Redesign packaging on Aloe Vera bottle product based on Kansei Engineering

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Abstract. Packaged designers must be able to select packaging elements that characterize products, communicate brand products, and create packaging into attractive media to attract consumers to purchase products among the various available products. The aim of this study is to understand visual design concepts and structural design concepts in the design of aloe vera bottled bottles. The method used for the development of a design product that focuses on consumer perceptions and links it with the attributes of the product is Kansei engineering. Kansei engineering is a technology capable of translating consumer feelings into design concepts. Research came up with a visual design concept of the chosen Kansei word, which is elegant, commercial, fresh, modern, varnish, aesthetic, interesting, simple, subjective, summarized. The visual design concept is barcode, nutrition fact-general, logo-word mark, brand top sign, product name-top sign, produce-bearing name, product present composition, family-size approach, back ground cool colors, font color-white, font type-san serif, Figure-original, material label-film plastic, and position label-wrap around label positions. The structural design concept is tropical as the top structure of the bottle, jugo as the center structure of the bottle, plastic colored as bottled material, and the size of the bottle 500 ml.

1. Introduction
Public awareness to consume herbs is getting higher along with public awareness for "back to nature". Based on the World Health Organization (WHO) the use of herbal ingredients in various countries around the world began to improve, until now 80 percent of people use it herbal products. Herbal products from agricultural processing are starting to be used by people in the Asian Pacific region has generally been processed into beverages such as sugar cane, coffee, coconut, tea, cocoa, and aloe vera [1]. Processing of agricultural products in Indonesia is currently being developed is the aloe vera commodity processing industry. Aloe vera contains anti-inflammatory and anti-inflammatory properties bacteria contained in aloe vera gel which can be used as industrial raw materials pharmaceuticals and cosmetics, and are widely consumed as packaged drinks [2].

The problem that often occurs is designers still optimal develop design innovations that take into account the emotional aspects of the product and design elements. Hence, packaging designers must be able to select packaging elements that characterize products, communicating the product brand, and making the packaging an attractive medium to attract consumer attention to buy products among the various product choices available. Designer in developing packaging design must be able to model business processes in design packaging design, produce design concepts, and produce output in the form of graphic visualization packaging design.

The method used for the development of emotion-oriented design products consumer perception and relating it to product attributes is Kansei Engineering (KE), because it has the ability to translate...
consumer needs and perceptions into design parameters through special engineering techniques [3]. Based on the background above, this study aims to determine the concept of visual design and structural design concepts in designing aloe vera bottle packaging designs.

2. Methodology
This study uses the Kansei engineering method with the object of research, namely packaging aloe vera bottled drink. The respondents have been with technique purposive sampling with the criteria they have known are bottled aloe vera beverage products, they have seen packaging, and they always observe the packaging before they buy the product. Product samples used were seven aloe vera bottled beverage products [4]. The following is data collection of this research.

a. Questionnaire
The questionnaire was used to obtain data directly from the respondents who filled in questionnaire [5]. An open questionnaire filled out by 80 respondents and semantic differential closed questionnaire that was filled out by 40 respondents. To produce a structural design concept using a closed questionnaire filled out by 100 respondents.

b. Observation
Observations were used to obtain sample data for vera bottled beverage products. Data required is obtained from primary data and secondary data [6]:
1) Primary data is obtained through a questionnaire to obtain data said Kansei, evaluation Kansei word data, and visual design elements data.
2) Secondary data obtained through internet searches to obtain product sample data.

The research stage consists of 2 parts, namely:
1) Visual Design Concept
2) Structural Design Concept

3. Discussion
3.1. Visual Design Concepts
The visual design concept is obtained by several stages of data processing, namely:

3.1.1. Kansei Word Data Filtering
Kansei word data filtering aims to get rid of words that have no meaning like conjunctions, not adjectives and others. The result of this filtering process is a list of words Kansei which is an adjective that reflects aloe vera bottled beverage products.

