

## Halal Assessment Model Design in Bakery Industry

Alyani Rahma Putri<sup>1\*</sup>, Nilda Tri Putri<sup>2</sup>, Alizar Hasan<sup>3</sup>, Ikhwan Arief<sup>4</sup>, Hayati Habibah Abdul Talib<sup>5</sup>

<sup>1,2,3,4</sup>Departement of Industrial Engineering, Faculty of Engineering, Universitas Andalas, Padang, Indonesia

<sup>5</sup>Faculty of Technology and Informatics Razak, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia

e-mail: [alyani.rahma96@gmail.com](mailto:alyani.rahma96@gmail.com)<sup>\*1</sup>, [nildatp@eng.unand.ac.id](mailto:nildatp@eng.unand.ac.id)<sup>2</sup>, [alizar\\_hasan@eng.unand.ac.id](mailto:alizar_hasan@eng.unand.ac.id)<sup>3</sup>,  
[ikhwan@eng.unand.ac.id](mailto:ikhwan@eng.unand.ac.id)<sup>4</sup>, [hayati@utm.my](mailto:hayati@utm.my)<sup>5</sup>

\*Corresponding Author

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**Abstract:** Bakery product is a product with huge business opportunities in the domestic and international halal food market. Bakery companies demand to keep consumers' trust in their bakery products. This study aims to design the halal assessment model required to determine the critical point in the bakery-making business process. This assessment tool is intended to understand, acknowledge, and determine the critical point of the bakery production process from the halal degree and is reviewed from all aspects, such as the materials' content, as well as the material acquisition and processing method based on 18 criteria of Good Manufacturing Practices (GMP) principles. The halal assessment model designed in this research used the Quality Function Deployment (QFD) approach, which was integrated into the company's business process. The halal critical bakery (HCB) was grouped based on Supply Chain Operations Reference (SCOR) model. Matrix 1 integrated GMP and business process (BP), and matrix 2 integrated GMP and HCB. The results of the design model implementation based on the standards set by the Halal Auditor of Institute for the Study of Food, Drugs, and Cosmetics Indonesian Ulema Council (LPPOM MUI) found that the company met the standard matrix component one by 47%. In comparison, matrix component 2 was only able to meet the Auditor standards by 34%, and the matrix component 3 standards were able to be fulfilled by the company by 75%. The fulfillment value of each matrix is influenced by the negative gap that occurs; the negative gap occurs because of the standard criteria in the technical matrix that are not accomplished. This halal assessment model design is expected to help the company evaluate and control critical points in the business processes.

**Keywords:** bakery industry, good manufacturing practices, halal assesment, quality function deployment, supply chain

### 1. Introduction

One type of food that uses complex food additives is a bakery, which has several opportunities for contamination of haram ingredients in its products (Rizka et al., 2018; Sucipto et al., 2022) (Rizka et al., 2018). Wheat flour, rum, developer ingredients, sea urchin brushes, meat, and its processed products, ovalets, shortening, margarine, cheese, yeast, creamer, gelatin, chocolate, and emulsifier are all considered halal critical in bakery products (Assessment Institute for Foods Drugs and Cosmetics Indonesian Ulema Council, 2014; Jerome et al., 2019). Whatever type of food is once halal (including bakery), if mixed with haram substances, it will be considered haram (Qardhawi, 1993). Therefore, halal labels and information on ingredient content in bakery products are important and urgent attributes for Muslim consumers because some additional ingredients used in bakery manufacture are at a critical point of prohibition and cannot be ignored.

Halal is Arabic for "allowed," whereas haram is Arabic for "forbidden" or "illegal" (Mohamad & Khairuldin, 2018). Despite its association in Islam with ritual slaughter, the halal doctrine pervades all aspects of life, including business and management (Ab Talib et al., 2015). Halal food is now more than just a religious requirement for Muslims; it has also expanded into business and trade. It has become a global symbol of quality and a way of life that unquestionably leads to a better one (Anam et al., 2018; Farouk et al., 2014). Halal food requirements do not only focus on the ingredients in food, safety, and hygiene aspects. Some parts must be strictly monitored by the company and the government for all stages of the production process, including production, processing, packaging, storage, and transportation. All stages throughout the production process must be ensured to meet all requirements following halal standards (Prabowo & Rahman, 2016; Sani et al., 2020). According to Koeswinarno (2020), the regulation of Halal Product Guarantee is in law No. 33 of 2014 is a political power regulating a product's halal factors. The comprehensive protection concept for Muslims includes religious requirements such as avoiding alcohol and pork and product safety, health, and hygiene (Koeswinarno, 2020).

The halal factor of a product is divided into five criteria. The first criterion is that the product has been declared halal according to law No. 33 of 2014. Second, the materials do not come from forbidden material or its derivatives. The third is that it does not contain *khamr* or other intoxicating elements. Next, it does not contain parts of the human body or its derivatives. The last criterion is that it is not mixed or contaminated by unclean goods during production, storage, transportation, distribution, and presentation, as stated by Permana et al. (2019).

Bakery is the object of research examined in this article. According to Arysan (2019) and Noort (2022), people who live in big cities prefer bread as a complementary staple food because bread has a higher and complete nutritional content than other complementary staple foods, so it can replace the function of rice as the main source of carbohydrates, as shown in Figure 1.

