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Developing Innovative Packaging Designs Concept for Siomay Gondrong Msmes through Kansei Engineering

Novi Purnama Sari[1]*, Jauhariah Nursya'bani[2], Shafa Aisyah Pasha Sandjaja[3], Tegar Bayu Satriaji[4]

[1,2,3,4]*Packaging Printing Industry Technology Study Program, Department of Printing and Publishing Engineering, Jakarta State Polytechnic, 16424, Jl. Prof. Dr. G.A Siwabessy, Kampus Baru UI Depok, Indonesia*
*Corresponding author email: novi.purnamasari@grafika.pnj.ac.id

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ABSTRACT

Currently, Micro, Small and Medium Enterprises (MSMEs) players are competing to attract consumers to buy their products, one of which is by using attractive packaging. Siomay Gondrong is one of the MSMEs players whose packaging is not attractive, does not have a strong identity, and uses packaging that is less safe in terms of function. Based on these problems, it is necessary to develop the product packaging of Siomay Gondrong. This research aims to determine the concept and design in developing Siomay Gondrong packaging that is in accordance with consumer preferences. Kansei Engineering is used as a method to translate consumers' emotions, feelings, and desires into product design, and Principal Component Analysis (PCA) is also used as a supporting method. The total number of samples and kansei words selected as consumer references were 44 samples and 35 kansei words. After filtering with the PCA method, two packaging concept models for siomay gondrong products were identified. The two models were "Not Aesthetic - Aesthetic" and "Not Informative - Innovative". These two concepts are retained because the values obtained in the Kaiser, Standard Deviation, and Cumulative Proportion methods are more than one (>1) and have a proportion of more than 80%. Further research is needed to determine the design elements that match consumer needs using the QTT1 (quantification theory type-1) method.

Keywords: Development, Kansei Engineering, Packaging, PCA.

Introduction

Micro, Small and Medium Enterprises (MSMEs) are essential for economic growth and development [1]. In accordance with the criteria set by Law 20 of 2008, small and medium trade enterprises are defined as productive economic businesses managed by business entities or individuals. Siomay Gondrong is one of the MSMEs in the Depok area, the siomay business already has 20 branches spread across the Depok area, with a turnover of 8-10 million per day making this business a fairly rapid development. Based on field surveys, the packaging used by this gondrong siomay is transparent plastic which makes its attractiveness reduced.

In the current era of globalization, competition among MSMEs to attract consumers is very tight. As a result, many MSMEs have begun to think of strategies that can attract customers to buy their goods by using attractive packaging as one way for MSMEs to increase their

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customers [2]. Packaging is usually made or designed in such a way that it can display images and perspectives on the contents of the product so that users can understand the message conveyed properly. In addition, packaging has a function to display messages from the contents of the product both through the information listed on the packaging and the appearance of the packaging [3]. Packaging has a strategic role in influencing consumer purchasing decisions by helping them recognize and consider products. Therefore, packaging designed to create a positive initial impression will greatly influence consumer decisions, both to buy and ignore the products offered by the company [4].

Concept determination is very important during the packaging development process. The design concept created is used as a basis for assessing its relationship with the packaging components. It is very important to have the right design concept when creating a product display that is reflected in the packaging. This facilitates good communication between producers and consumers [5].

This study aims to determine the packaging design concept of Siomay Gondrong products that are in accordance with customer wants and needs. The Kansei Engineering method is used to determine customers' impressions and feelings towards Siomay Gondrong product packaging represented by Kansei Word [6]. The use of the Kansei Engineering method is one way to plan and develop packaging [7]. Kansei Engineering according to Nagamachi and Lokman [8], is an approach method that considers aspects of emotional psychology, feelings, and customer desires for products to design specifications for development or improvement [9]. Principal Component Analysis (PCA) is also used as a supporting method. The PCA method is used to process data generated from interviews and questionnaires. This method allows the processing of smaller data without losing much important information, and also allows the discovery of patterns in the data [10].

