| C                 |      | 1.44 | 1.44 | 1.44 | 1.44 | 1.96 | 2.28 |      |     |     |     |     |     |     |     |     |
| D                 |      | 2.88 | 2.88 | 2.88 | 2.88 | 3.28 | 3.92 |      |     |     |     |     |     |     |     |     |
| **Employee**      |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| A                 |      | 51.80 | 51.80 | 39.80 | 40.20 | 44.20 | 36.00 | 40.57 | 41.10 | 49.99 | 49.57 | 45.10 |     |     |     |     |
| B                 |      | 6.05 | 6.05 | 6.80 | 5.33 | 5.08 | -2.25 | -1.93 | 2.85 | 4.20 | 3.19 | 2.60 |     |     |     |     |
| C                 |      | 5.00 | 5.00 | 5.60 | 13.20 | 13.00 | -1.80 | -1.03 | 6.90 | 8.99 | 8.17 | 6.70 |     |     |     |     |
| D                 |      | 2.30 | 2.30 | 3.20 | 3.30 | 3.00 | -2.70 | -2.53 | 1.50 | 2.22 | 1.57 | 1.20 |     |     |     |     |
| **Maintenance**   |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| A                 |      | 41.03 | 54.47 | 48.47 | 35.44 | 40.22 | 53.72 | 44.72 | 56.91 | 53.91 | 53.91 | 53.91 |     |     |     |     |
| B                 |      | 7.66 | 8.59 | -1.41 | -2.81 | 3.09 | 3.84 | 3.34 | 5.78 | 3.28 | 3.28 | 3.28 |     |     |     |     |
| C                 |      | 0.13 | 1.10 | -2.80 | -3.26 | 4.22 | 4.32 | 4.25 | 4.14 | 1.71 | 1.71 | 1.71 |     |     |     |     |
| D                 |      | 2.88 | 5.89 | -1.51 | -3.26 | 12.77 | 13.27 | 12.94 | 13.42 | 5.76 | 5.76 | 5.76 |     |     |     |     |
| **Halal**         |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| A                 |      | 43.50 | 58.00 | 58.00 | 43.50 | 43.50 | 40.50 | 55.00 | 55.00 | 57.00 | 57.00 |     |     |     |     |
| B                 |      | 0.75 | 1.00 | 1.00 | 0.75 | 0.75 | -2.25 | -2.00 | -2.00 | 0.00 | 0.00 | 0.00 |     |     |     |     |
| C                 |      | 2.82 | 3.82 | 3.82 | 2.82 | 2.82 | 0.90 | 1.90 | 1.90 | 3.30 | 3.30 |     |     |     |     |     |
| D                 |      | 4.26 | 6.16 | 6.16 | 4.26 | 4.26 | 1.50 | 3.40 | 3.40 | 6.20 | 6.20 |     |     |     |     |     |

*(+) The value is above the slaughterhouse in Pekanbaru

(−) The value is under the slaughterhouse in Pekanbaru
5.1. Performance indicator

Halal Good Manufacturing Practices provides 54 performance indicators for slaughterhouses. This indicator is broken down from variables referring to Indonesian government regulations. Syzdykbayeva et al. (2019) point out that government regulations provide variables that can be evaluated in the implementation mechanism and according to their needs so that the implications of this recommendation are useful for policymakers. Furthermore, forming indicators is carried out by referring to variables in government policy by adopting deductive research. Hyde (2000) argues that deductive research has procedures that can explain important steps to ensure confidence in qualitative research findings. Obviously, regulatory or theoretical government policies can build indicators for measuring performance in a system.

5.2. Slaughterhouse performance

This case study analyzes that slaughterhouse in Pekanbaru has a good category than other slaughterhouses. The implementation of Halal Good Manufacturing Practices provides performance measurement based on defined variables. The performance of slaughterhouses from the overall variable in Pekanbaru with a value of 71.5% which is 71–90%, is a good category. Then, slaughterhouses in Bangkinang, Rengat and Dumai have performed with a value of 58.61%, 54.79% and 60.56% which is 51–70%, which is an average category. The superiority of slaughterhouse performance in Pekanbaru is due to the manager following the standards of public needs. Moreover, the slaughterhouse in Pekanbaru for building and facility variables is included in the average category. The location, building and facilities at the slaughterhouse meet the requirements. The building has good road access and is not located in a flooded location, making this slaughterhouse a good category. Then, the facilities in the slaughterhouse have met the standards for good sanitation processes and waste storage so as not to pollute the environment. The equipment variable is weighted with the average category. Currently, the equipment in the slaughterhouse is still suitable for use. In the future, the management must provide good equipment for the production process at the slaughterhouse. The employee variable also gets the average category. Indicators of employee health, work equipment and work attitude get the average category. Then, the overall employee training indicators are in the average category. Slaughterhouse has conducted supervision on employee performance. Furthermore, the better scheduling of training for the meat production process at the slaughterhouse is one of the continuous improvements in this slaughterhouse. In contrast to the three variables above, the maintenance variables on the indicators of building, waste and cleanliness are in a good category. Waste control so as not to pollute the environment has been carried out. Then, the indicators of tools and equipment are in a good category. Thus, the slaughterhouse has maintained the cleanliness of the equipment used to prevent contamination. Then, the halal variable on the animal slaughter indicator is in a good category. This is because the slaughterer has received a certificate for carrying out the slaughter according to Islamic standards and concepts from the government. However, indicators of buildings and facilities, and equipment are in the average category. Indicators of buildings and facilities on the halal variable must be regularly cleaned to avoid dirt. Then, the equipment is easy to clean to avoid
contamination with other materials. Slaughterhouses are devoted only to the halal slaughter of animals. This is done in order to maintain the halalness of the meat to be obtained. The addition of standardization of halal certificates to guarantee product quality for consumers makes the quality of this business service better than others. Sharabi (2013) examines organizations in higher education following consumer needs. The results also reveal that service quality improvements based on the needs of the consumer are more dynamic and are able to provide the best service. Then, the existence of quality assurance certification gives confidence to consumers to choose products and be loyal to products. Ball et al. (2004) indicate that customer loyalty and trust are obtained through product quality assurance.

