

Application of Quality Function Deployment (QFD) Method in Food Industry: A case study in “Waroeng Special Sambal”

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Abstract:- The emergence of a variety of similar restaurants with different quality and competitive prices provides an opportunity for consumers to choose products according to their respective tastes. On the other hand, service provider or food industry should pay more attention to various aspects in order to meet the wishes of customers including restaurants such as *Waroeng Special Sambal (Waroeng SS)*. This study was aimed to assist the management of *Waroeng SS* in the identification of customer satisfaction and desire using Quality Function Deployment (QFD) method. The method used in this study was quantitative method namely the QFD. Data of this study were obtained from the survey by giving questionnaires to 100 customers in *Waroeng SS*. Based on QFD analysis, it can be known that the order of priority requirements of *Waroeng SS* customers are taste, price, toilet, portion, menu variation, strategic place, presentation time, unique presentation, parking, cleanliness, and friendly service.

Keywords:- QFD; Restaurants Analysis; Food Industry; Costumers Requirement; HOQ.

I. INTRODUCTION

Along with the current developments and economic changes, competition between business people is increasing, including in the food industry such as restaurants. The emergence of a variety of similar restaurants with different quality and competitive prices provides an opportunity for consumers to choose products according to their respective tastes. On the other hand, service provider or food industry should pay more attention to various aspects in order to meet the wishes of customers including restaurants such as *Waroeng Special Sambal (Waroeng SS)*.

Waroeng SS is now one of the icons of culinary sauce, particularly in Special Region of Yogyakarta. *Waroeng SS* was established in 2002, it has now spread to more than 27 cities in Indonesia. Although *Waroeng SS* is now highly developed, there is still a need to improve the quality and identification of customer wishes appropriately. This is to guarantee the *Waroeng SS* will still be an option for consumers despite many restaurants have been established. This is in line with the statement of one of the branch heads of *Waroeng SS* located in Kaliurang region Km 13 of Sleman Yogyakarta that they strongly need inputs for quality development, particularly in translating consumer desires.

This study was aimed to assist the management of *Waroeng SS* in the identification of customer satisfaction and

desire using Quality Function Deployment (QFD) method. The QFD method is one of the quantitative methods in the integrated quality management. The QFD is used as a tool to correctly translate customer desires, so as to obtain appropriate technical or service requirements [1]. The first QFD theory adopted in Japan in 1972 successfully became a tool for systematic quality improvement in translating market research and customer requirements into technical requirements. The QFD has been proven to increase customer satisfaction [2].

II. LITERATURE REVIEWS

Quality Function Deployment (QFD) including new methods of Quality Engineering which focuses on customer needs and product quality is increasing rapidly. In other words, the basic philosophy of implementing the QFD is to consider and use customer quality demands in the different stages of development or service. Therefore, all product design features and specifications are determined in accordance with the point of view of “customers”, thus the role of experts in designing new products and services is nothing more than “translators” who alter, in considerable quantitative, customer demands on data design using the QFD Method [3].

Quality Function Deployment is a system where the customer needs are converted to a decent product or service [4]. According to the definition stated by Yuji Akao, a founder of the QFD method, this method translates the needs and expectations of customers for a particular product and determining the product characteristics [5]. According to Ham *et al.* [6], the goal of implementing the QFD method is to lower the cost, minimize the frequent changes in technology, identify critical aspects, determine future production processes, shorten product improvement period and resource optimization, customize design and quality planning, as well as to perform the better selection in the hope of food stall’s survival and competitiveness [7].

In the implementation of QFD method, the design process begins with the formation of a matrix or often called House of Quality (HOQ). Basically, the HOQ is a matrix incorporated in the first stage (product planning) which contains information about the customers and their potential needs, relative importance, as well as the customer perception and satisfaction according to the products/services provided by a company compared to the other competitors. The HOQ demonstrates a structure to design and build a cycle, and its shape resembles a house key in building HOQ which is focused on customer needs, so that the design and improvement process is in line with consumer needs.

