Customer satisfaction and proximity analysis of white bread product in Malang City - East Java Province, Indonesia

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Abstract. A considerable number of SMEs in Malang leads to high competition and allows producers to improve quality based on consumer needs. Therefore, bakery industries should know what consumers want and need to increase the sale of their products. This study aims to knowing and analysing consumer satisfaction rate and proximity of white bread products that are sold in Malang City based on consumer opinion, so the bakeries could increase the organoleptic quality of their products. Customer satisfaction was measured using the Importance Performance Analysis (IPA) method and Customer Satisfaction Index (CSI). The proximity of each product is measured by using Multidimensional Scaling (MDS). Customer satisfaction values based on IPA analysis are high in both consumer interest and consumer satisfaction. So it is concluded that consumers are satisfied with the product. Customer satisfaction value based on CSI (67%) also shows that consumers are satisfied with the product. MDS analysis shows that there is the proximity between four product groups namely group I (sample 864 and 126), group II (sample 911 and 714), group III (sample 949, 141, and 593), and group IV (sample 548, 209, and 739) on all observed attributes. Similarities of each sample also can be observed by measuring the distance between two samples nearby. The smaller distance meaning that the two samples are similar. The distance between sample 911 and 126 is the closest, so these samples are considered similar.

1. Introduction
Bread is one of the processed foods made from wheat flour which is consumed by many people because of its practicality. Furthermore, some people decide that bread is a staple food, especially in urban communities. One type of bread that quite popular is white bread. White bread is made from wheat flour by the fermentation process, using eggs and a little sugar to speed up the fermentation process or not at all [1]. Bread contains high carbohydrates and some nutrition that can complement the nutritional needs of the consumers [2]. Nowadays, people increasingly pay attention to the quality of the food products they consume. Consumer demand for food is not only about nutrition, but also includes food safety and quality [3]. With this perspective, food producers need to make quality improvements. Data mining from this study is consumer satisfaction and product proximity based on consumer perception. From consumer perceptions, we can obtain a description of consumer taste for white bread. The sampling method used is stratified random sampling. This study aims to knowing and analysing consumer
satisfaction rate and proximity of white bread products that are sold in Malang City based on consumer opinion, so the bakeries could increase the organoleptic quality of their products.

2. Materials and methods

2.1. Material and tools
The materials used in this study were white bread samples obtained from ten bakeries located in Malang City and were given sample codes namely 126, 141, 209, 548, 579, 714, 739, 864, 911, and 949. Another material is mineral water that was used as a palate cleanser. The tools used are test booth, sample cup, labels, questionnaire sheets, and pens.

2.2. Determination of samples and panellists
Based on preliminary research, we found 29 bakeries in Malang that sell bread products, they are located in 5 districts, namely Blimbing, Kedungkandang, Klojen, Lowokwaru, and Sukun. From 29 samples obtained, only 24 bread shops sell white bread products. The sampling was conducted according to stratified random sampling techniques to select samples in each district. The results are 10 shops that sell white bread in Malang, namely 126, 141, 209, 548, 579, 714, 739, 864, 911, and 949. Panelists were selected by an accidental sampling technique with a minimum of 100 people. The panelist criteria were to have consumed the bread at least once, lived in Malang, had no gluten allergy, and was 18-50 years old.

2.3. Data mining
The data in this study were taken based on the results of organoleptic tests on 10 brands of white bread products. In the organoleptic test, an assessment of expectations (importance) and product performance was carried out with parameters including the attributes of color, aroma, appearance, taste, and texture. Before giving questionnaires to panelists, questionnaires must be tested for validity and reliability.

2.4. Data analysis
Customer satisfaction is measured using the Customer Satisfaction Index (CSI) method and Importance Performance Analysis (IPA). CSI analysis begins by determining the level of suitability, Mean Importance Score (MIS), Mean Satisfaction Score (MSS), Weight Factors (WF), and Weight Score (WS) of each sample, then the results are compared with the CSI table [4]. IPA analysis is performed with SPSS 24 software by comparing importance and performance by panelists’ opinion through IPA matrix. This matrix is created by plotting individual attributes of important values and satisfaction values on a two-dimensional graph having four quadrants [5]. The proximity of the product is analyzed using the Multidimensional Scaling (MDS) method because this study will process respondents’ perceptions of the sample's attributes. The purpose of MDS is to overview objects in multidimensional space so the relative position illustrates closeness between objects [6]. Analysis of product position mapping using the SPSS 24 software.