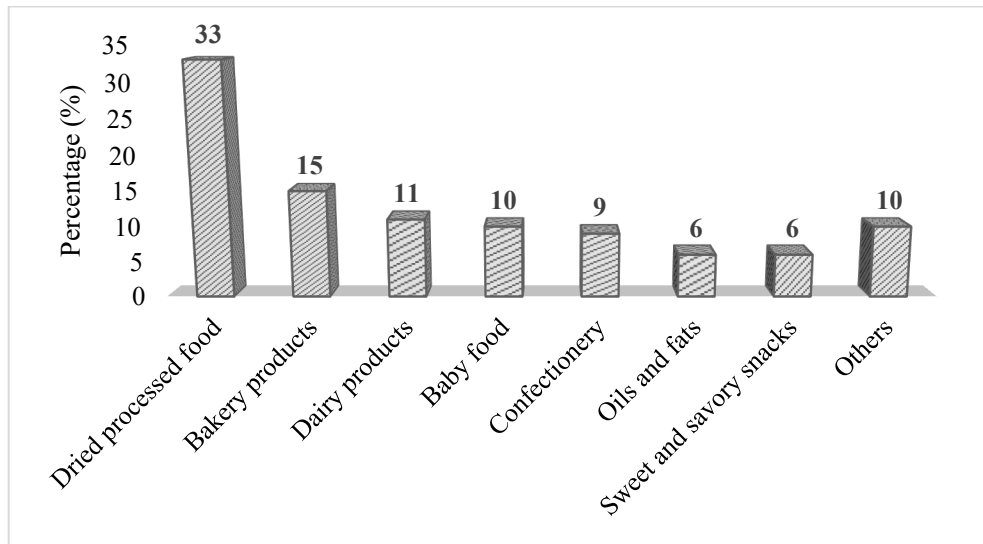


Figure 1. Global Market for Halal Products

The fact that bakery products rank second in the global market for halal products signifies that bakery products are a market with great opportunities in the halal food business at home and abroad (Dyck et al., 2012; Sahir et al., 2021). GMP in the food industry is used as a halal food reference standard that makes the food industry ready to conduct business processes by sharia or Islamic law. Preparatory work starts from the following aspects, namely: the use and selection of products, the supplier of the product, the production process, the process of storing unfinished products to the final product, and the method of allocation and separation in this process, such as the way of storing and transporting halal products or food in order to avoid unclean things or haram (Deuraseh, 2020; Maarif, 2016; Sulaiman et al., 2021).

Bakery X is a bakery company and one of the bread industries in Pekanbaru that has held halal certification from LPPOM MUI. The products studied are buns, as the main products that continue to be produced by companies that use some toppings, such as chocolate, meat, and mozzarella cheese imported from abroad. The topping used is one of the ingredients that became a tipping point and prohibition in making bread. According to Astuti et al. (2020), the rampant globalization of the food industry has affected most food and beverages that require traders to buy groceries abroad in Indonesia. As long as Bakery X was established, the company has never used halal assessment tools with any method since they only see the halal label. Therefore, it is necessary to design halal assessment tools at Bakery X to see if the ingredients and processes used in producing bakeries already use halal ingredients and safe processes.

Previous research on the design of the halal measurement model is in chicken meat processing. The study uses the quality function deployment method in PT. X, conducted by Maarif (2016) and Helmi (2019), has also discussed the design of the halal measurement model in household industry using QFD Method. However, there is no current research on implementing QFD in the development of halal food in the bakery industry. This halal assessment design on bakery X used QFD method to design the conceptual model. This research aimed to design a conceptual model for critical points in every product-making process. The determination of critical points in the designed assessment model was seen from the halal degree and reviewed every aspect of the material content used in the bun's making process. The material acquisition and processing were based on the 18 GMP principles. Therefore, the QFD

approach, integrated into the business process and critical bakery, which was categorized using the SCOR model, became the selected method in this research. The implementation results in Bakery X show that for Matrix 1 integrated GMP and BP filled by Bakery X by 47%, matrix 2 GMP integrated and HCB filled by Bakery X by 34%, and matrix 3 integrated BP and HCB filled by Bakery X by 75%, which means there are still gaps to note in the selection and sorting of raw materials, processing of semi-finished materials, and processing of finished materials. In matrices 2 and 3, there is also a gap in the HCB component, namely actor (employee). Therefore, the design of this assessment model is expected to help companies evaluate and control the critical points in business processes.

**2. Materials and Methods**

The halal assessment model in this study uses the QFD method. QFD is one of the most widely used techniques for improving quality and meeting customer expectations. This tool combines all customer needs in every aspect of the product, converting them into technical requirements so that they can be met (Abdel-Basset et al., 2019). According to Bernal et al. (2009), Bossert (2021), and Terninko (2018) the House of Quality (HOQ) is a matrix included in the method of implementing the quality function. HOQ aims to determine the important under points of halal in the business process of making buns. The initial QFD model in this study was based on the guidelines for GMP criteria and the critical halal point in the bakery, according to the MUI. After the initial QFD model was designed, the LPPOM MUI and the company management validated the halal factors through interviews and standard weighting (Sutawidjaya & Asmarani, 2018).

The initial QFD model in this study consists of 3 matrices based on the QFD assessment model belonging to the research of Cardoso et al. (2015), which examines the implementation of the quality function application in the development of organic products to produce organic food QFD evaluation model. The initial QFD model in this research consists of 3 matrices based on the QFD assessment model (Cardoso et al., 2015). These three adopted matrices in this research are QFD halal evaluation refer models. In the verification stage, there are 3 matrices. Matrix 1 integrated GMP and BP, matrix 2 integrated and HCB, and matrix 3 integrated BP and HCB.

*2.1. Matrix 1 Good Manufacturing Practices and Business Process*

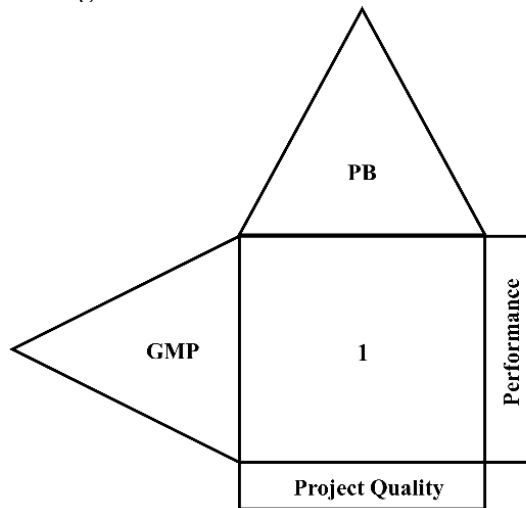


Figure 2. Matrix 1 Conceptual Model

In the halal assessment model using matrix 1 QFD, the GMP was made as an attribute and BP as a technical response, as shown in Figure 2. Therefore, GMP consists of criteria that had been adjusted with the actual condition of the bakery company, as shown in Table 1.

