Peppermint hard candy packaging design with Kansei engineering

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Abstract. Peppermint hard candy is increasing sold in the market. It causes a tight business competition and need some efforts for the product to survive and to win the competition. One effort that can be done is to design peppermint hard candy packaging. This paper describes the peppermint hard candy primary packaging design in accordance with the consumers’ needs. Kansei engineering (KE) was used in this study to translate consumer perceptions of the primary packaging design. Data is processed by using factor analysis and conjoint analysis. Based on the analysis, the design of peppermint hard candy packaging desired by the consumer was plastic, tubular, printed sticker label, flip-top accessory and transparent colors. The label design element has the highest importance value (30.524%) followed by material design elements (29.188%), shape (21.763%), accessories (11.300%) and color (7.226%).

1. Introduction

Indonesia is a country with a high population. In 2018, Indonesia had a population of around 265,015,313 people. The population of Indonesia in 2020 is estimated to be 271,066,400 people and in 2030 it will be 286,405,100 people [1]. The growth of Indonesian population causes an increase in food and beverage needs. Food, besides its function as an energy source, serves as a stress reliever. Examples of stress relieving foods are sweets [2].

Candies are generally divided into two classes, namely crystalline candy and non-crystalline candy. Examples of non-crystalline candy are soft candy [3] and hard candy [3, 4]. In Indonesia, hard candy has been widely produced by various companies. There are 28 hard candy brands that have been registered in Indonesia and all of them are dominated by peppermint flavor [5]. This condition creates intense business competition among candy business actors. One effort that can be taken to survive and win the competition is to develop a product development strategy by designing peppermint candy packaging that meets consumer needs. This is because packaging is the product's charm for eye-catching and usage attractiveness [6]. Peppermint hard candy packaging is now commonly found with various types and models. By looking at the diversity of peppermint candy packaging at this time, it is necessary to make an effort to find out what kind of peppermint candy packaging design that consumers want. The method used for packaging design in this study is the Kansei engineering (KE) method. KE is a method that uses the psychological image or feeling of the user towards a product to be used in designing a product [7, 8]. The KE method has the advantage of being able to translate the emotional needs of consumers into concrete design parameters [6, 8]. Several studies on the design of non-food products such as disposable razors and recliner products using the KE method have been conducted [9, 10].
Research on food product design using the KE method has also been conducted [6, 7, 11]. This study discusses the design of food products with a focus on the design of candy packaging. This study aimed to determine the design of peppermint hard candy primary packaging following consumers' wants using the KE method.

2. Materials and Method
The study was conducted in Malang City in 2018. Determination of respondents using incidental techniques by looking for respondents who were like or consuming or currently buying peppermint hard candy with an age range between 17-56 years. A total of 40 respondents were involved in this study.

2.1. Kansei engineering research stages
The stages of this research are as follows:
1. Identification of packaging elements
Packaging elements in this study are materials, shapes, colors, labels, and accessories. According to Pamanggiasih et al. [7], the five elements can clearly identify differences in various samples. These packaging elements are also elements of the visual appeal of packaging designs that can be found easily in each product sample. The packaging elements are important because they are used as a reference in the design of peppermint hard candy packaging.

2. Kansei words collection
The Kansei words collected are Kansei words related to hard candy packaging. Kansei word collection was carried out to capture the feeling or Kansei (impression) felt by consumers of peppermint hard candy packaging. The Kansei words used were obtained from journals, the internet and research reports, and obtained 21 Kansei words. Kansei words have represented the packaging design attributes in the form of the five packaging elements. The Kansei words used along with its classification of 5 design elements can be seen in Table 1.

| Kansei words                                      | Design elements |
|--------------------------------------------------|-----------------|
| Environmentally Friendly – Not Environmentally Friendly |                 |
| Safe – Not Safe                                   | Material        |
| Cheap – expensive                                |                 |
| Clean – dirty                                    |                 |
| Durable – Easily Damaged                         |                 |
| Luxury - Not Luxury                               |                 |
| Ergonomic - Not Ergonomic                         | Shape           |
| Modern - Ancient                                 |                 |
| Unique - Not Unique                               |                 |
| Simple - Complex                                 |                 |
| Easy to store - Hard to store                    |                 |
| Neat - Careless                                   |                 |
| Compound Content - Single Content                 |                 |
| Patterned - Not Patterned                        |                 |
| Unique - Not Unique                               |                 |
| Patterned - Not Patterned                        | Label           |
| Informative - Lack of Information                 |                 |
| Light Color - Dark Color                          |                 |
| Elegant - Not Elegant                             |                 |
| Interesting - Boring                             |                 |
| Flashy - Not Flashy                               |                 |
| Easy to Open/Closed - Difficult to Open/Closed   |                 |
| Innovative - Not Innovative                      |                 |
|                                                                                          |
3. Collection of product samples
Product sample collection aims as stimuli to capture the Kansei/respondents’ feelings towards the sample product design that has been collected. Product sample collection is done through direct observation of the shopping center in Malang and 16 samples are obtained. Samples used as stimuli are samples that have different design elements (materials, shapes, labels, colors, accessories). Several samples with the same sub-element are selected as samples that can represent similar product samples.