3.1.2. Weighting of Kansei Word Data Filtering Results
Weighting Kansei word data aims to reduce Kansei word filtering results, in order obtained 15 high-weight Kansei words for the next process. This weighting uses Term Frequency-Inverse Document Frequency (TF-IDF) algorithm. The following is Table 1 Weighting Kansei Word Data.
Table 1. Weighting of Kansei Word Data

| No | Kansei Word  | Weight | No | Kansei Word  | Weight | No | Kansei Word  | Weight |
|----|--------------|--------|----|--------------|--------|----|--------------|--------|
| 1. | Simple       | 75     | 16.| Striking     | 3      | 31.| Interesting | 43     |
| 2. | Practical    | 60     | 17.| Colored      | 44     | 32.| Cheers       | 3      |
| 3. | Light        | 11     | 18.| Gorgeous     | 9      | 33.| Original     | 3      |
| 4. | Fresh        | 59     | 19.| Minimalist   | 3      | 34.| Monotone     | 18     |
| 5. | Elegant      | 40     | 20.| Healthy      | 7      | 35.| Natural      | 43     |
| 6. | Strong       | 9      | 21.| Informative  | 14     | 36.| Economical   | 11     |
| 7. | Beautiful    | 5      | 22.| Cool         | 11     | 37.| Safe         | 3      |
| 8. | Unique       | 48     | 23.| Innovative   | 5      | 38.| Ergonomic    | 26     |
| 9. | Delicious    | 9      | 24.| Modern       | 11     | 39.| Efficient    | 3      |
| 10.| Eye Catching | 7      | 25.| Recycle      | 3      | 40.| Plastic      | 9      |
| 11.| Good         | 7      | 26.| Commercial   | 42     | 41.| Aesthetics   | 18     |
| 12.| Concise      | 3      | 27.| Tantalizing  | 3      | 42.| Funny        | 7      |
| 13.| Comfortable  | 3      | 28.| Big          | 3      | 43.| Present      | 5      |
| 14.| Good looking | 3      | 29.| Patent       | 3      | 44.| Futuristic   | 3      |
| 15.| Cool         | 5      | 30.| Transparent | 3      | 45.| Trendy       | 3      |

3.1.3. Testing Data
The validity test was carried out seven times according to the number of samples. Total conclusion the validity test output is valid because the Pearson correlation value is greater than the r table value namely 0.312 [7]. Furthermore, reliability testing, the questionnaire statement is reliable if the Cronbach's Alpha value is greater than 0.6 [8]. The following is table results of the validity test and reliability test.

Table 2. Conclusion of the validity and reliability test of jugo aloe vera

| No | Kansei Word | Pearson Correlation |
|----|--------------|---------------------|
| 1. | Simple       | 0.621               |
| 2. | Practical    | 0.525               |
| 3. | Fresh        | 0.763               |
| 4. | Unique       | 0.695               |
| 5. | Coloured     | 0.784               |
| 6. | Attractive   | 0.825               |
| 7. | Natural      | 0.636               |
| 8. | Commercial   | 0.871               |
| 9. | Elegant      | 0.836               |
| 10.| Ergonomist   | 0.646               |
| 11.| Monotone     | 0.805               |
| 12.| Aesthetic    | 0.772               |
| 13.| Informative  | 0.803               |
| 14.| Economical   | 0.694               |
| 15.| Modern       | 0.825               |

3.1.4. Reducing Kansei word
After the Kansei word is tested for validity and reliability, then it’s averaged and processed using the principal component analysis (PCA) method. This method is a reduction technique used to identify several variables that can represent the variance of the total variable. The output of PCA consists of eigenvalues, variability and cumulative proportions of processing using the xlstat 2020 software. The following is Table 3 Results of Cumulative Proportions.
Table 3. Results of cumulative proportions

|     | PC1       | PC2       | PC3       | PC4       | PC5       | PC6       |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| Eigenvalue | 11,286    | 1,482     | 0,949     | 0,605     | 0,371     | 0,106     |
| Variability (%) | 75,242     | 9,880     | 7,662     | 4,032     | 2,474     | 0,709     |
| Cumulative % | 75,242     | 85,123    | 92,785    | 96,817    | 99,291    | 100,000   |