Table 1. GMP Criteria

GMP Principal	Terms or Uses
Location	The industrial location is clean, free from garbage, odor, smoke, and dirt.
Building	Easy to clean, easy to sanitize, and easy to maintain.
Sanitation Facilities	Sanitation facilities are made based on plans that meet technical and hygienic plans.
Machinery and Tools	Equipment is placed in the order of the production process.

GMP Principal	Terms or Uses
Material	The raw materials used are not damaged, rotten, and contain hazardous materials.
Process Monitoring	Material control, contamination control, process time, and temperature control.
The Final Product	Final product quality and safety inspection.
Employees	Employees are fit and clean.
Packaging	Goods are stored and handled hygienically.
Labeling	Product name labeling.
Storage of Production Tools and Raw Materials	Proper storage of production equipment, raw materials, and finished products.
Maintenance And Sanitation Program	Cleaning of production equipment and environment.
Transport	Availability of safe and hygienic containers and means of transportation.
Documentation and Recording	Recording of raw materials and final products.
Training	Cleaning, training, and employee health.
Product Withdrawal	Availability of training on basic hygiene, basic principles of cleaning and sanitation, material handling, and cleaning for employees, as well as participating in halal and safe training.
Guideline Implementation	Withdrawal of products suspected of being contaminated with illegal and dangerous substances.

The business processes critical rate was also weighed to obtain the weighting for each business process. The weighing was done by the HRD Director and QC Department, who understand the entire business process, and by Halal Auditor. The bun-making process at Bakery X consists of:

- a. Raw material purchasing
- b. Raw material selection and sorting
- c. Raw material cleaning
- d. Storage
- e. Semi-finished material processing
- f. Semi-finished material delivery to bakery X outlets
- g. Finished material processing
- h. *Finishing and plating*
- i. Sales

2.2. Matrix 2 Good Manufacturing Practices and Halal Critical Bakery

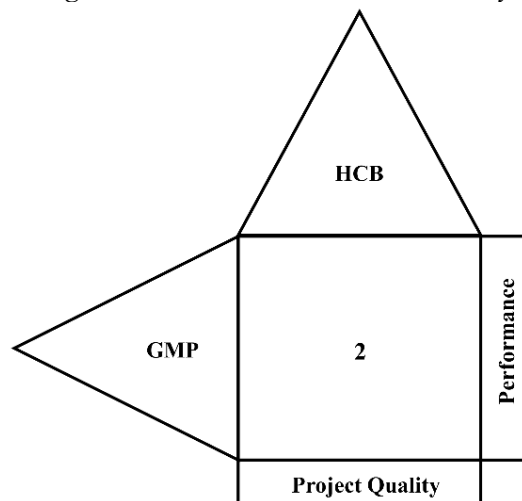


Figure 3. Matrix 2 Conceptual Model

In the halal assessment model using matrix 2 QFD, the GMP was made as an attribute and HCB as a technical response, as shown in Figure 3. GMP consists of criteria that had been adjusted with the actual condition of the bakery company. Similar to matrix 1, GMP in matrix 2 is also grouped using SCOR model. According to Cardoso et al. (2015), SCOR is a process reference model incorporating concepts in reengineering business processes. This model is arranged and divided into five components:

Plan, Source, Make, Deliver, and Return Cardoso et al., (2015). After that, the HCB component was determined as the technical response. Therefore, GMP is every aspect of the business process at Bakery X. The determination of the critical halal point on the bun can be found in Table 2.

Table 2. Halal Critical Point on Bun

Material	Characteristic
Wheat Flour	The wheat flour used does not contain additives, namely L-cysteine, made from human hair, and various gums and gelatin whose halal is doubted.
Leavening Agent	Not using the cream of tartar because it is produced from the wine industry (a type of liquor)
Pig hairbrush	Not using brushes that contain the word Bristle.
Meat and its processed products	Avoid using haram meat or processed products such as pork (sausage, beef floss).
Shortening	Not using white butter made from haram animal's fat
Margarine	The margarine used does not use illegal stabilizers.
Instant baker's yeast	Not using yeast added with emulsifying ingredients from haram ingredients, such as pork lecithin and anti-clotting compounds. Must be halal
Cheese	It does not use enzymes and starters (so that the cheese clumps), which come from the digestive tract of haram animals.
Chocolate	Not using an emulsifier derived from animal lecithin, made enzymatically using the enzyme phospholipase A <sub>2</sub> derived from pig pancreas.
Tomato or chili sauce	It is not using textile dyes due to heavy metal residues that are harmful to health, nor use specified stabilizers.
Mayonnaise	Paying attention to the halal status of additional ingredients such as oil and vinegar.

HCB grouping, which includes all aspects related to business processes at Bakery X:

a. Raw Materials

The main raw materials in bun making at Bakery X are Cakra Flour, Eggs, Salt, Sugar, Yeast, Mushrooms, Pepper, Meat, Mozzarella Cheese, Tomato Sauce, Sausage, Mayonnaise, Butter, Onions, Garlic, Chili Sauce, Milk, Chocolate, and Red Beans. HOQ is a matrix included in implementing the quality function that aims to determine the critical halal points in the business process of making buns. The initial QFD model in this study was based on the guidelines for GMP criteria and the critical halal point in the bakery, according to the MUI. After the initial QFD model was designed, the halal factors were validated by the HCB MUI and the company management through interviews and standard weighting Jaswir et al. (2020).

b. Actor

Actors are all parties involved in the business processes that exist in the company. As a result, actors become one of the important factors that can affect the reliability of the production process (Maarif, 2016).

c. Documents

Documents can affect the sustainability of business processes in a company. Documents are important because they prove that the company has performed production according to procedures. In addition, all fully documented activities can minimize the occurrence of illegal processes (Maarif, 2016).

d. Tools

The tools must meet the existing requirements because they can affect the continuity of business processes. Several requirements from LPPOM MUI must be met regarding the tools used during the production process, including cleaning the production tool to avoid non-halal product residues, the clean and free containers from uncleanness, and use of halal brushes (Sagara, 2013).

e. Location or Environment

Location or environment is also one of the criteria that can affect the sustainability of business processes. The company's location must be clean, industrial, and free from garbage, odor, smoke, and dirt. In addition, a separate location can prevent the product from being contaminated with non-halal ingredients (Ministry of Industry, 2010).

