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The Development of Design Dry Cake Packaging at the SME-Scale Industry Using Kansei Engineering

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Abstract— Packaging is an important factor for food products because of its function and usefulness in improving product quality and selling power of the product. The problem in this study is that there are consumer complaints about the packaging used is very simple which causes the texture of the product to change, the shelf life is short, the packaging is damaged and easily torn, less able to protect the product. The research objective is the development of cookie packaging design using the Kansei Engineering method combined with the Quality Function Deployment (QFD) method. The application of Kansei Engineering is by translating images or consumer feelings into real design components. The findings of this study are packaging design based on the attributes desired by consumers in the form of red, round, labeled packaging containing complete information, jar packaging made of safe materials to protect the product.

Keywords— Packaging, Kansei Engineering, QFD, Dry Cake

I. INTRODUCTION

The Small and Medium Enterprises (SME) business industry has a strategic role in the Indonesian economy because it plays an important role in local economic development and community empowerment and also acts as a provider of employment [1]. This has encouraged the growth of the SME industry in several regions, especially in areas such as Wajo Regency. The growth of Small and Medium Industries in Wajo Regency is currently experiencing very rapid development, giving rise to very tight competition for business actors. Every industry is competing in implementing strategies to increase sales. This is very important because an effective sales strategy can improve product sales performance or marketing performance in business activities [2,3,4]. One of the important strategies for the SME industry is the packaging. Packaging is an important factor for some food products because of its function and usefulness in improving safety, product quality, promotion, and product marketability [5,6,7]. Packaging and labels not only function as product safety but also serve as promotion and information about the product in question. Good and attractive product packaging will provide its own added value as a consumer attraction. Packaging also serves as a differentiator of a product in its marketing. By paying attention to the function of product packaging, is an important thing for the SME scale industry, because packaging is one of the factors that significantly influence the performance of the SME industry [8].

Small and Medium Enterprises "Fajar Utama" is a small industry engaged in the manufacture of snacks, namely pastries. The SME industry was founded in 2007 and currently has 7 employees. The production capacity produced per month is 2-3,000 boxes and is marketed in the Wajo Regency area. In the SME scale industry "Fajar Utama", there are three sections,

namely the production section, the administration section, and the marketing section, the marketing section is in charge of taking care of the packaging, and as for how to package the product, which is very simple and the packaging used is in the form of mica plastic which is then stamped without a pressing process so that it is easier for air to enter through the gap between the staples and will affect the texture of the product from being initially crunchy to becoming soft. The storage period for pastries is quite long because they contain a small amount of water, but because of the simple packaging, the shelf life of the product is short. In addition, there are complaints from consumers about products that are not fresh (product quality decreases) before the stipulated shelf life, packaging that is easily damaged and easily torn is not able to protect the product and will ultimately affect product sales.

Based on these problems, this study conducted a study of cake packaging design with the approach of Quality Function Deployment and Kansei Engineering. This approach was taken because it has been scientifically proven to be applied by previous researchers in compiling the basic concepts of packaging design [9,10]. By paying attention to the problems related to packaging and its relevance to the application of the method, this is what motivates the author to research on "Development of Pastry Product Packaging Designs Using the Kansei Engineering Method". Another consumer-based method is QFD (Quality Function Deployment). The difference is, Kansei Engineering (Kansei Engineering) focuses on the user's impression and feeling of the product, while QFD emphasizes the technical aspects of the product and the engineer's perception. However, Kansei Engineering has the advantage of being able to capture the emotional desires of consumers and translate them into a design.

II. RESEARCH METHOD

This research was conducted on the "Fajar Utama" Small and Medium Industry (IKM), which is located in Wage Village, Sombingene District, Wajo Regency, South Sulawesi. The stages of the research method:

2.1 Data Test

1) Determination of Research Sample

In this study, we will only use research samples, namely people who buy pastries in Wajo Regency. In this study, the authors determine the number of samples to be studied using the Y_{min} formula. To obtain the number of samples, the data used are data on the number of consumer data since 2008 (the beginning of the establishment of the Fajar Utama IKM) as many as 16,195 people.

From the total population above, the number of samples obtained is:

$$n = \frac{N}{1 + \sqrt{N \cdot e^2}} = \frac{16,195}{1 + \sqrt{16,195 \cdot (0.05)^2}} = 99,993$$

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Small and Medium Enterprises "Fajar Utama" is a small industry engaged in the manufacture of snacks, namely pastries. The SME industry was founded in 2007 and currently has 7 employees. The production capacity produced per month is $\pm$ 3,000 boxes and is marketed in the Wajo Regency area. In the SME scale industry "Fajar Utama", there are three sections,

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Rounded up to 100 samples

1) Data Sufficiency Test

In obtaining the attributes of cookie packaging

$$r = \left(\frac{K}{K-1} \right) \left(1 - \frac{\sum \sigma_i^2}{\sigma^2} \right)$$

desired by consumers, it is done by distributing 100 questionnaires, of which 82 questionnaires are returned. The calculation of the data adequacy test is carried out to find out how much the minimum amount of data (sample) is needed. The formula used is the Bernoulli equation as follows:

$$N \geq \frac{(Za/2)^2 pq}{e^2}$$

Description ;