Many previous studies have used kansei engineering to determine packaging concepts such as the packaging of cut fruit salad which gets the sustainable-safety design concept [9]. Fried meatball packaging that gets a conventional-practical concept [11]. After conducting research through literature studies, there has been no development of siomay packaging for MSMEs so that the packaging becomes more attractive according to customer preferences.

This research is expected to be able to provide a better design concept to consumers, so as to increase the selling value and value of Siomay Gondrong products. The packaging is expected to give a better impression through an attractive design and make it easier to use for consumers as a product identity. This research aims to formulate the product packaging design concept.

Methods

This research applies the Kansei Engineering method supported by the Principal Component Analysis (PCA) method. The following of Figure 1 is a flowchart diagram that describes the research process from the beginning to get the results of the design concept.

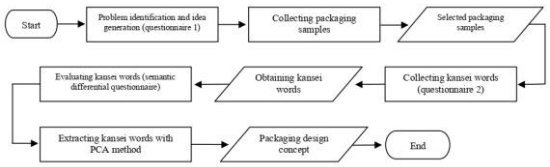

Figure 1. Flowchart of the research method

Identifying Problems and Determining Ideas

The research begins with a survey to consumers to identify problems and then become a reference for determining the idea of the Siomay Gondrong packaging design concept.

Collecting Packaging Samples

This research uses an online collection method to obtain a variety of packaging samples. Then evaluate the collected samples based on the criteria of shape, material, design, size, and features relevant to the object of research [11].

Collecting Kansei Words

According to Nagamachi & Lokman [8], the kansei words collected in research generally consist of 50 to 100 words. The kansei words are obtained through an identification process that involves distributing questionnaires online, either through self-completion or with the help of researchers. This process utilized a purposive sampling approach, where

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respondents were selected based on certain criteria to ensure the relevance of the data collected [12].

Evaluating Kansei Words and Packaging Samples

After collecting the kansei words, each packaging sample that had been collected previously was matched with the kansei word and evaluated using a Semantic Differential questionnaire. This questionnaire uses a 7-point scale, with a value range of -3, -2, -1, 0, 1, 2, 3, and involves 30 respondents selected by purposive sampling. According to Fahmi and Sumarni [13], a sufficient number of subjects for Kansei Engineering studies is between 20 to 30 people. Therefore, this study involved 30 respondents.

Extracting Kansei Word with Principal Component Analysis

Kansei word extraction is performed using the PCA method which aims to determine the packaging concept. According to Coghlan [14], the selection of principal components is done by maintaining a variation value greater than one (>1).

Results and Discussion

The design and development of packaging at Siomay Gondrong is used as a research object designed using the Kansei Engineering method. The steps in applying this method include; (1) Identifying problems and determining ideas, (2) Collecting packaging samples, (3) Collecting Kansei Word, (4) Evaluating Kansei Word and packaging samples, (5) Extracting Kansei Word with Principal Component Analysis.

Identifying Problems and Determining Ideas

In identifying problems and determining packaging development ideas, 3 packages have been selected to conduct a questionnaire survey via google form, the three packages include Ayam Gepuk Pak Gembus, Mie Jebew, and Siomay Gondrong. Of the total 33 respondents collected, 54.5% stated that they chose Siomay Gondrong packaging, 24.2% chose Jebew Noodle packaging, and 21.2% chose Ayam Gepuk Pak Gembus packaging. Survey results prove that the Siomay Gondrong packaging was chosen as the material in the study.

Collecting Packaging Samples

Collecting packaging samples with this online method is obtained through the pinterest website, then evaluating the samples that have been collected based on the criteria of shape, material, design, size, and features relevant to the object of research [11]. After that, a second questionnaire survey was conducted to obtain the results of the selected sample packaging. The previously collected packaging samples were coded and then selected by identifying from the packaging shape, material, packaging function to design elements. From a total of 66 packaging samples collected, 44 packaging samples were selected. Figure 2 shows the selected packaging samples.