2.2. Data analysis
Various stages were performed in data analysis as follows:
1. Questionnaire testing
   Questionnaire testing is done by using validity and reliability testing. In the validity test, if r count > r table, then the variable is said to be valid, and vice versa. For reliability testing, if the Cronbach's Alpha coefficient > 0.6, the instrument is said to be reliable.
2. Factor analysis
   Factor analysis in this study is used to find out how many factors are formed from proper Kansei word variables and to find out the grouping of Kansei words in the factors that have been formed. The stages of factor analysis carried out in this research are determining the analyzed variables, testing the variables, the factoring process and the rotation process.
3. Conjoint analysis
   Conjoint analysis is used to determine the relationship between design elements (materials, shapes, colors, labels and accessories) with the Kansei word. Based on this, the combination of attributes of peppermint hard candy products preferred by consumers are obtained. Conjoint analysis is done by compiling plan cards, data processing then results interpretation. At the stage of preparing plan cards, items and categories are first determined to be used as a reference for the packaging design combination. The elements and categories used can be seen in Table 2. Once the elements and categories are known, plan cards are formed.

| Table 2. Elements and categories |
|----------------------------------|
| **Element** | No. | Category | **Element** | No. | Category |
| Material    | 1.  | Plastic  | 1.  | Printing |
|             | 2.  | Aluminum Foil | 2.  | Sticker |
|             | 3.  | Metal    | 3.  | Printing and Stickers |
|             | 4.  | Paper    | 4.  | Paper |
| Shape       | 1.  | Pillow   | 1.  | Full Color |
|             | 2.  | Tube     | 2.  | Plain |
|             | 3.  | Beam     | 1.  | Hanging |
|             | 4.  | Roll     | 2.  | Zipperlock |
|             |     | Accessories | 3.  | Flip top |
|             |     |           | 4.  | NA |

4. Design packaging design
   The basic concept of peppermint hard candy packaging design was made refer to the result of the overall utility value in conjoint analysis. The packaging design was done using the graphics processing software.

3. Results and Discussion
3.1. Overview of respondents
   General description of respondents presents the profile of respondents consisting of gender, age and occupation. The most dominant sex is female (60%). The most dominant age is 17-25 years (50%). The most dominant occupations are private employees (40%).
3.2. Questionnaire testing
The results of testing the questionnaire obtained only 19 valid Kansei words. The Kansei words are attractive, modern, elegant, unique, informative, innovative, easy to store, easy to open/close, clean, safe, flashy, ergonomic, luxurious, bright colors, neat, durable, simple, and multiple contents. The 19 Kansei words are also reliable.

3.3. Factor analysis
In this study, 19 Kansei words were processed and analyzed again. Factor analysis is used to determine the interrelationships between the word Kansei variables and simplify them into newly formed factors that are fewer in number compared to the previous number, without eliminating meaningful information [7]. In the process of variable testing, 18 Kansei words that are feasible for factor analysis were found. The Kansei words are attractive, modern, elegant, unique, informative, innovative, easy to store, easy to open/close, clean, safe, flashy, ergonomic, luxurious, bright colors, neat, durable and simple. The factoring process is then carried out to find out how many factors/components are formed from the variables that have been tested. The results obtained there are 4 factors formed. The rotation process is carried out and the results of grouping the 18 Kansei word variables into the factors / components are formed, namely:

1. Component 1 consists of 7 Kansei words, which are easy to store, easy to open / close, clean, safe, neat, durable and simple. Factor 1 is named as the packaging resistance factor.
2. Component 2 consists of 6 Kansei words, which are attractive, modern, elegant, unique, innovative and luxurious. Factor 2 is called the beauty factor of the packaging.
3. Component 3 consists of 2 Kansei words, namely striking and ergonomic. Factor 3 is called the convenience factor of packaging.
4. Component 4 consists of 3 Kansei words, namely informative, bright colors, patterned. Factor 4 is named as the completeness factor of the packaging.

3.4. Conjoint analysis
Conjoint analysis links the packaging design elements (materials, shapes, labels, colors and accessories) with the 18 Kansei words. The results obtained from the conjoint analysis are as follows:

1. Utility value
   Utility is a value that shows usability value for each level. If there is a value that has a positive sign, it indicates that the level is the level preferred by the respondent. Conversely, if you have a negative sign, then the level shows not liked by respondents [6]. The results of summarizing the utility value of each positive word Kansei can be seen in Table 3. An example of the interpretation of the results of the conjoint analysis based on Table 3, on the utility value for Kansei attracts consumers to prefer packaging designs made of paper, plastic or metal; tube, pillow or block shape, paper labels, plain colors, and flip-top accessories. However, based on the category level ranking of each design element, the word Kansei attracts more favored consumers with packaging materials made from paper, tubular, labeled paper, plain color and has a flip-top accessory.