N=Minimum Number of Samples

Z=Normal Distribution Value

a=Accuracy Rate 10%

e=Error Rate 10%

p=proportion of correct questionnaire

$$= \frac{\sum \text{Questionnaire Returned}}{\sum \text{Questionnaire Distributed}} = \frac{82}{100} = 0,82$$

q= the proportion of questionnaires that are considered wrong

$$= \frac{\sum \text{Non-Return Questionnaire}}{\sum \text{Distributed Questionnaire}} = \frac{18}{100} = 0,18$$

$$N \geq \frac{\left(\frac{0,1}{2} \right)^2 (0,82)(0,18)}{(0,1)^2}$$

$$N \geq \frac{(1,645)^2 (0,82)(0,18)}{0,01}$$

$$N \geq \frac{(2,706)(0,82)(0,18)}{0,01}$$

$$N \geq 39,94 \text{ Rounded up to } 40$$

$$N \geq 40$$

From the results of the data adequacy test above, it can be concluded that the data has met the number of drinking samples, namely 82 40

Validation Test

Validity shows the extent to which a measuring instrument measures what it wants to measure. A test can be said to have high validity if the test carries out its measuring function, or provides measurement results under the meaning and purpose of the test.

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}}$$

Reliability Test

The general method used to measure the reliability of the questionnaire with the internal consistency method is Cronbach's Alpha, which can be formulated as follows:

1) Stages of Quality Function Deployment

The phase of collecting consumer voices (voice of customers). The general procedure for collecting consumer votes is

1) Determine the attributes that are important to consumers (in the form of qualitative data) and this data is usually obtained from interviews and observations of consumers.

2) Develop a house of quality

The steps in making a quality house are:

a) Making a matrix of consumer needs

b) Making planning matrix

c) Making technical response

III. RESULT AND DISCUSSION

Analysis of the data used is descriptive qualitative analysis, namely how to describe the process of filling out questions about the assessment of Kansei aspects in each stage of processing with the assessment of the scope of Kansei aspects carried out by the scoring method. After the data has been collected, it is presented in tabular form with a description in narrative form. The results of the questions with the scoring method are used to determine the packaging that consumers want.

3.1 Quality Function Deployment

a. Importance To Customers

Importance value shows how big the level of importance for each Abon packaging attribute to consumers. This value is calculated based on the total score of interest divided by the number of respondents. The results of the attribute calculation are shown in Table 1.

The Importance to Customer (ITC) value is the comparison value between the Total Score Interest (TSI) and the Number of Respondents (NOR)

Table 1. Importance to Customer

No	Attribute	NOR	TST	ITC
1	The package contains complete information	82	314	3,829
2	Packaging made of plastic	82	311	3,793
3	Box-shaped packaging	82	268	3,268
4	Round packaging 8	82	304	3,707
5	Rectangular packaging	82	284	3,463
6	Recyclable packaging	82	301	3,671
7	Easy-to-hold packaging	82	305	3,721
8	Easy to open packaging	82	298	3,634
9	Red packaging color	82	316	3,853
10	Colors of brown packaging	82	252	3,073
11	Dark packaging color	82	268	3,268
12	Packs with displays	82	286	3,487
13	Packaging that protects the product	82	317	3,866
14	Packaging from safe materials	82	326	3,976

b. Customer Satisfaction, Expected Performance and GAP

Customer Satisfaction Performance is a consumer's assessment of the level of satisfaction. This value is calculated based on the total level of satisfaction divided by the number of respondents. The calculation results for all attributes can be seen in the table below:

Customers Satisfaction Performance (CSP) is obtained from the comparison value between the Total Satisfaction Score

(TSS) and the Number of Respondents (NOR) value. Calculation Example: Customers Satisfaction Performance = $320/82 = 3,902$ in the satisfied category. The results of the GAP, which is negative, show the problems faced by the manager so that corrective actions need to be taken to improve product quality to consumers. How to get this value by subtracting the value of the level of perceived satisfaction with the value of the expected level of satisfaction.
 $GAP = (\text{Value of Perceived Satisfaction Level}) - (\text{Expected Satisfaction Level})$. Calculation Example: $GAP = 3,902 - 3,732 = 0,17$. The results of the calculation of the value of Customer Satisfaction Performance (CSP), Customer Expected Performance (CEP) & GAP are as shown in Table 2.

