The use of importance-performance analysis for Indonesian smoked fish production strategy

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Abstract. Food and beverage industry is currently facing tight competition, especially due to ASEAN free market (MEA). Local products in Indonesia including smoked fish products must compete with imported products in ASEAN region. In order to be competitive in global market, Indonesian smoked fish industry must understand the current product quality position to formulate the right strategy. One of the best methods is the Importance Performance Analysis (IPA) that aims to measure the relationship between consumer perceptions and the priority of product quality improvement. This research result that the Indonesian smoked fish production strategy has to improve two variables which are hygiene and safety for consumption of the product. These two variables are categorized as action and located in concentrate quadrant. It means that these two variables have high priority of importance to the customer but less performance. In order to make Indonesian smoked fish competitive in ASEAN market competition, these two variables need to be improved.

1. Introduction
Indonesia is a maritime country where most of its territory is oceans. As a maritime country, Indonesia has a wealth of abundant seafood, as well as its processing product. One of the fish processing product that has a good prospect in the future is smoked fish [1].

Smoked fish is the result of fish processing product that combines salting and smoking process to reduce the water content in the fish meat that aims to prevent the bacteria live. It will make the rotting process become longer. The smoking process is easy, it does not require large power, and it is cheap so these industries significantly emerge.

The food and beverage industry is currently facing tight competition [2] especially due to ASEAN free market (MEA). Local products in Indonesia including smoked fish products must compete with imported products in ASEAN region. In order to be competitive in global market, Indonesian smoked fish industry must understand the current product quality position so that it can formulate the right production strategy. One of the best methods to do is the Importance Performance Analysis (IPA) that aims to measure the relationship between consumer perceptions and the priority of product quality improvement [3].

2. Smoked fish
Smoked fish is one of traditional fish processing product that using the smoke to preserve, colorize and add the distinctive flavor of the fish [4]. Principally, this fumigation process has several stages that are:
salting, drying, heating, and fumigation. But in general, the fumigation is carried out with the following steps:

2.1. Preliminary treatment
Preliminary treatment is the process of preparation for the next process. In this process the grouping is done based on the type, size and quality of freshness to be cleaned (removed the contents of the stomach and gills) before it can be processed further.

2.2. Salting
After the preliminary treatment, the next step is salting process. The salting process has a purpose to attract water and coagulate protein in fish meat so that the texture of the fish becomes denser. At a rather high concentration, salt can inhibit the growth of bacteria and discoloration and can give the typical flavor.

2.3. Drying
This process aims to remove the water content in the fish so the quality of the fish is stable. If the fish meat is smoked directly when it still has the water content high enough, the fish meat will be dark brown and ugly. Through proper drying, the fish surface on the inside will becomes drier. Many moisture contents evaporate from the intercellular portion of the fish and leave the gaps between the cells in the surface layer. This can cause the fish to absorb the color and good smell of smoke at the time of smoking.

2.4. Arrangement
The arrangement of the fish is arranged in the smoking chamber in such a way that aim to obtain a uniform flow of smoke and heat which greatly determines the quality of the final product. To get the flow of smoke and heat evenly, the distance between the fish on the smoker rack and the distance between each of the curing racks in the smoking chamber should not be too tight.

2.5. Smoking
The purpose of smoking in the preservation of fish is to preserve and give the color and flavor of a typical smoke in fish. In fact, the long-lasting power generated by smoke is very limited, so that the fish can preserve must be followed or preceded by other preservation methods. Smoking also aims to remove the vapors from phenol or aldehyde elements that contained in wood species and then attach it to the fish meat. Delicious flavors that characterize smoked fish products, especially from phenol and aldehyde element.

2.6. Cooling and packaging
The smoking process generally ends with a cooling and packaging stage. After completion of the smoking stage, the product is kept in a clean room and left so it can reach the room temperature, after that the packaging is carried out. Packaging can use the polyethylene plastic and if it wants to extend the storage life of the product, it can be done with vacuum packaging.

3. Importance performance analysis
Importance Performance Analysis (IPA) measure the satisfaction level of product or service into four quadrants in Importance-Performance matrix (figure 1). This method firstly introduced by [5]. The interpretation of the IPA is graphically presented on a grid divided into four quadrants [6]. It helps to analyze and compare the performance that perceived by the customers. The quadrants are:

a. Concentrate here quadrant
   In this quadrant, the variables have the good importance for the customers but less performance on the product. We have to concentrate to increase the performance of the variable to satisfy the customer.
b. Keep up the good work quadrant
   In this quadrant, the variables have the good importance for the customer and the product has a good performance. We have to keep the performance stable.

c. Low priority quadrant
   In this quadrant, the variables are less importance to the customer and less performance on the product. These variables that include in this quadrant have to studied further to attract the importance of customer.

d. Mostly overkill quadrant
   In this quadrant, the variables are less important to the customer but it has good performance on the product. We have not to do anything for these variables.