A study of the implementation of QFD method in the food industry was conducted by Costa *et al.* [3]. Based on literature studies, it is found that QFD method can help the food industry in aligning services with customer wishes. Implementation of QFD has been carried out in several studies, between others Anwar *et al.* [4] who improved the service of *Ngodoe* Cafe. Based on four stages of the QFD method, it can be determined the priority of improving the service quality of *Ngadoe* Café namely service competence, facility design improvement, layout improvement, menu quality improvement, and infrastructure design. Another implementation can be performed is improving the quality of corn noodles as revealed by Suryaningrat *et al.* [5]. Based on the level of customer satisfaction, of 4 attributes such as Taste, elasticity, color and texture, attribute could be fulfilled by the corn noodle was only the Taste.

III. RESEARCH METHOD

This study was aimed to assist the translation of consumer desire and to provide recommendation of improvement in the food industry, particularly in Waroeng SS.

The method used in this study was quantitative method namely the QFD. Data of this study were obtained from the survey by giving questionnaires to 100 customers in Waroeng SS. Sample collection used systematic sampling method. The QFD in this study is divided in 3 stages as follows:

A. Collection of Voice of Customer

In this stage, survey was carried out to obtain voice of consumers, namely any reasons that are considered by consumers to choose Waroeng SS as preferred place to eat.

B. House of Quality Arrangement

Stages should be done to arrange house of quality are:

- Stage I Identification of Customer Requirements
- Stage II Registration of Technical Requirements
- Stage III Direct of Improvement
- Stage IV Improvement of Interrelationship Matrix between Customer Requirements (What) and Technical Requirements (How)
- Stage V Improvement of Interrelationship Matrix between Technical Requirements (How)
- Stage VI Customer Competitive Assessment
- Stage VII Priority Improvement of Customer Requirements
- Stage VIII Target Value of customers
- Stage IX Vertical Scale Factor
- Stage X Selling Point
- Stage XI Absolute Weight of Customer Requirement

C. Analysis and interpretation are the technical and implementation stages of QFD

In this stage, analysis and interpretation were performed on the house of quality that has been arranged in the previous stage.

IV. RESULT AND DISCUSSION

A. Identification of Customer Requirements and Technical Requirements

Customer requirement is the first stage to be developed in building the HOQ matrix. As a parable, customer requirements build the left house wall. Based on the customer requirements, it can be known what things are desired and expected by Waroeng SS’s customers. Customer requirement consists of what things consumers need or expect from Waroeng SS it self.

Identification of customer requirements was performed by giving questionnaires to Waroeng SS’s consumers. Prior to the dissemination of the questionnaire, it was first done the determination of the anticipated service attributes as desired and required by consumers based on quality dimension approaches that are variant of menu (X1), price (X2), place and facility (X3), and employee (X4). The questionnaires were then distributed so that the quality attributes of Waroeng SS that are truly desired by the consumer can be obtained. Once customer requirements were obtained, the performance level could be determined. Customer satisfaction was assessed by using a 5-point likert scale, namely 1 for the worst and 5 for the best. Furthermore, the data were analyzed using frequency tables.

Consumer Requirement	Average Satisfaction Level
Taste	3.9
Menu variation	4.15
Creative food presentation	3.35
Expected portion	3.6
Price	3.85
Strategic and accessible places	3.95
Sufficient parking area	3.35
Toilet	2.9
cleanliness	4
Friendly service	4
Serving time	2.95

Table 1. Customer Requirements of Waroeng SS

Based on table I, it can be seen that menu variation is the main requirement for consumers to choose Waroeng SS as a preferred place to eat. Furthermore, the other main requirements for consumers to choose Waroeng SS were cleanliness and friendly service. Meanwhile, the lowest requirement was toilet and mosque. Thus, by paying attention to the survey results, Waroeng SS should be loyal to consumers and always try to add menu variation in order to keep the consumers.

B. Registration of Technical Requirements

Technical requirement is the stage performed to provide consumer needs in the list of customer requirements by using various resources owned by the company. The technical requirements required to provide customer needs in Waroeng SS are as follows:

Technical Requirements	Satisfaction Level
Raw material supply	Activities undertaken by <i>Waroeng SS</i> in meeting all raw material needs during operational activities.
Raw material storage	Temporary storage of raw materials in a certain place before being processed to the next stage.
Preparation	Preparing the raw materials into processed foods include cleaning of dirt, cutting and washing.
Cooking process	Processing of raw materials through the preparation stage into finished or semi-finished products.
Service	Consumer service, starting from their arrival until their departure. Services also include providing complete facilities and guarantees to consumers.
Room cleaning	Cleaning tables and floors and bringing dirty utensils to the washing department. Cleaning also includes all room and dining facilities, both inside and outside the room of <i>Waroeng SS</i> .
Washing	Washing all the tableware and cooking utensils have been used.