Collecting Kansei Words

Kansei words are obtained through questionnaire surveys and interviews that have been conducted previously with a purposive sampling approach, which collects respondents according to specified criteria to ensure the relevance of the data collected [15]. This survey was assisted by the Siomay Gondrong stimulus video in the form of information from the product and problems that occur from the Siomay Gondrong packaging. After the kansei words are collected, the next step is to separate the kansei words or adjectives with design characteristics that include packaging shape, features, design and packaging material. After being separated, each selected kansei word is given a positive value (+) and given an antonym with a negative value (-). After the kansei words are collected, the next step is to separate the kansei words or adjectives with design characteristics that include packaging shape, features, design and packaging material. After being separated, each selected kansei word is given a positive value (+) and given an antonym with a negative value (-).

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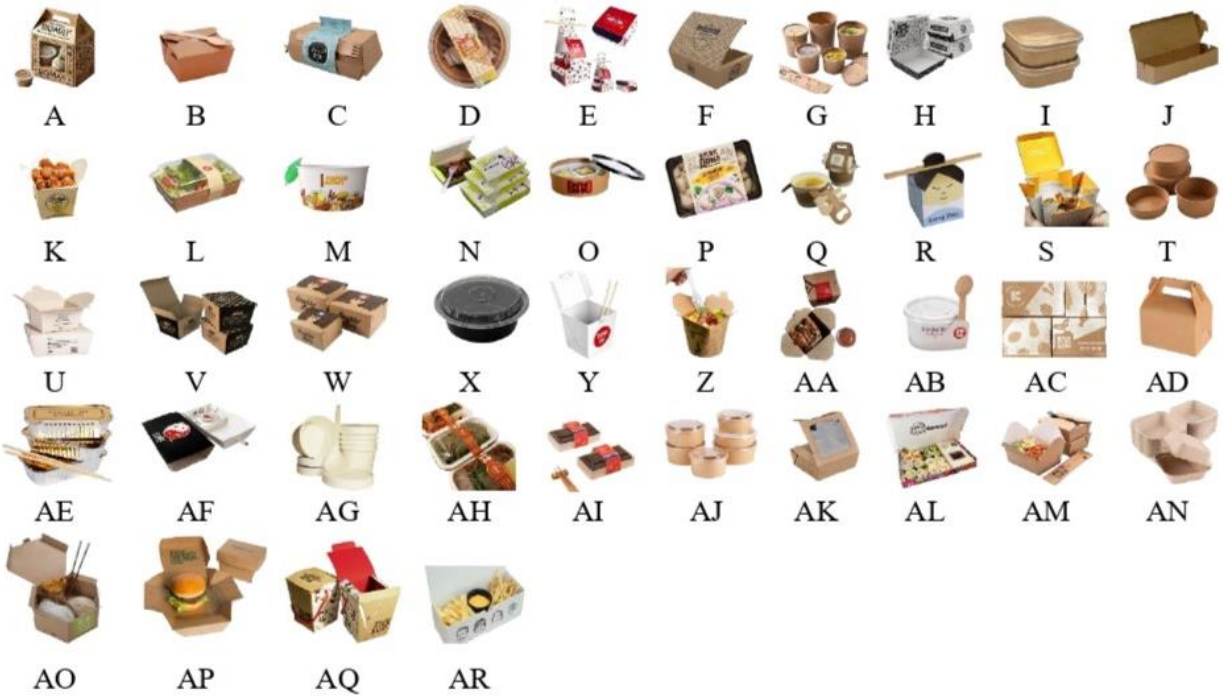

Figure 2. Selected samples

From the results obtained, the total number of kansei words before being grouped was 444 kansei words, after being separated from words that still have the same meaning or are related [16], 90 kansei words were selected and then separated again based on characteristic designs and emotional words or adjectives and the final result was 35 selected kansei words and their antonyms. The selected kansei words and their antonyms are shown in Table 1 and Table 2.