2.3. Matrix 3 Business Process and Halal Critical

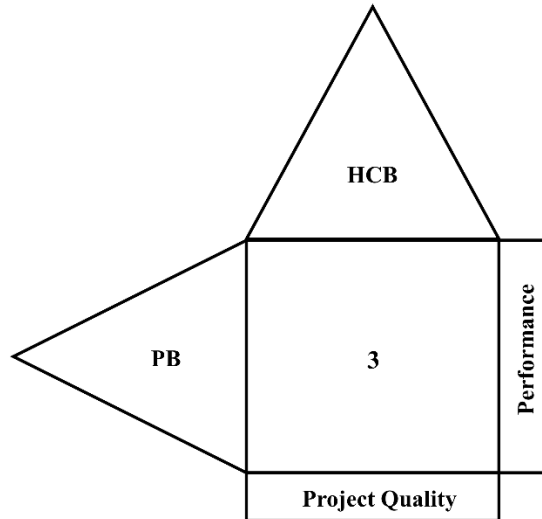


Figure 4. Matrix 3 Conceptual Model

In the halal assessment model using matrix 3 QFD, BP was made as an attribute and HCB as the technical response, as shown in Figure 4. GMP consists of criteria that had been adjusted with the actual condition of the bakery company.

3. Result and Discussion

The results of the halal assessment design at Bakery X obtained 17 GMP criteria selected from a total of 18 criteria, as shown in Table 1. The selected GMP criteria are grouped using the SCOR model, further divided into several components. The source comprises location components, buildings, sanitation facilities, machinery and equipment, materials, and employees. Make consists of monitoring processes, final products, packaging, labeling, storage of production equipment and raw materials, maintenance and sanitation programs, documentation and recording, product recalls, and program implementation. Finally, delivery contains a transport component. In addition, weighting is also carried out on the selected criteria based on the level of importance of each criterion using a Likert scale (1-5 or very unimportant-very important).

The first data processing is carried out by calculating the standard aggregate to get the cumulative comparison value between the company and the auditor and then calculating the planning matrix. The planning matrix is a matrix related to planning the fulfillment of the goals of the standard competency level set by the auditor and the company. In this matrix, a comparison is made between the aggregate values of competence for each production process. Then the improvement ratio is calculated based on the goals of the aggregate value. The value of goals per standard requirement is obtained from the aggregate value of standard competence and the aggregate value of the company's competence. The largest value of the two aggregate values will be the goals to be achieved. Based on these goals, an improvement ratio can be calculated to compare the company's competency requirements. In addition to the improvement ratio, interest points are another component of the planning matrix. Interest points show the importance of each production process. The interest point value is directly proportional to the improvement ratio value, which indicates the priority of improvements the company needs to make. The calculation shows that the company still has to make improvements from the aspect of the study of matrix 1, 2, and 3. The next matrix components are raw weight and normalized raw weight. Raw weight is obtained from the standard aggregate multiplication, improvement ratio, and interest point. The normalized raw weight, the normalized value of the weight, is then calculated by dividing the weight by the total weight of each standard requirement.

They emphasized that in addition to the planning matrix, a technical matrix was also made to show the percentage of the company's business process competency level gap with the standard competency level. Based on this matrix, which business processes have the largest gaps in obtaining business process improvement priorities can be seen. First, the value of the contribution of each business process is calculated (Helmi, 2019). The value shows the contribution of a process to the overall production process. It is obtained from the normalized weight value with the relationship value on the HOQ and the weight of the GMP criteria integrated with the business process. The other component is

the normalization of the contribution value. This normalization is obtained by dividing the contribution value of a production process by the total contribution value of all business processes. Next, the standard and company competency level values are entered. Finally, the value of the two aspects is calculated by multiplying the contribution value above based on the standard and company level. The standard aspect is obtained from the multiplication of the standard competency level with the contribution value of the business process. In contrast, the corporate aspect is obtained from the multiplication of the company's competency level with the business process contribution value. The percentage of the gap is then obtained by dividing the gap by the value of the largest aspect of the standard or company. The following are the data processing results for matrix 1, 2, and 3.

3.1. Matrix 1 Good Manufacturing Practices and Business Process

The results of the aggregate calculation of the company's standard requirements and Halal Auditor standards for matrix 1 are in Table 3. A planning matrix is a matrix that deals with planning to meet the standard competency level goals set by auditors and companies. In this matrix, a comparison is made between the aggregate values of competence for each production process and then calculated the improvement ratio based on the goals of the aggregate value.

The value of goals per standard requirement is derived from the aggregate value of standard competence and the aggregate value of the company's competence. The largest value of both aggregate values will be the goals to be achieved. Based on these goals, the improvement ratio can be calculated as a comparison of the competence of the company's requirements.

In addition to the improvement ratio, the interesting point is another component of the planning matrix. The interest point value can be worth 1.5 if the aggregate value of the standard competence is greater than the aggregate value of the company's competence and is worth 1.2 if the aggregate value of the company's competence is greater than the aggregate value of the standard competence. The interest point value is directly proportional to the value of the improvement ratio, where the value indicates the priority of improvements that the company needs to make.

First, raw weight is obtained from standard aggregate multiplication, improvement ratio, and interest point results. The normalized raw weight, the normalization value of the weight, is then calculated by dividing the weight against the total weight of each standard requirement. The next planning matrix calculation results can be seen in Table 3, Table 6, and Table 9.