Table 2. Technical Requirements

C. Determination of Direct of Improvement (DOI)

Determination of Direct of Improvement (DOI) for each technical requirement is important to perform because it will be very helpful in determining the correlation between technical requirements. There are three directs of improvement namely:

- ↑, this symbol is given on the technical requirements that will increase customer satisfaction if it is improved.
- ↓, this symbol is given on the technical requirements that will increase customer satisfaction if it is lowered.
- O, this symbol is given on the technical requirements that will increase customer satisfaction when there is a certain target (range of values).

Primary Technical Requirement	Direct of Improvement
Raw material supply	↑
Raw material storage	↑
Preparation	↑
Cooking process	↑
Service	↑
Room cleaning	↑
Washing	↑
Price	↓

Table 3. Direct of Improvement on Technical Requirements

Referring to Table 3. it is known that almost all of the *Waroeng SS* engineering requirements have an upward

development direction, except price. This means that to increase customer satisfaction, *Waroeng SS* should try to set a lower price and improve the quality of other technical requirements.

D. Improvement of Interrelationship Matrix between Customer Requirements (What) and Technical Requirements (How)

The next stage in HOQ arrangement is to compare consumer requirements with technical requirements and determine the relationship between the two requirements in the interrelationship matrix. Any technical requirements may affect more than one customer requirement, and vice versa.

No	Kebutuhan Konsumen	Kebutuhan Teknik							
		Raw material supply	raw material storage	Preparation	Cooking process	Service	Room cleaning	Washing	Price
1	Flavor	●	●	●	●	□	□	□	●
2	Menu variation	●	●	●	●	△	□	□	●
3	Creative food presentation	○	○	○	●	●	●	○	○
4	Expected portion	○	○	○	●	△	□	□	○
5	Price	●	●	○	△	□	□	□	●
6	Strategic and accessible places	□	□	□	□	□	□	□	△
7	Sufficient parking area	□	□	△	□	●	○	□	□
8	Toilet	□	□	△	□	△	●	□	□
9	Hygiene	○	○	○	●	○	●	●	△
10	Friendly service	□	□	●	○	●	□	□	□
11	Serving time	△	△	○	○	●	□	●	□

Fig 1:- Interrelationship Matrix between Customer Requirements and Technical Requirements

- = Strong relationship
- = Medium relationship
- △ = Weak relationship
- = No relationship

Based on Figure 1. it can be seen that there are three kind of relationship between the *Waroeng SS* attributes and the technical requirements. There are strong relationships, medium relationships and weak or unrelated relationships. Examples of strong relationships that occur between the Taste of food with the process of preparing the food from raw material supply, raw material storage, and cooking process. Supply of best raw materials, storage of raw materials in accordance with the conditions and types of raw materials, and efficient cooking process can produce a good taste of food.

Examples of weak relationships occur between the serving time and raw material storage. This relates to the condition of storage devices or storage methods that result in the rapidity or availability of raw materials available and serving time.

E. Improvement of Interrelationship Matrix between Technical Requirements (How)

Interrelationship matrix or correlation between technical requirements is a useful matrix to identify which requirements are mutually supportive and contrary with one another. Contrary technical requirement is very important to

know because it is a result of customer requirements and the consequence indicates the point where trade offs should be made.