Table. 1 Kansei words and design characteristics

Kansei Words	Design Characteristics
Comfortable	Bowl/cup shaped packaging
Efficient	The packaging design has illustrations of textured dumplings
Leakproof	The packaging design describes an abstract shape
Easy to carry	The packaging design has a fish illustration
Sturdy	Packaging design has a simple style
Easy to hold	Packaging design is dominated by white color
Informative	The packaging design is dominated by gray color
Packaging design describes savory taste	Packaging design is dominated by beige color
Make it easy for consumers to consume	Packaging design has an appetizing illustration
Packaging design describes delicious taste	Packaging design has a halal label
Packaging design describes enjoyment	Packaging design illustrates product characteristics
Packaging design describes spicy flavor	Packaging design illustrates softness
Preserve the product	Packaging design has illustrations of spices
Affordable price	Packaging design describes the rough shape
Easy to use	Packaging design describes chewy dumplings
Safe	Packaging design has illustration
Easy to open	Packaging design is dominated by brown color
Easy to close	Box-shaped packaging

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Attractive	Packaging design describes salty flavor
Hygienic	Packaging design has visual appeal
Simple	Packaging design describes fresh aroma
Oil resistant	Packaging design describes sweet taste
Easy to store	Packaging using kraft material
Protects the product	Packaging using paper bowl material
Practical	Packaging using cardboard material
Innovative	Packaging using PP material
Good to look at	Packaging using ivory material
Minimalist	Food grade packaging material
Unique	Eye-catching packaging design
Recycled	Has a label
Modern	
Environmentally friendly	
Aesthetic	
Heat resistant	
Reusable	

Table. 2 Kansei words and antonyms

Kansei Words	**Antonyms**
Comfortable	Uncomfortable
Efficient	Non efficient
Leak proof	Not leak proof
Easy to carry	Not easy to carry
Sturdy	Unsturdy
Easy to hold	Not easy to hold
Informative	Not informative
Design describes savory taste	Design does not describe savory taste
Make it easier for consumers to consume	Not make it easier for consumers to consume
Design describes delicious flavors	Design does not describe delicious flavors
Design describes enjoyment	Design does not describe enjoyment
Design describes the spicy flavor	Design does not describe the spicy flavor
Maintain the product	Not maintaining the product
Affordable prices	Expensive
Easy to use	Not easy to use
Safe	Unsafe
Easy to open	Not easy to open
Easy to close	Not easy to close
Attractive	Not attractive
Hygienic	Not hygienic
Simple	Not simple
Oil resistant	Not oil resistant
Easy to store	Not easy to store
Protect the product	Not protect the product
Practical	Not practical
Innovative	Not innovative
Eye-catching	Not eye-catching
Minimalist	Not minimalist
Unique	Not unique
Recycle	Not recycle
Modern	Not modern

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Eco friendly	Not eco friendly
Aesthetics	Not aesthetic
Heat resistant	Not heat resistant
Can be reused	Unreused

Evaluating Kansei Words and Packaging Samples

After collecting the kansei words, each packaging sample that has been collected previously is matched with the kansei word and evaluated using a Semantic Differential questionnaire. This questionnaire uses a 7-point scale, with a value range of -3, -2, -1, 0, 1, 2, 3, and involves 30 respondents selected by purposive sampling. According to Nagamachi & Lokman [8], in research the number of subjects sufficient for Kansei Engineering studies is between 20 to 30 people. Therefore, this study involved 30 respondents. The Semantic Differential questionnaire was completed using the Questionpro application. Respondents answered the questionnaire by choosing a value from the 7 scales that have been given, for kansei words are words that have a positive value while for antonym words have a negative value. The following Figure 3 shows an example of filling out the Semantic Differential questionnaire on sample one.

Figure 3. Semantic differential questionnaire display

Extracting Kansei Word with Principal Component Analysis

The results of the Semantic Differential questionnaire were then processed using the PCA method. In processing the results of this questionnaire, it is processed with R software. The running results are in the form of standard deviation method, proportion of variance, cumulative proportion, scree plot graph, and distribution diagram. The successful running data processing process will produce a PC. According to Coghlan [14], PC is used to be a reference for packaging concepts, but the PC used is a PC that meets the standards, namely having a cumulative proportion value above 80%.