Table 3. Matrix 1 Planning (Performance)

	GMP Criteria	Auditor Agregat	Company Agregat	Goal	Improvement Ratio	Interest Point	Weight	Normalized
Source	Location	3.48	3.42	3.48	1.02	1.5	1.53	0.066464
	Building	3.90	3.95	3.95	1	1.2	1.2	0.052129
	Sanitation Facilities	3.48	3.42	3.48	1.02	1.5	1.53	0.066464
	Machinery and Tools	3.90	3.84	3.90	1.02	1.5	1.53	0.066464
	Material	3.48	3.41	3.48	1.02	1.5	1.53	0.066464
	Employees	3.90	3.84	3.90	1.02	1.5	1.53	0.066464
	Training	2.82	2.89	2.89	1	1.2	1.2	0.052129
Make	Process Monitoring	3.66	3.84	3.84	1	1.2	1.2	0.052129
	The final product	0.90	0.98	0.98	1	1.2	1.2	0.052129
	Packaging	1.32	1.51	1.51	1	1.2	1.2	0.052129
	Label	1.92	2.14	2.14	1	1.2	1.2	0.052129
	Storage of Production Tools and Raw Materials	3.00	3.10	3.10	1	1.2	1.2	0.052129
	Maintenance And Sanitation Program	4.08	4.05	4.08	1.01	1.5	1.52	0.06603
	Documentation and Recording	1.50	1.61	1.61	1	1.2	1.2	0.052129
	Product Withdrawal Guideline	1.32	1.30	1.32	1.02	1.5	1.53	0.066464
	Implementation	2.82	2.78	2.82	1.01	1.5	1.52	0.06603
	Delivery	Transport	2.82	2.99	2.99	1	1.2	1.2

In addition to the planning matrix, a technical matrix is created to see the percentage of the gap in the competence level of the company's business processes with a standard level of competence. Based on this matrix, business processes have the largest gap in obtaining improvement priorities.

Calculating the contribution value of each business process is the first process. This contribution value shows the contribution of a process to the production process as a whole. It is derived from the normalized weight value with the relationship value in HOQ and the weight of the GMP criteria integrated with the business process. The other component is the normalization of the contribution value. This normalization is obtained by dividing the contribution value of a production process by the total contribution value of the entire business process and then adding the value of standard and company competency levels. Then, based on the standard and company level, calculated the value of both aspects multiplied by the value of the above contribution. The standard aspect is obtained from the multiplication the standard competency level with the value of business process contribution. In contrast, the company aspect is obtained from the multiplication of the company's competency level with the value of business process contribution. The percentage gap is then obtained by dividing the gap against the value of the largest aspect of the standard or company. Furthermore, the technical matrix calculation can be seen in Table 4, Table 7, and Table 10.

Table 4. Matrix 1 Technical (Project Quality)

	Raw Material Purchase	Raw Material Selection and Sorting	Raw Material Cleaning	Storage	Processing of Semi-Finished Materials	Delivery of Semi-Finished Materials to Outlet	Finished Material Processing	Finishing and Plating	Sales
Contribution Value	1.263970	0.474828	1.306526	0.681955	0.756394	0.361572	0.140888	0.908199	0.471943
Contribution Normalization	0.198542	0.074585	0.205226	0.107120	0.118813	0.056795	0.022130	0.142658	0.074132
Standard GMP Criteria Level	5.055881	1.899311	5.226105	2.727820	3.781972	1.446288	0.704442	4.540994	1.415829
Company GMP Criteria Level	6.319851	1.424484	6.532631	3.409775	3.025578	1.446288	0.563554	4.540994	1.887771
Gap	1.263970	-0.474828	1.306526	0.681955	-0.756394	0.000000	-0.140888	0.000000	0.471943
% Gap	0.25	-0.25	0.25	0.25	-0.20	0	-0.20	0	0.33

Table 5. Matrix 1 Standard Compliance

	GMP Criteria	Improvement Ratio	Weight	Normalized
Source	Location	1.02	1.53	0.066464
	Sanitation Facilities	1.02	1.53	0.066464
	Machinery and Tools	1.02	1.53	0.066464
	Material	1.02	1.53	0.066464
	Employees	1.02	1.53	0.066464
Make	Maintenance and Sanitation Program	1.01	1.52	0.06603
	Product Withdrawal	1.02	1.53	0.066464
	Guideline Implementation	1.01	1.52	0.066030

There are 8 requirements of the GMP Criteria integrated with the SCOR model whose standards were not met by the company.



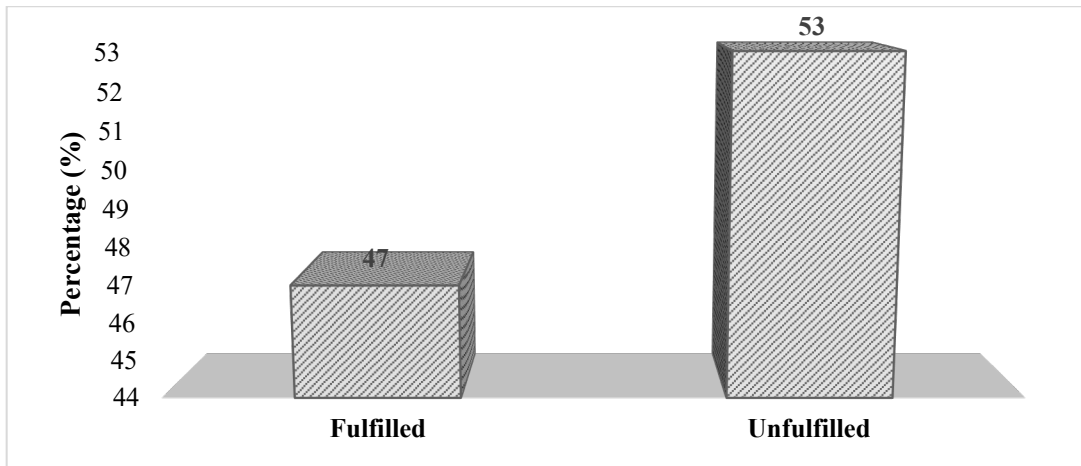


Figure 5. Compliance with the Requirements of the Matrix 1 Standard

Figure 5 shows the total weight of the requirements that meet the standards versus those that do not, with 53% of the requirements not met. This 53% value means that some standards have been set by halal auditors who cannot meet the company requirements that the company in Table 5 cannot meet. It is known from the value of the improvement ratio, which has a value greater than one. Therefore, the designed assessment tool can see the ability of the bakery company to meet the standards of matrix 1.