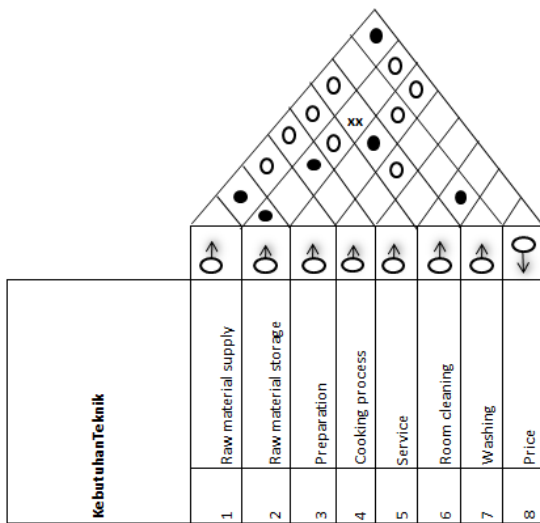


Fig 2:- Relationship between Technical Requirements

- = Strong positive relationship
- = Weak positive relationship
- xx = Weak negative relationship
- x = Strong negative relationship
- = No relationship

A strong positive relationship is a very strong one-way relationship. Examples of relationships between technical requirements that have a strong positive relationship are the storage of raw materials with the supply of raw materials. This is because an over-supply of raw materials will cause the raw material to last longer in storage, or in other words the supply of raw materials is also associated with space or storage capacity.

A weak positive relationship is also a one-way relationship. But the resulting impact is not too strong. An example of a relationship between technical requirements that has a weak positive relationship is the relationship between the supply of raw materials and services.

A negative relationship is a contrary relationship. If a characteristic has increased then other process characteristics will decrease. Examples of relationships between technical requirements that have a weak negative relationship are the storage of raw materials with service. This relates to and the state of the food served, if the storage capacity is too high it will cause the quality of the raw material which is served down, but it does not apply so on. Strong negative relationships do not occur between the requirements of Waroeng SS techniques.

In addition to having a positive and negative relationship, there is also no relationship between the technical requirements. Examples of technical requirements that have no relationship are the storage of raw materials by washing equipment.

F. Customer Competitive Assessment

Competitive assessment of each customer requirements is a method to determine whether customer requirements are met and also to identify which customer requirements need to get more attention in the next design. Customer competitive assessment also includes an assessment on organizational position compared to its nearest competitor within the limits of customer requirements. The customer competitive assessment occupies the right-hand column of the interrelationship matrix between customer requirements and technical requirements. In this study, customer competitive assessment used 5-point Likert scale.

Customer competitive assessment was done by giving questionnaires to some respondents who have ever eaten at food stall Cowok Ireng. The author chose Cowok Ireng as a competitor of Waroeng SS because Cowok Ireng respondents has similar characteristics to Waroeng SS. Questions on the questionnaires given to Cowok Ireng respondents were the same as the questionnaires on Waroeng SS respondents, thus it can be seen the comparison of customer requirements between the two food stalls’ s respondents. Competitive assessment for Waroeng SS customers can be seen in Table 4.

Customer Requirement	Satisfaction Level	
	Waroeng SS	Cowek Ireng
Taste	3.9	3.33
Menu variation	4.15	3.67
Creative food presentation	3.35	3.00
Expected portion	3.6	3.11
Price	3.85	3.22
Strategic and accessible places	3.95	3.67
Sufficient parking area	3.35	3.78
Toilet cleanliness	2.9	2.44
Friendly service	4.00	4.00
Serving time	2.95	3.33

Table 4. Competitive Matrix of Customer Requirements

Based on the Table 4, the comparison of position between Waroeng SS and Cowek Ireng in satisfying customer requirements can be categorized as follows:

- *Catch-up position*
Consumers assess that the service provided by Cowek Ireng was better than Waroeng SS. For this position, Waroeng SS must take action to catch up in achieving customer satisfaction. Attributes belonging to this position were the parking area and serving time.
- *Current strength position*
Current strength position is the opposite of the previous category in which the consumers assess the service provided Waroeng SS was better than Cowek Ireng. In this position, Cowek ireng must maintain its superiority by continuously monitoring the performance of competitors and developing concepts to improve customer satisfaction. Some of the attributes included in this position were Taste, menu variation, creative food presentation, expected portion, price,

strategic place and accessible places, toilet, cleanliness, and friendly service.

• *Opportunity position*

Opportunities emerge if the category is considered equally good by consumers. *Waroeng SS* will get added value in promotion (sales point) if *Cowek Ireng* can take advantage of opportunity to increase customer satisfaction. Attribute belonging to this position was the cleanliness.