![Importance-Performance Matrix](image)

**Figure 1.** Importance-Performance Matrix [7].

4. Methodology
This research is divided in to three stages which will be explained in the following subsection.

4.1. Preparation stages
This stage aims to find out the needs and desires of smoke fish products by costumers. We interview some people who often consume it to get it done. The result of the interview is a variable that will be used to make the importance and performance questionnaire, that are:

1. Freshness
2. Color
3. Flavors
4. Typical smell
5. Can be stored in a long period of time
6. Cleanliness
7. Prices
8. Security for consumption
9. Undamaged fish meat
10. Fish dryness level
11. Organic processing (without chemicals)
12. Uniqueness shape

4.2. Data collection, testing and processing stages
After the questionnaire based on the variables for the importance and performance products was made, the questionnaire was distributed to respondents in Semarang. However, there was only 40% of 100 questionnaires could be used. The data from the questionnaire were then tested for validity and reliability analysis. The variables that not valid and reliable were eliminated and then the other was re-tested until all variables are valid and reliable. After that, the data was processed using IPA method.

4.3. Data analysis stages
The data analysis is performed based on IPA method, where the variables have been divided into four quadrants so it is known where the quality position and what strategy should be done for each variable.
5. Results and discussions
The discussion of the results is explained in the following subsection.

5.1. Validity and reliability test
The data from the data collection is tested using validity test and reliability test. The validity test result is shown in table 1.

Table 1. Validity test result

| Variables | Importance | Performance |   |   |
|-----------|------------|-------------|---|---|
|           | $r_{xy}$   | $r_{table}$ | Results | $r_{xy}$ | $r_{table}$ | Results |
| 1         | 0.754      | 0.320       | Valid   | 0.470     | 0.320       | Valid   |
| 2         | 0.755      | 0.320       | Valid   | 0.513     | 0.320       | Valid   |
| 3         | 0.717      | 0.320       | Valid   | 0.519     | 0.320       | Valid   |
| 4         | 0.455      | 0.320       | Valid   | 0.374     | 0.320       | Valid   |
| 5         | 0.756      | 0.320       | Valid   | 0.280     | 0.320       | Not Valid |
| 6         | 0.724      | 0.320       | Valid   | 0.456     | 0.320       | Valid   |
| 7         | 0.708      | 0.320       | Valid   | 0.505     | 0.320       | Valid   |
| 8         | 0.709      | 0.320       | Valid   | 0.335     | 0.320       | Valid   |
| 9         | 0.729      | 0.320       | Valid   | 0.580     | 0.320       | Valid   |
| 10        | 0.557      | 0.320       | Valid   | 0.246     | 0.320       | Not Valid |
| 11        | 0.625      | 0.320       | Valid   | 0.284     | 0.320       | Not Valid |
| 12        | -0.143     | 0.320       | Not Valid | 0.161     | 0.320       | Not Valid |

From table 1, we know that variables 5, 10, 11, and 12 are not valid for the performance data, and variable 12 is not valid for importance data. These variables are eliminated and the rest is re-tested again. The validity re-test result is shown in table 2.

Table 2. Validity re-test result

| Variables | Importance | Performance |   |   |
|-----------|------------|-------------|---|---|
|           | $r_{xy}$   | $r_{table}$ | Results | $r_{xy}$ | $r_{table}$ | Results |
| 1         | 0.782      | 0.320       | Valid   | 0.473     | 0.320       | Valid   |
| 2         | 0.729      | 0.320       | Valid   | 0.581     | 0.320       | Valid   |
| 3         | 0.712      | 0.320       | Valid   | 0.446     | 0.320       | Valid   |
| 4         | 0.420      | 0.320       | Valid   | 0.473     | 0.320       | Valid   |
| 5         | 0.759      | 0.320       | Valid   | -         | -           | -       |
| 6         | 0.746      | 0.320       | Valid   | 0.441     | 0.320       | Valid   |
| 7         | 0.713      | 0.320       | Valid   | 0.470     | 0.320       | Valid   |
| 8         | 0.752      | 0.320       | Valid   | 0.396     | 0.320       | Valid   |
| 9         | 0.739      | 0.320       | Valid   | 0.489     | 0.320       | Valid   |
| 10        | 0.586      | 0.320       | Valid   | -         | -           | -       |
| 11        | 0.624      | 0.320       | Valid   | -         | -           | -       |
| 12        | -         | -           | -         | -         | -           | -       |

From table 2, we have that all variables are valid so we can process to reliability test that can be seen in table 3. From table 3, we know that the results for importance and reliability test is reliable for both of them so we can use the data for the IPA process. For the next processing, we just use 8 variables that valid for both importance and performance.
Table 3. Reliability test results

| Importance | Performance |
|------------|-------------|
| Cronbach’s Alpha | N of Items | Cronbach’s Alpha | N of Items |
| 0.920 | 11 | 0.764 | 8 |

5.2. IPA process
The first step in IPA process is determine the Hold or action for each variables by comparing the suitability scores with decision scores that can be seen in table 4.