3. Results and discussion

3.1. Suitability analysis
The suitability index is a comparison between performance and importance score. The higher value given, the more accurate suitability will be. The aim is to find out how much the customer is satisfied with the performance of a product and how much the producer understands what consumers want for the product offered. We can also determine the priority scale used in handling [7]. The suitability of all samples can be seen in Table 1. Table 1 shows the suitability index of 10 white bread samples in Malang city varies from 73-95% with an overall suitability index was 83%. Overall samples in Malang city belong to the high suitability index [8].
Table 1. Suitability index of all samples.

| Sample | Suitability Index (%) | Sample | Suitability Index (%) |
|--------|-----------------------|--------|-----------------------|
| 126    | 84                    | 714    | 80                    |
| 141    | 85                    | 739    | 83                    |
| 209    | 95                    | 864    | 86                    |
| 548    | 87                    | 911    | 73                    |
| 593    | 84                    | 949    | 73                    |

Overall Suitability Index: 83 %

3.2. Importance performance analysis (IPA)
IPA is a method that compares the level of importance and performance that is useful for the development of effective marketing programs [9]. The mean of performance is denoted by (X) and the mean of importance is denoted by (Y). IPA analysis result of all samples can be shown in Figure 1-10. Colour (1); Aroma (2); Appearance (3); Taste (4); and Texture (5).

Figure 1. Cartesian diagram of 126
Figure 2. Cartesian diagram of 141
Figure 3. Cartesian diagram of 209
Figure 4. Cartesian diagram of 548
Attributes in quadrant I are attributes that are considered important for consumers but satisfaction rates are still low, so producers need to improve the quality. Attributes in quadrant II are attributes that need to be maintained because the performance is high as consumers expect. Attributes in quadrant III have low priority because it contains attributes that considered not too important by consumers and the performance is not too excellent. In quadrant IV there are attributes, where have a low level of importance but have a high level of performance, so it is considered too excessive. Customer satisfaction based on IPA analysis, overall the level of performance is equal to importance (quadrant II) is texture.
and appearance parameters. Especially for sample 209, the parameters in quadrant II are appearance, taste, and texture.

From the IPA matrix, resources need to be focused and improved on elements in the "Concentrate here" quadrant (high importance and low satisfaction), or customers will be lost. Resources should continue to be focused and keep on track on the "Keep up the good work" (high importance and high satisfaction) quadrant to maintain customer satisfaction. Resources can be allocated away from the "Lower priority" (low importance and low satisfaction) and "Possible overkill" (low importance and high satisfaction) quadrants because consumers neglect these parameters on those quadrants [5].

3.3. Customer Satisfaction Index (CSI)

Customer Satisfaction Index (CSI) is a method to determine the level of customer satisfaction with an approach that considers the importance of the attributes measured. CSI is a quantitative analysis of the percentage of satisfied customers in a customer satisfaction survey, the aim is to determine the level of customer satisfaction concerning the level of importance of product/service attributes [10]. CSI calculation results from the whole sample can be seen in Table 2.

| Sample | CSI (%) | Sample | CSI (%) |
|--------|---------|--------|---------|
| 126    | 67      | 714    | 64      |
| 141    | 69      | 739    | 67      |
| 209    | 77      | 864    | 69      |
| 548    | 70      | 911    | 58      |
| 593    | 67      | 949    | 59      |

| Overall CSI: 67% |

CSI values obtained from the sample 209, 548, 141, 864, 126, 593, and sample 739 are in the range of 66-80.99%, which means that consumers are satisfied with the bread products. CSI values obtained from samples 714, 949, and 911 are in the range of 51-65.99%, which means that consumers are quite satisfied with the bread products. Overall CSI (67%) indicates that consumers are satisfied with the product provided. Referring to the CSI calculation, the attribute with the highest Weight Factor value is texture and taste, while the lowest is the aroma attribute. It can be concluded that the texture and taste attributes are needed to be maintained. To increase the level of customer satisfaction, producers need to improve the aroma attribute on white bread products whose performance is still quite low [11].