G. *Priority Improvement of Customer Requirements*

Each customer requirement is ranked based on the levels of importance of the visitor. Level of importance is important for prioritizing business and trade-off decisions. The scale used in the level of importance is 5-point Likert scale. The level of importance of each customer requirement was known through a survey on *Waroeng SS* customers by giving questionnaires. Consumers are required to rank each customer requirements according to their levels of importance.

Customer Requirement	Average Level of Importance
Taste	4.67
Menu variation	4.22
Creative food presentation	3.89
Expected portion	3.67
Price	4.33
Strategic and accessible places	3.78
Sufficient parking area	3.89
Toilet	3.89
cleanliness	4.33
Friendly service	3.78
Serving time	3.67

Table 5. Average Levels of Importance of Each Customer Requirement in Waroeng SS

Based on the table above, it is seen that the most important customer requirement that should exist in a food stall are flavour, cleanliness, and price of food, followed by creative food presentation, parking area, mosque, and toilet, as well as the friendly service, strategic and accessible place, serving time and expected portion.

H. *Target Value of Costumers*

Target value was determined by evaluating the assessment of each customer requirement and creating new choices to keep the product from changing, improving the product or making the product to be better than its competitors. The target value in this study used the same scale as the customer competitive assessment namely 5-point likert scale.

Customer Requirement	Satisfaction Level		Target Value
	Waroeng SS	Cowek Ireng	
Taste	3.9	3.33	4
Menu variation	4.15	3.67	4
Creative food presentation	3.35	3.00	4
Expected portion	3.6	3.11	4
Price	3.85	3.22	4
Strategic and accessible places	3.95	3.67	4
Sufficient parking area	3.35	3.78	4
Toilet	2.9	2.44	4
cleanliness	4	4.00	4
Friendly service	4	3.56	4
Serving time	2.95	3.33	4

Table 6. Target Value of Customer Requirement Waroeng SS

I. *Vertical Scale Factor*

Vertical scale factor is the ratio between the target values implemented by the company’s management with the level of satisfaction assessed by the customer. Customer requirements that have a vertical scale factor value above 1 indicate the need for improvement. The greater the value of the vertical scale factor, the greater the improvement effort is needed.

Customer Requirement	Vertical Scale Factor
Taste	1.02
Menu variation	0.96
Creative food presentation	1.19
Expected portion	1.11
Price	1.03
Strategic and accessible places	1.01
Sufficient parking area	1.19
Toilet	1.37
cleanliness	1.00
Friendly service	1.00
Serving time	1.35

Table 7. Vertical Scale Factor on Each Customer Requirement

Based on Table 7, it is known that *Waroeng SS* needs to improve attributes of toilet, serving time, sufficient parking area, creative food presentation, price, strategic and accessible place, and Taste. While attributes that do not require improvements are menu variation, cleanliness and friendly service.

J. *Selling Point*

Selling point provides information about how well a customer requirement will help product sales. The purpose of selling point is to promote the best and most helpful customer requirements in product sales.

In the case of *Waroeng SS*, selling point indicates how influential the customer requirements in increasing the appeal and sales of food in *Waroeng SS*. In this study, the selling point is a predetermined value that is 1.0 if customer requirement does not help in the food sales, value of 1.2 if

customer requirement is quite helpful in food sales and value of 1.5 if customer requirement is helpful in the food sales.

Customer Requirement	Selling point
Taste	1.5
Menu variation	1.5
Creative food presentation	1.2
Expected portion	1.5
Price	1.5
Strategic and accessible places	1.5
Sufficient parking area	1.2
Toilet	1.2
cleanliness	1.2
Friendly service	1.2
Serving time	1.2

Table 8. Selling Point on Each Customer Requirement

Description:

1.0 = not helpful in product sales

1.2 = quite helpful in product sales

1.5 = helpful in product sales

K. Absolute Weight of Each Customer Requirements

The final stage in improving the planning matrix is the determination of absolute weight of customer requirements. Absolute weight of the customer requirements is obtained from the multiplication results between the level of importance and vertical scale factor. Furthermore, all the absolute weights are summed, and the percentage for each customer requirement is calculated, thus the priority that must exist as well as expected attributes can be determined. Determination of absolute weight of customer requirements is useful as a guide in the planning and development improvement stages of products and services.