Standard Deviation

Based on the standard deviation method, the greater the standard deviation value, the better the variable value. In Figure 4, the PCA processing results with the largest standard deviation values are PC1 and PC2, namely 6.2036 and 1.32727.

```
                          PC1     PC2     PC3     PC4
Standard deviation     6.2036 1.32727 0.68993 0.57698
Proportion of Variance 0.9163 0.04194 0.01133 0.00793
Cumulative Proportion  0.9163 0.95823 0.96957 0.97749
                          PC8     PC9    PC10    PC11
Standard deviation     0.27299 0.24593 0.20964 0.18421
Proportion of Variance 0.00177 0.00144 0.00105 0.00081
Cumulative Proportion  0.99151 0.99295 0.99400 0.99480
                         PC15    PC16    PC17    PC18
Standard deviation     0.13624 0.12734 0.12060 0.11471
Proportion of Variance 0.00044 0.00039 0.00035 0.00031
Cumulative Proportion  0.99687 0.99725 0.99760 0.99791
```

Figure 4. Standard deviation results

Cumulative Proportion

Furthermore, the PCA results also show the cumulative proportion value, where this method requires a value requirement above 80% [14]. It can be seen on Figure 5 that the value on PC1 is 91.63% and on PC2 is 95.82%, meaning that the cumulative proportion value reaches the requirements and can be good main component.

```
                          PC1     PC2     PC3     PC4
Standard deviation     6.2036 1.32727 0.68993 0.57698
Proportion of Variance 0.9163 0.04194 0.01133 0.00793
Cumulative Proportion  0.9163 0.95823 0.96957 0.97749
                          PC8     PC9    PC10    PC11
Standard deviation     0.27299 0.24593 0.20964 0.18421
Proportion of Variance 0.00177 0.00144 0.00105 0.00081
Cumulative Proportion  0.99151 0.99295 0.99400 0.99480
                         PC15    PC16    PC17    PC18
Standard deviation     0.13624 0.12734 0.12060 0.11471
Proportion of Variance 0.00044 0.00039 0.00035 0.00031
Cumulative Proportion  0.99687 0.99725 0.99760 0.99791
```

Figure 5. Cumulative proportion result

Kaiser Method

The Kaiser method is used to determine the main component by selecting the value of data variation above 1 [14]. Figure 6 shows the results of the variation value above 1 are PC1

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and PC2 with values of 3.848419e+01 and 1.761634e+00.

```
> screeplot(datakanseipca.pca, type="lines")
> (datakanseipca.pca$sdev)^2
 [1] 3.848419e+01 1.761634e+00 4.760006e-01 3.329015e-01 2.035726e-01
 [6] 1.952327e-01 1.153007e-01 7.452598e-02 6.048308e-02 4.395056e-02
```

Figure 6. Result of variation value >1

Scree Plot Graphic

Scree plot is a plot between the eigenvalue and the number of main components formed. To find out the number of main components formed can be seen by paying attention to the slope of the scree plot [17]. Figure 7 shows that the slope or elbow fault is at the point of components 1 and 2, so it can be concluded that components 1 and 2 should be retained.

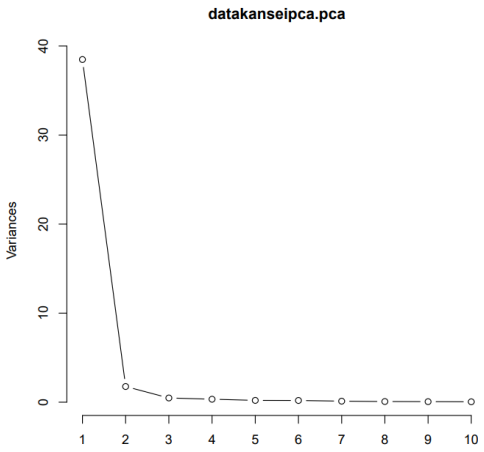

Figure 7. Scree plot graph result

Kansei Word Extraction

In the running results of PCA method processing using R software, the results of the distribution map will be obtained which will become a design concept based on the positive axis and negative axis. In determining the selected group of words, it can be found by drawing a diagonal line with a 180° angle slope and will form a paired PC [14]. Figure 8 explains the number of lines drawn is the interpretation of the number of PCs selected, namely with the result of 2 PCs. After getting the selected word, then conduct a discussion accompanied by expert panelists to get a conclusion from the selected kansei word. So in Figure 8 shows the results of the conclusion after conducting discussions with expert panelists.