Table 2. Value of Customer Satisfaction, Expected Performance and GAP

No	Attribute	CSP	CEP	GAP
1	The package contains complete information	3,902	3,732	0,17
2	Packaging made of plastic	3,732	3,707	0,025
3	Box-shaped packaging	3,085	2,930	0,155
4	Round packaging	3,780	3,707	0,073
5	Rectangular packaging	3,244	3,256	-0,012
6	Recyclable packaging	3,768	3,660	0,108
7	Easy-to-hold packaging	3,756	3,927	-0,171
8	Easy to open packaging	3,707	3,756	-0,049
9	Red packaging color	3,585	3,610	-0,025
10	Colors of brown packaging	2,841	2,878	-0,037
11	Dark packaging color	3,037	3,085	-0,048
12	Packs with displays	3,817	3,671	0,146
13	Packaging that protects the product	3,988	4,037	-0,049
14	Packaging from safe materials	4,244	4,122	0,122

3.2 Building Kansei Engineering

a. Collecting Kansei Words The word Kansei was obtained through survey activities, interviews, and distributing research questionnaires to respondents. The Kansei words that have been collected are related to packaging design as described in Table 3.

2. Eliminate Kansei words

After grouping Kansei words with the same meaning, then Kansei words are eliminated based on the assessment or selection of respondents. The Kansei word selected include 7 Kansei words which include rectangular packaging, easy-to-hold packaging, light packaging to open and close, red packaging, brown packaging, dark color packaging, packaging that protects the product. After determining the 7 Kansei Words, an analysis was carried out to determine the goal value. The goal here shows how much the level of satisfactory performance is expected to be achieved by the company to fulfill every consumer desire. In this packaging design analysis with the Kansei Word approach, the improvement ratio value, sales point value, raw weight value, and normalized value were

also determined. Sales points are values that reflect the ability to sell products.

Table 3. Kansei's words that have been collected

No	Attribute	Interpretation of Meaning	Makna Kansei
1	Complete information	Relevant matters all product information	Image
2	Made from mica jar	Type of packaging used	
3	Box-shaped	The form of packaging containing pastries with flavorsCoconut	
4	Round shape	Packaging containing cake dry round	
5	Rectangular	Cookies with peanut flavor	
6	Have a logo	A logo that becomes a memorable business icon	
7	Brown Colors	Pastries with sesame variety	
8	Color red	Cookies with brown sugar flavor	
9	Dark colors	Pastries with Original taste	
10	Recyclable	Environmentally friendly packaging raw materials	Impression
12	Safe materials (Protect the product)	Packaging for food products	
11	Easy to open and close	Pastries can last a long time	Emotion
13	Comfortable to hold	Easy to carry	

The raw weight value is the multiplication between importance to customer with improvement ratio and sales point. The normalized raw weight value is the comparison value between the raw weight of each attribute in Kansei Word and the total raw weight. The value of importance to customer, improvement ratio, sales point, raw weight which is the basis for determining the value of normalized raw weight can be seen in Table 4.

Table 4. Raw Weight Dan Normalize Raw Weight

Attribute	Raw Weight	Normalize Raw Weight
Colored packaging Red	8,062	0,168
Packaging round shape	7,351	0,153
Packaging contains information Complete	7,357	0,153

Packaging the one with the logo	4,111	0,086
Packaging made of Plastic	4,879	0,102
Kemasan Protective packaging Product	5,816	0,121
Packaging comfortable to hold	5,943	0,124
Total	43,519	0,907

Based on the consideration of normalized value, technical response, own performance value, the basic concept of cookie packaging design can be determined. The basic attributes based on Kansei Word and the technical responses that were determined to redesign the cookie packaging are as follows:

- Make packaging with red color
- Making packaging at an affordable price
- Make the Packaging have Logo
- Make a packaging label that includes the composition, expiration date, name, and address of the company.
- Make packaging that can be used repeatedly (Multi -Trip)
- Make packaging that protects the product from being contaminated by temperature, bacteria from the outside and is waterproof
- Make packaging with a shape that is not too big

Based on the consideration of the basic concepts of Kansei Word-based redesign and technical responses, a new packaging design was created as shown in Figure 1



Figure 1. Packaging Design based Kansei Engineering

The new packaging design is made with a red design. The packaging is also labeled, brand, product composition information, and expiration date. The packaging is made in a round shape with a plastic material that can protect the product. The aspect of color selection in the design of pastry packaging is important because the color of the packaging can be a factor for consumer considerations to make decisions in buying goods [11, 12]. Aspects of packaging labels are also important in packaging design because packaging labels can influence consumer buying behavior [13]. For packaging safety, it is necessary to consider the safety aspects of packaging materials and should follow the applicable laws and regulations regarding permitted packaging materials [14].

IV. CONCLUSION

Based on the results of data analysis using the Quality Function Deployment (QFD) and Kansei Engineering approaches, the basic concepts for designing pastry product packaging were found by combining aspects of technical

response and Kansei Word. Packaging design is made based on considerations of shape, color, safety aspects of packaging materials, label aspects, ease of use aspects of packaging, and aspects of complete information contained in the packaging. Aspects of the color specified are red, the packaging material is plastic, the shape of the packaging is round, the packaging is labeled. Determination of the basic aspects of packaging design based on the wishes, emotional support, and technical response from consumers supported by Kansei Word that has been determined. Based on this, it can be stated that in designing the packaging, the integration approach of QFD and Kansei Engineering can be used.

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