Customer Requirement	Absolute Weight	Percentage	Priority
Taste	7.14	11.01	1
Menu variation	6.07	9.36	5
Creative food presentation	5.55	8.56	7
Expected portion	6.11	9.42	4
Price	6.68	10.29	2
Strategic and accessible places	5.72	8.81	6
Sufficient parking area	5.55	8.55	8
Toilet	6.39	9.85	3
cleanliness	5.19	7.99	9
Friendly service	4.53	6.98	10
Serving time	5.94	9.15	6
Total	64.89		

Table 9. Absolute Weight of Each Customers Requirement in Waroeng SS

Customer requirements are sorted from attributes that have the greatest absolute weights to the smallest. Based on Table 9, it can be seen that the priority order of customer requirements in Waroeng SS is as follows:

- *Taste*

This aspect was the first priority, thus Waroeng SS is suggested to prioritize this attribute in order to improve service quality. The Taste of food and drink is the level of delicacy of a cuisine. Taste is the attraction for consumers to buy food at a food stall. Waroeng SS should be able to improve the sense that customer satisfaction is maintained and become a distinct advantage. This can be done by maintaining the consistency of Tastes and maintaining the quality of the ingredients used.

- *Price*

Price is considered important by consumers, thus Waroeng SS should provide menus with affordable prices.

- *Toilet*

Toilets also play an important role in customer requirements, particularly in terms of cleanliness. Thus, Waroeng SS should provide adequate and clean toilets.

- *Expected Portion*

Food portion was also the reason why customers choose Waroeng SS as a preferred food stall. Waroeng SS should always improve their understanding on the appropriate proportions, especially eating habits of the people around Waroeng SS.

- *Menu Variation*

Waroeng SS should maintain customer favorite menus and reduce the menus that are less desirable by customers. Furthermore, Waroeng SS should be able to distinguish breakfast menu with lunch menu. In addition, the role of waitress can also be improved through giving briefings to waiters and other employees, especially regarding new menus.

- *Strategic and Accessible Places*

Location of the food stalls is very influential on the number of consumers because of the location of Waroeng SS is strategic and easy to reach by customers, particularly among UII students. This is one of the reasons why Waroeng SS is in great demand by consumers.

- *Serving Time*

Waroeng SS still could not meet this requirement. Therefore, Waroeng SS should improve this customer requirements. This can be done by increasing the number of employees, hiring new employees, and adding cooking utensils.

- *Creative Food Presentation*

Food presentation in Waroeng SS was quite creative so that it was able to attract consumers. Thus, Waroeng SS should continue to maintain it because the creative food presentation in Waroeng SS can be its own characteristics compared with other food stalls.

- *Parking Area*

Since parking area in Waroeng SS was still less, hence Waroeng SS should add more parking area, thus customers will be more comfortable eating in Waroeng SS.

- *cleanliness*

This aspect includes cleanliness, menu variation, employees and creative food presentation. Food cleanliness is considered important to attract consumers so that consumers will be more comfortable to eat in Waroeng SS.

- *Friendly Service*

Service affects the consumer impression. If the service is friendly and satisfactory, it will create an impression for consumers so that consumers will return to Waroeng SS. Thus, Waroeng SS should be more improved in order to attract buying interest of the consumers.

V. CONCLUSIONS

The result of analysis of quality improvement by using QFD method got some conclusion.

- There are 11 main customer requirements to ensure customers still choose waroeng SS as a place to eat, are Taste, variation menu, creative food presentation, strategic and accessible places, parking area sufficient, toilet, cleanliness, friendly service, and serving time.

- There are 8 technical requirements that will affect one or more customer requirements ie raw material supply, preparation, cooking process, service, room cleaning, washing, and price.

- Based on the analysis of QFD, Interrelationship Matrix between Customer Requirements (What) to Technical Requirements (How), and the Absolute Weight of Each Customer Requirements, The order of priority requirements of Waroeng SS customers are the taste, price, toilet, portion, menu variation, strategic place, presentation time, unique presentation, parking, cleanliness, and friendly service.

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