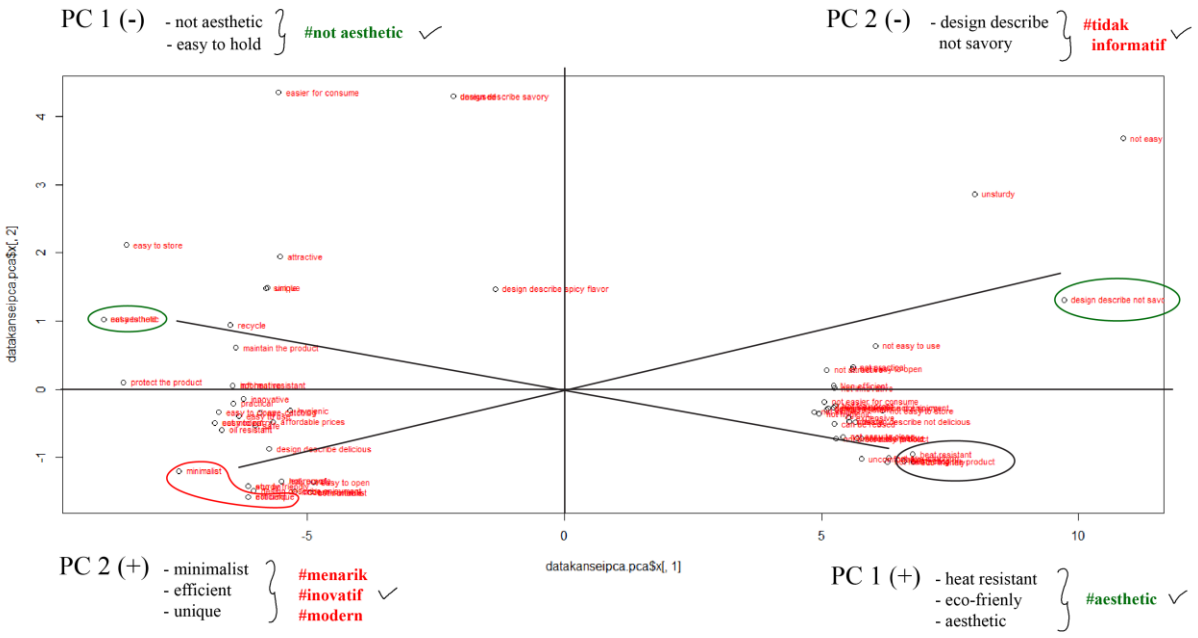

Figure 8. The results of the kansei word distribution map in R software

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In positive PC 1 there are kansei words, namely heat resistant, eco-friendly, and aesthetic, while negative PC 1 has kansei words, namely not aesthetic and easy to hold. So based on the data, the concept obtained for PC 1 is "Not Aesthetic - Aesthetic". In positive PC 2 there are kansei words namely minimalist, efficient, and unique, while negative PC 2 has kansei words namely design describe not savory. So the concept obtained on PC 2 is "Not Informative - Innovative".

Conclusion

Based on the results obtained from running PCA data using R software, two packaging concept models for Siomay Gondrong products were successfully identified. The next process is a discussion with expert panelists to extract which concept is selected. The two models are "Not Aesthetic - Aesthetic" and "Not Informative - Innovative". These two concepts were retained because the values obtained in the Kaiser, Standard Deviation, and Cumulative Proportion methods were more than one (>1) and had a proportion of more than 80%. Further research is needed to determine the design elements that match consumer needs using the QTT1 (quantification theory type-1) method.

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