3.4. Matrix 2 Good Manufacturing Practices and Halal Critical Bakery

The calculation result of the company and auditor standard on matrix 2 can be seen in Table 6.

Table 6. Matrix 2 Planning (Performance)

	GMP Criteria	Auditor Aggregate	Company Aggregate	Goal	Improvement Ratio	Interest Point	Weight	Normalized
Source	Location	0.80	0.80	0.80	1	1.2	1.2	0.047207
	Building	1.60	1.40	1.60	1.14	1.5	1.71	0.06727
	Sanitation Facilities	2.40	2.20	2.40	1.09	1.5	1.64	0.064516
	Machinery And Tools	3.65	3.45	3.65	1.06	1.5	1.59	0.062549
	Material	4.10	4.20	4.20	1	1.2	1.2	0.047207
	Employees	3.30	3.40	3.40	1	1.2	1.2	0.047207
	Training	0.80	0.60	0.80	1.33	1.5	2	0.078678
Make	Process Monitoring	4.10	4.20	4.20	1	1.2	1.2	0.047207
	The final product	2.40	2.20	2.40	1.09	1.5	1.64	0.064516
	Packaging	2.40	2.20	2.40	1.09	1.5	1.64	0.064516
	Label	3.30	3.40	3.40	1	1.2	1.2	0.047207
	Storage of Production Tools and Raw Materials	4.10	4.20	4.20	1	1.2	1.2	0.047207
	Maintenance And Sanitation Program	3.65	3.45	3.65	1.06	1.5	1.59	0.062549
	Documentation And Recording	2.50	2.60	2.60	1	1.2	1.2	0.047207
	Product Withdrawal	2.85	2.65	2.85	1.08	1.5	1.62	0.063729
	Implementation of the Guidelines	0.80	0.60	0.80	1.33	1.5	2	0.078678
Delivery	Transport	3.65	3.45	3.65	1.06	1.5	1.59	0.062549

Table 7. Matrix 2 Technical (Project Quality)

	Bun raw material	Actor	Document	Tools	Location/Environment
Contribution Value	0.816585	1.427465	0.237923	0.874283	0.880786
Contribution Normalization	0.192725	0.336901	0.056153	0.206343	0.207878
Standard GMP criteria level	4.082926	5.709859	0.713770	3.497132	3.523145
Corporate GMP criteria level	4.082926	4.282394	1.189616	3.497132	3.523145
Gap	0.000000	-1.427465	0.475847	0.000000	0.000000
% Gap	0	-0.25	0.66	0	0

Table 8. Matrix 2 Standard Compliance Requirements

GMP Criteria		Improvement Ratio	Weight	Normalized
Source	Building	1.14	1.71	0.06727
	Sanitation Facilities	1.09	1.64	0.064516
	Machinery And Tools	1.06	1.59	0.062549
	Training	1.33	2	0.078678
Make	The final product	1.09	1.64	0.064516
	Packaging	1.09	1.64	0.064516
	Maintenance And Sanitation Program	1.06	1.59	0.062549
	Product Withdrawal	1.08	1.62	0.063729
	Implementation of the Guidelines	1.33	2	0.078678
Delivery	Transport	1.06	1.59	0.062549

The 10 requirements of the GMP Criteria are integrated with the SCOR model, whose standards have not been met by the company.

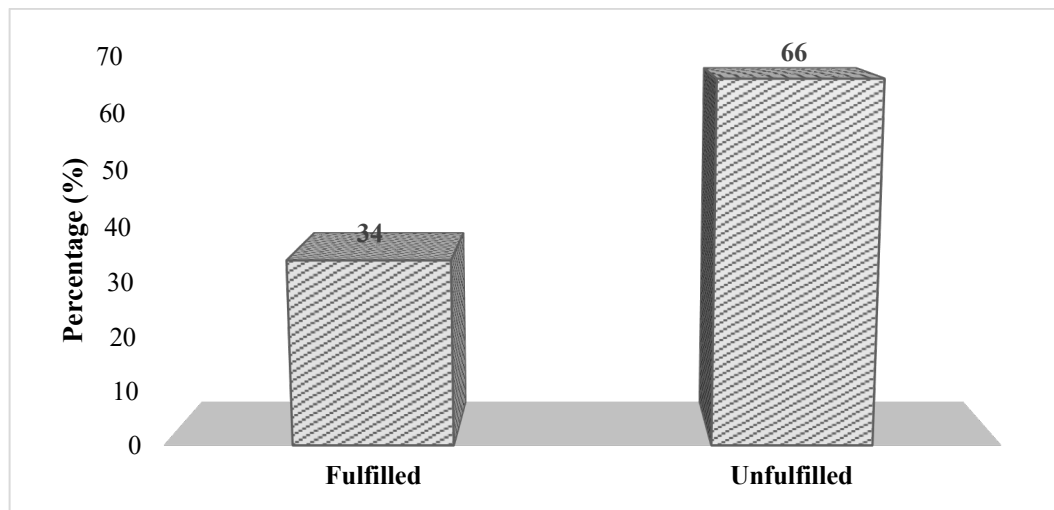


Figure 6. Compliance with the Requirements of the Matrix 2 Standards

The total weight of the requirements that can meet the standard is compared to those that cannot, with 66% of the requirements not met. This 66% value means that some standards have been set by halal auditors who cannot meet the company requirements that cannot be met by the company seen in Table 8. It can be seen from the value of the improvement ratio, which has a value greater than one. Therefore, the measuring instrument designed can see the ability of bakery companies to meet the standards of matrix 2, as shown in Figure 6.