Table 4. IPA-Hold or Action

| No | Variables | Importance scores | Performance scores | Suitability scores | Decision scores | Hold or Action |
|----|-----------|-------------------|-------------------|-------------------|-----------------|----------------|
| 1  | Freshness | 125               | 109               | 87.20%           | 86.99%          | H              |
| 2  | Color     | 121               | 105               | 86.78%           | 86.99%          | A              |
| 3  | Flavors   | 127               | 116               | 91.34%           | 86.99%          | H              |
| 4  | Typical smell | 124             | 108               | 87.10%           | 86.99%          | H              |
| 5  | Hygiene   | 129               | 105               | 81.40%           | 86.99%          | A              |
| 6  | Price     | 120               | 112               | 93.33%           | 86.99%          | H              |
| 7  | Safety for consumption | 129 | 104 | 80.62% | 86.99% | A |
| 8  | Undamaged fish meat | 127 | 112 | 88.19% | 86.99% | H |
| Total | | 1002 | 871 | 86.99% | |

There are 3 variables that categorized as Action (see table 4) that are: Color, Hygiene, and Safety for consumption. These variables need to be improved to get the customer satisfaction. The rest can be Hold to keep the customer satisfaction. After IPA-Hold or Action table is made, the next step in IPA is to make the IPA matrix that devide the variables into 4 quadrants. That diagram is based on the importance and performance scores for each variables (figure 2).

Figure 2. IPA matrix
a. **Concentrate here quadrant**

The variables that conclude on this quadrant are Hygiene and Safety for Consumption. Both of them are listed in the action categorized that need to be repaired soon to increase the satisfaction of customer. Most of the Indonesian smoked fish is less hygiene because it processed traditionally with less hygiene tools and place (figure 3). The Indonesian traditional smoked fish industry is identical with low hygiene levels and poor sanitation aspects so that smoked fish products have a bad image as food for consumers. In addition, smoked fish products are also considered less qualified and nutritious, its functional properties are inconsistent and there is no guarantee of quality and safety [1].

![Figure 3. Indonesian traditional smoked fish production process](image)

The hygiene and the safety for consumption are two variables that strongly related. There is no guarantee for the product safety if the product is less hygiene. Not only the process, but the Indonesian smoked fish packaging is also less hygiene (figure 4).

![Figure 4. Indonesian smoked fish](image)

b. **Keep up the good work quadrant**

Undamaged fish meats and flavor is in the Keep Up the Good Work Quadrant. It means these variables has a good priority to the customers and the industry has the good performance on it. Although the production process is less hygiene, but the flavor is very delicious. Indonesian smoked fish has delicious
flavor due to its recipe and the smoking process. The fish meats that undamaged is thanks to the sticking process that carried out carefully. Although its process is very easy but the process is risky.

c. Low priority quadrant
In this quadrant, the variables have low priority for the consumer and it has low performance too. It can be something that customers want in the future so we have to pay attention to these variables too. The variables that conclude in this quadrant are freshness, typical smell, and color.

The typical smell is reached by using some Indonesian wood that has different aromas each other. It can be the attractiveness to the customer if it explores further. The color is something special. It has to be studied because the perception of one to another is different. There is someone think that the darker the color is better and the other think it is worse.

d. Possibly overkill quadrant
Price is the only variable that concludes in this quadrant. This variable is less important for the customer but the performance is too high or even exaggerate. It means that the price is too cheap so everyone can buy. There is no improvement for this variables and we can concentrate on the others.

6. Conclusion
The variables that have to be improved are hygiene and safety for consumption. These two variables are categorized as Action and located in Concentrate here quadrant. It means that these two variables have the high priority of importance to the customer but less performance. In order to make Indonesian smoked fish survive the competition in ASEAN market, these two variables need to be improved. The solution for this problem is to make the production center that has good hygiene production systems, modern facilities and tools, good sanitation, hygiene packaging and the quality assurance system that can keep the quality and safety of the products.

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