2. Importance value
   Importance values indicate the relative importance (in percentage terms) of design elements according to respondents' perceptions. Based on the overall importance value, the design elements considered by the respondents to design peppermint hard candy packaging products consecutively are label (30.524%), material (29.188%), shape (21.763%), accessories (11.300%) and color (7.226%).

3. Value of Pearson’s R and Kendall’s Tau
   Pearson's R and Kendall's Tau values are used to determine the relationship or correlation between design elements and the word Kansei. If the value of Pearson's R and Kendall's Tau > 0.5 and the significance value <0.05 then it is concluded that between the design elements with the word Kansei has a strong relationship or correlation. The result of the conjoint analysis shows that Pearson's overall value is 0.967, with a significance of 0.000, and Kendall's Tau value as a whole is 0.812, with
a significance of 0.000. It can be concluded that each word Kansei has a strong correlation or relationship with design elements, so that the results of conjoint analysis can be relied upon in its use to meet the desires of consumers in the design of peppermint hard candy packaging.

### Table 3. Importance value and factor

| No | Kansei Words                  | Material | Form | Label | Color | Accessories |
|----|-------------------------------|----------|------|-------|-------|-------------|
| 1  | Interesting – boring          | 23.793   | 26.375 | 31.313 | 6.734 | 11.785      |
| 2  | Modern – obsolete             | 24.731   | 26.882 | 31.317 | 5.914 | 11.156      |
| 3  | Elegant – not elegant         | 29.101   | 23.810 | 31.746 | 9.524 | 5.820       |
| 4  | Unique – usual                | 27.611   | 26.695 | 27.673 | 8.064 | 9.957       |
| 5  | Informative – uninformative   | 23.306   | 24.119 | 32.249 | 8.672 | 11.653      |
| 6  | Innovative – unoriginal       | 25.455   | 27.879 | 28.485 | 9.091 | 9.091       |
| 7  | Easy to store – hard to store | 19.883   | 30.117 | 40.936 | 3.509 | 5.556       |
| 8  | Easy to open/closed – hard to open/closed | 27.103 | 23.364 | 23.131 | 4.673 | 21.729 |
| 9  | Clean – dirty                 | 58.571   | 7.143 | 15.714 | 17.143 | 1.429   |
| 10 | Safe – unsafe                 | 32.709   | 25.894 | 29.131 | 4.770 | 7.486       |
| 11 | Striking – unobtrusive        | 21.898   | 26.095 | 34.854 | 7.299 | 9.854       |
| 12 | Ergonomic – unergonomic       | 30.476   | 17.143 | 26.667 | 1.905 | 23.810      |
| 13 | Luxurious – frugality         | 29.605   | 17.928 | 34.375 | 8.553 | 9.539       |
| 14 | Bright color - unbright color | 29.032   | 11.290 | 46.237 | 0.538 | 12.903      |
| 15 | Neat - untidy                 | 35.165   | 17.216 | 25.031 | 14.164 | 8.425   |
| 16 | Durable – perishable          | 35.866   | 21.581 | 20.973 | 7.295 | 14.286      |
| 17 | Simple – complex              | 25.743   | 14.851 | 35.644 | 3.960 | 19.802      |
| 18 | Patterned – unpatterned       | 25.338   | 23.345 | 33.950 | 8.256 | 9.110       |
|    | Overall Statistics (%)        | 29.188   | 21.763 | 30.524 | 7.226 | 11.300      |

3.5. Packaging design

This stage provides an illustrative example of a peppermint hard candy packaging design that is following the wishes of the consumer. The basic concept of package design made in package design refers to the results of the overall conjoint analysis utility [12, 13], which can be seen in Table 4. The concept of combination that is used as the basis for designing hard candy packaging is the combination of plastic, tube, plain, and flip-top. By using a graphic editor software, the design is as shown in Figure 1.
### Table 4. Overall utility value

| Design Element | Category | Utility | Design Element | Category | Utility |
|----------------|----------|---------|----------------|----------|---------|
| Material       | Plastic  | 0.314   | Color          | Full Color | -0.125 |
|                | Alumunium foil | -0.459  |                | Plain     | 0.125  |
|                | Metal    | 0.009   |                |           |         |
|                | Paper    | 0.137   |                |           |         |
| Shape          | Pillow   | 0.031   | Accessories    | Hanging   | 0.036  |
|                | Tube     | 0.221   |                | Zipperlock| -0.006 |
|                | Bar      | 0.172   |                | Flip top  | 0.103  |
|                | Roll     | -0.424  |                | No accessory | -0.134 |
| Label          | Printing | -0.101  |                |           |         |
|                | Sticker  | -0.392  |                |           |         |
|                | Printed sticker | 0.020  |                |           |         |
|                | Paper    | 0.473   |                |           |         |

### Figure 1. Front view packaging design

#### 4. Conclusions

Based on the analysis, the design of peppermint hard candy packaging desired by the consumer was plastic, tubular, printed sticker label, flip-top accessory, and transparent colors. The label element has the highest importance value (30.524%) followed by material (29.188%), shape (21.763%), accessories (11.300%), and color (7.226%).

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