3.5. Matrix 3 Business Process and Halal Critical

In the halal assessment model using QFD matrix 3, Business Process is placed as an attribute while Halal Critical Bakery is a technical response. The Business Process contains criteria that have been adjusted to the actual conditions in the bakery company. The calculation of the standard requirements of matrix 3 can be seen in Table 9.

Table 9. Matrix 3 Planning (Performance)

Business Process	Auditor Aggregate	Company Aggregate	Goal	Improvement Ratio	Interest Point	Weight	Normalized
Purchase of raw materials	4.10	4.20	4.20	1	1.2	1.2	0.093567
Selection and sorting of raw materials	2.85	2.95	2.95	1	1.2	1.2	0.093567
Raw material cleaning	3.65	3.45	3.65	1.06	1.5	1.59	0.123977
Storage	4.10	4.20	4.20	1	1.2	1.2	0.093567
Processing of semi-finished materials	4.10	4.20	4.20	1	1.2	1.2	0.093567
Delivery of semi-finished materials	4.10	4.20	4.20	1	1.2	1.2	0.093567
To the outlet	2.85	2.95	2.95	1	1.2	1.2	0.093567
Processing	4.10	4.20	4.20	1	1.2	1.2	0.093567
Finished material	2.85	2.95	2.95	1	1.2	1.2	0.093567
Finishing and plating	2.40	2.20	2.40	1.09	1.5	1.635	0.127485

Table 10. Technical Matrix 3 (Project Quality)

	Bun raw material	Actor (Employee)	Document	Tools	Location/Environment
Contribution Value	1.121051	1.570523	0.547367	1.345963	1.345963
Contribution Normalization	0.189020	0.264805	0.092291	0.226942	0.226942
Standard GMP criteria level	5.605256	6.282094	1.642101	5.383850	5.383850
Corporate GMP criteria level	5.605256	4.711570	2.736835	5.383850	5.383850
Gap	0.000000	-1.570523	1.094734	0.000000	0.000000
% Gap	0	-0.25	0.66	0	0

Table 11. Fulfillment of Technical Responses Matrix 3

Halal Critical	Contribution Normalization	Gap
Actor (Employee)	0.264805	0.25

The critical halal component the company cannot fulfill is 26%, while the company can fulfill the other 74%. This 26% value means that some standards have been set by halal auditors who cannot meet the company requirements that cannot be met by the company seen in Table 10. It can be seen from the

value of the improvement ratio, which has a value greater than one. Therefore, the measuring instrument designed can see the ability of bakery companies to meet the standards of matrix 3.

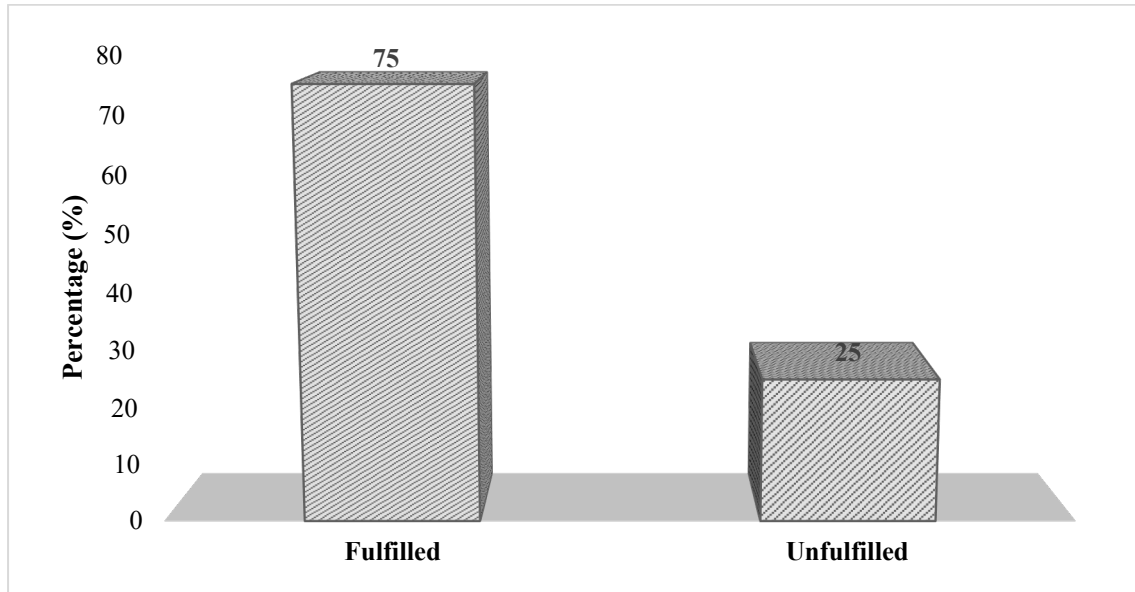


Figure 7. Compliance with the Requirements of the Matrix 3 Standards

Technical response matrix 3 that has not been able to be fulfilled by the company can be seen in the Table of Fulfillment of Technical Responses matrix 3. This 25% value means that some standards have been set by halal auditors who cannot meet the company requirements that cannot be met by the company, as seen in Table 11. The results of this calculation indicate that the measuring instrument designed can see the bakery industry's ability to fulfill the technical response in matrix 3, as shown in Figure 7.

### 3.6 Proposed Improvements to the Gap at Bakery X

There are 4 proposals for improvement given to the company: proposal A (Providing personal hygiene training for food processing), proposal B (Adding an inspector for supervision of hygiene practices), proposal C (Providing rewards and punishments), and proposal D (Adding the hygiene inspection process to employees).

Proposal A refers to the company having to provide training within a certain period, for example, every 6 months to employees on the basics of hygiene, factors that cause quality and safety decline, factors that cause disease and poisoning, CPPOB, training on basic principles cleaning and sanitation as well as material handling and cleaning training. This training aims to provide employees with the importance of maintaining hygiene for themselves, others, and the workplace.