5.3. Continue improvement

Basic improvement in the system is carrying out activities on a business process on an ongoing basis. Many customer requirements and technical requirements define that it needs to improve. Then, it can meet customer needs in this study. The provision of this matrix aims to make it easier for slaughterhouse managers to improve their performance in a structured manner. This study provides a benchmarking matrix and recommendations for improvement. Thus, the priority of improvement in an organization can be determined and makes it easier for managers to develop strategies for its implementation. Continue improvement in this case study was conducted through benchmarking with the slaughterhouse in Pekanbaru, which was obtained better than the Others slaughterhouse. Management can make the slaughterhouse in Pekanbaru a reference to achieve the standards set by the government. The benchmarking matrix in Table 11 shows that the absolute importance value for Case A (Pekanbaru) is the standard that is met. Thus, if the values are above case A (+), then it has been declared to meet the standard. Then for values is under case A (-), it is concluded that it has not met the existing standards. This makes it easier for slaughterhouse managers to improve and improve their performance to become the quality standard needed by consumers and the Indonesian government. Stimec and Grima (2018) state that continuous improvement must be carried out regularly and on a schedule, to make it easier for managers to improve performance. Continue improvement needs to be carried out to avoid the accumulation of problems in the system and prevent activity terminations in business processes (Backlund & Sundqvist, 2018).

The implementation of this model integrates the Analytical Hierarchy Process (AHP) method and the HOQ Matrix for the process of performance measurement and benchmarking of business services. The model for assessment of Halal Good Manufacturing Practice in a slaughterhouse can provide benefits to several parties. Slaughterhouse practitioners can measure performance in meeting consumer needs and following government policy standards. This is due to the calculation of performance measurement for Halal good manufacturing practice on the variables of building and facility, equipment, employee, maintenance and Halal. Then, the Indonesian government can make this HGMP Framework a policy that can be applied to all regions in Indonesia through Indonesian government regulations. Thus, there are regulatory standards in the upstream sector of providing quality standards for consumer needs globally. Moreover, the integration of this method
can provide recommendations for performance improvements to business service managers. Thus, an increase in demand for product needs and demands for improvement of service quality to slaughterhouses can be done in a continuous way and finished products can be distributed according to consumer needs. Baidya et al. (2016) integrate AHP and HOQ for Strategic maintenance technique selection. These methods provide strategic significance to any organization’s performance by considering several criteria. Erkarslan and Yilmaz (2011) use these methods to optimize product design. The findings of this study indicate that the implementation of HOQ to each criterion in the design phase can assist in implementing the design efficiently. Indeed, this approach is the appropriate tool for making decisions in determining priority improvements in slaughterhouses in Indonesia.

6. Conclusion

This study indicated that the quality of business services was not only determined by the final product but also can be assessed from several performance criteria. The assessment model on Halal Good Manufacturing Practices (HGMP) in slaughterhouses provided five main variables covering buildings and facilities, equipment, employees, maintenance, and Halal, which also refers to aspects of animal welfare, safety, and meeting quality (Good manufacturing Practice in Indonesia regulation). This model has succeeded in providing performance measurement tools and recommendations for improvement through benchmarking business services based on the standardization of public services. The limitation of the study was related to the sample size of this study. The slaughterhouse in this study only came from one province in Indonesia. To generalize the results of the study, it is necessary to add samples from other provinces. Thus, the central Halal certification agency in Indonesia can comprehensively standardize this assessment process. Another limitation, it could not consider the implementation of the critical point of raw materials, the production process, food safety, and the sanitation process in the slaughterhouse. Thus, further research is recommended to consider the application of Hygiene and Sanitation requirements for the safety of Animal products in the slaughterhouse as stated in the Certificate of Veterinary Control Number. Slaughterhouse managers are also expected to be able to implement good manufacturing practice methods with a supply chain strategy by paying attention to the initial process of the arrival of animals until the meat is delivered to consumers and conducting regular service quality audits.

Acknowledgments

The authors thanks to the Ministry of Religious Affairs Republic of Indonesia and Sultan Syarif Kasim State Islamic University which supported this research on Grant No. 1175/R/2019.

Disclosure statement

No potential conflict of interest was reported by the author(s).
Funding

This work was supported by the Sultan Syarif Kasim State Islamic University [Grant No. 1175/R/2019].

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