3.4. Multidimensional scaling analysis (MDS)

| Sample | Colour | Aroma | Appearance | Taste | Texture |
|--------|--------|-------|------------|-------|---------|
| 126    | 3,36   | 2,80  | 3,58       | 3,12  | 3,12    |
| 141    | 2,97   | 3,04  | 3,36       | 2,71  | 2,80    |
| 209    | 3,36   | 3,12  | 3,36       | 3,12  | 3,58    |
| 548    | 3,36   | 2,71  | 3,58       | 2,91  | 4,00    |
| 593    | 3,12   | 2,97  | 3,23       | 3,04  | 2,91    |
| 714    | 3,23   | 2,76  | 3,36       | 3,12  | 3,04    |
| 739    | 3,36   | 2,97  | 3,23       | 2,91  | 3,58    |
| 864    | 3,58   | 2,67  | 4,00       | 3,04  | 3,23    |
| 911    | 3,36   | 2,67  | 3,36       | 2,60  | 3,04    |
| 949    | 3,12   | 2,91  | 2,91       | 2,71  | 2,19    |
MDS analysis is a statistical technique used to measure the proximity between objects in a maps overview. MDS aims to map objects in multidimensional space so the relative position reflects the level of proximity between objects. Multidimensional Scaling (MDS) analysis begins with the calculation of the mean of the new scale (scaling). The results of these averages can be seen in Table 3.

From the results of the MDS analysis, STRESS value is 0.09003 (9%), according to [12], this value is included in the category of 'good enough' (10% - 20%), so this analysis has a low mismatch and the result of MDS model is good. The R-square value obtained is 0.96461. This value is included in the 'very strong' category [13]. The R-square value that approaches 1 means that the MDS model is like a reality. It can be inferred that the SPSS output model can be accepted to illustrate the mapping of 10 white bread samples based on five parameters assessed by panellists [14]. The scatterplot of linear fit graphs move linearly means that panellists are consistent in making the assessment. In optimally scaled data (disparities) for subject 1 is data that shows the distance between types of white bread. The farthest distance is sample 548 and 949, which means that according to consumers' opinion this product is different from other products. Data proceed with MDS analysis using SPSS 24 software. The results of MDS can be seen in Figure 11.

Figure 11. Multidimensional scaling (MDS) result.

Figure 11 shows the plot that there are four groups of white bread products that have similarities between their members. Those groups are Group I (864 and 126), Group II (911 and 714), Group III (949, 141, and 593), Group IV (548, 209, and 739). This grouping is based on product similarity according to the panelist’s opinion. Products in one quadrant are then considered too similar. Similarities between samples can also be seen from the distance between the two samples. The shorter distance the more similar those two samples. Sample 209 and 739 are located in one quadrant and have a small distance. Also, there are samples 911, 714, and 126 that adjacent but differ in quadrants. If we see closer, the distance between sample 911 and 126 is closest so they were considered similar. Based on the configuration map, sample 548 is in the far-right position. Referring back from average scaling, sample 548 has the highest scale (4.00) on the appearance and texture characteristics. So that dimension 1 can be renamed into appearance and texture. While dimension 2 renamed as attributes of aroma, color, and taste. Producers need to research and improve quality so that their products can surpass their competitors. Multidimensional Scaling analysis by measuring consumer’s perceptions can only describe the sample groups' similarity but have not answered which attributes that considered different. To find out, it is necessary to do a correspondence analysis method for knowing each product excellence [15].

4. Conclusions
The results showed that the level of satisfaction based on Importance Performance Analysis (IPA), the overall level of performance which is comparable to importance (quadrant II) is the texture and
appearance parameters. Specifically, for sample 209, the parameters in quadrant II are appearance, taste, and texture. The overall level of satisfaction based on the Customer Satisfaction Index (CSI) shows that consumers are satisfied with plain bread products. Based on the results of the overall Multidimensional Scaling (MDS) plot, there is the closeness between the four product groups, namely I (samples 864 and 126), II (samples 911 and 714), III (samples 949, 141, and 593), and IV (sample 548, 209, and 739) on all observed attributes. The similarity between samples can also be seen from the distance between two adjacent samples. The smaller the distance, the more similar the two samples are. The distance between sample 911 and sample 126 is the closest so that these two samples are considered similar. This result can be used as a reference for the company in order to increase their white bread product’s organoleptic quality so that it can meet consumer satisfaction.

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