Proposal B suggests adding a hygiene practice inspector who is in charge of supervising employees in practicing hygiene within the company, such as checking the completeness of basic personal protective equipment, checking nails, checking body temperature, and other inspections related to employee hygiene in order to maintain halal, cleanliness and product safety of the company.

Proposed C refers to rewards and punishments, such as giving gifts every month to employees who have the highest points in hygiene practices and giving punishments in the form of salary deductions or suspensions for employees who violate the hygiene practices established by the company. Proposal C aims to motivate employees to compete in maintaining their hygiene practices in the company properly while still paying attention to the halal side.

Proposed D is to increase the hygiene inspection process before starting any activity in the company. The inspection process in question includes checking employee body temperatures, nails, and so on related to hygiene at the company. This inspection process is carried out so that hygiene practices in the company can be maintained properly to maintain the halal, cleanliness, and safety of the products produced by the company. An improvement matrix for proposed improvements to bakery X can be seen in Table 12.

Table 12. Improvement Proposal to Bakery X

Business Process	Improvement Proposal								Performance		
	Proposal A		Proposal B		Proposal C		Proposal D		Importance Level	Weight	Weight (%)
Raw Material Selection and Sorting	1.71	9	0.57	3	0.57	3	1.71	9	4	1	19.047%
Raw Material Cleaning	1.71	9	1.71	9	0.57	3	1.71	9	4	1	19.047%
Semi-Finished Material Processing	2.16	9	0.72	3	0.72	3	2.16	9	5	1.25	23.810%
Finished Material Processing	2.16	9	0.72	3	0.72	3	2.16	9	5	1.25	23.810%
Sales	0.42	3	0.42	3	0.42	3	1.26	9	3	0.75	14.286%
<b>Absolute Importance</b>	8.16		4.14		3.00		9.00		24.30	5.25	100%
<b>Percent Importance</b>	33.580%		17.037%		12.346%		37.037%		100%		
<b>Ranking</b>	2		3		4		1				

Description:

- Proposal Code    Improvement Proposal
- Proposal A       : Providing personal hygiene training for food processing
- Proposal B       : Adding an inspector for hygiene practice supervision
- Proposal C       : Giving rewards and punishments
- Proposal D       : Adding a hygiene inspection process to employees

Recommendations for improvement with a weight percentage of 37.037% and rank 1 were chosen, which is Proposal D refers to increasing the hygiene inspection process for employees. Thus, it can be concluded that the company must add a hygiene inspection process for employees before carrying out activities related to business processes to avoid bacterial contamination and other harmful substances to the products produced by the company. The following graph of the analysis of the proposal given to Bakery X is shown in Figure 8.

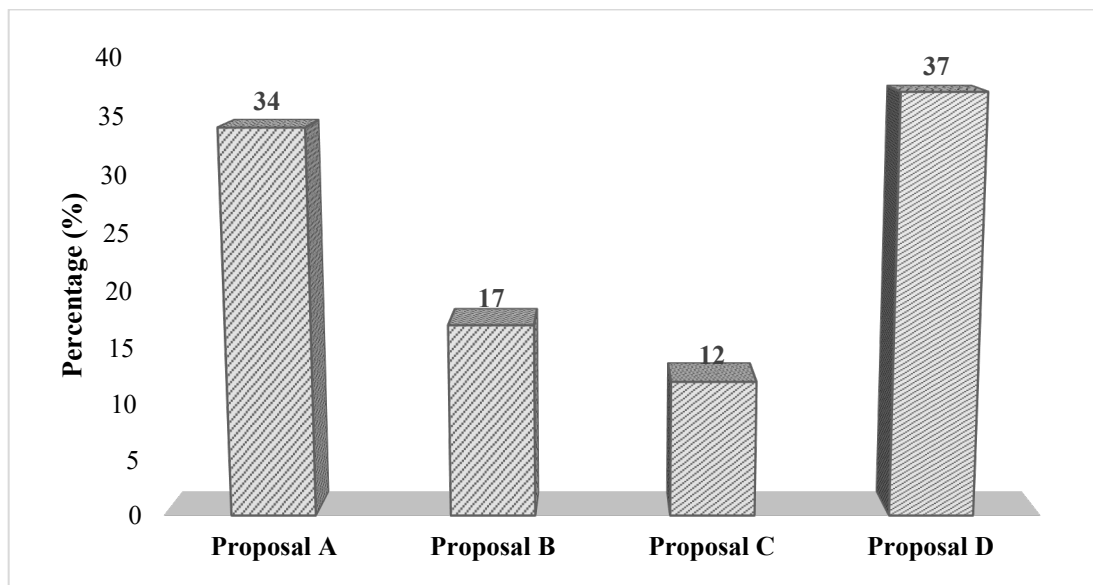


Figure 8. Percentage of Proposed Improvements to Bakery X

Figure 8 shows that the proposal that needed to be immediately carried out by Bakery X is proposal D which has the highest percentage of 37.04%. The intended proposal D is to add a hygiene inspection process before starting the activities at the company. The inspection process in question, such as checking employee body temperature and nails, is related to hygiene at the company. This inspection process is carried out so that hygiene practices in the company can be maintained properly to maintain the halal, cleanliness, and safety of the products produced by the company.

#### 4. Conclusion

The conceptual model of halal readiness using the Quality Function Deployment method designed in this study consists of 3 matrices. Matrix 1 is the relationship between GMP or attributes with the BP or as a technical response. Matrix 2 consists of GMP or attributes with HCB or technical responses. Matrix 3 consists of the BP or attributes with HCB as a technical response. There are three gaps in the raw material selection and sorting, semi-finished material processing, and finished material processing on matrix 1. The gap on matrix 2 is only found in the critical halal bakery on the actor (employee). On matrix 3, it also only occurs in the actor's critical halal bakery (employee). Based on the 3 matrices, it is concluded that actor or employee is the critical halal point because only the standard components of actors that Bakery X cannot meet, and the improvement proposal is to add more hygiene inspection processes on employees before conducting any activities in the company.

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