The eigenvalues of PC1 and PC2 are 11.286 and 1.482, with the variability level at PC1 was 72.242% and PC2 was 9.880%. This means by using the Kaiser criteria based on eigen values, the first 2 principal components are retained. Cumulative values of PC1 and PC2 with a cumulative value above 80%, it represents the entire data set. Meaning with using the Kaiser criterion based on the cumulative value, the first 2 principal components are retained. Furthermore, by looking at the scree plot that is in the xlat 2020 output. The most obvious change is the slope of the scree plot occurs in component 2, which is the “elbow” of the scree plot such that PC1 and PC 2 is maintained.

Furthermore, a factor analysis was carried out to find the significant factors of the word Kansei to determine the visual design concept of aloe vera beverage packaging. The following is Table 4 Results Factor Loading After Sorting.

Table 4. Results factor loading after sorting

|     | F1    | F2    |
|-----|-------|-------|
| Economical | 0,133 | Monotone | -0,400 |
| Practical  | 0,463 | Unique   | -0,265 |
| Informative| 0,521 | Interesting | -0,254 |
| Ergonomic | 0,592 | Colored  | -0,143 |
| Natural   | 0,680 | Commercial | -0,133 |
| Unique    | 0,728 | Elegant  | -0,109 |
| Monotone  | 0,785 | Modern   | -0,053 |
| Simple    | 0,843 | Fresh    | -0,038 |
| Interesting| 0,873 | Ergonomic | 0,026 |
| Aesthetics| 0,923 | Aesthetics | 0,028 |
| Colored   | 0,938 | Simple   | 0,119 |
| Modern    | 0,956 | Natural  | 0,203 |
| Fresh     | 0,960 | Economical | 0,319 |
| Commercial| 0,971 | Practical | 0,562 |
| Elegant   | 0,983 | Informative | 0,699 |

The minimum value used is > 0.8 [9]. Kansei word on factors first (F1) which has a value close to 1 or > 0.8 is elegant, commercial, fresh, modern, colorful, aesthetic, attractive, and simple, which then subjectively summarized the word Kansei. Kansei is chosen as attractive. Kansei said in the second factor (F2) which has value close to 1 or > 0.8 absent. Thus, there is only one selected Kansei concept that comes from the first factor (F1) is attractive.

3.1.5 Identifying Visual Design Elements

Identification of design elements is carried out to determine which visual design elements are divided into primary design elements and secondary design elements that are on the aloe bottled beverage product vera. The following is Table 5 Identification of Visual Design Elements.
Furthermore, the identification results of the design elements are tabulated on the product sample. The following is Table 6 Tabulation of the Results of Identification of Visual Design Elements.

### Table 5. Identification of visual design elements

| Code | Design Elements          | 1    | 2    | 3    | 4    |
|------|--------------------------|------|------|------|------|
|      | Primary Element          |      |      |      |      |
| X1   | Barcode                  | Exist| Non-exist |      |      |
| X2   | Nutrition Facts          | General| Specific|      |      |
| X3   | Logo                     | Figure Mark| Word Mark|      | Combination Mark |
| X4   | Brand Marks              | Top Front| Middle Front| Bottom Front|      |
| X5   | Product Name             | Top Front| Middle Front| Bottom Front|      |
| X6   | Product Composition      | Exist| Non-exist |      |      |
| X7   | Expired Date             | Exist| Non-exist |      |      |
| X8   | Net Weight Position      | Front| Side| Back |      |
|      | Secondary Element        |      |      |      |      |
| X9   | Background Color         | Warm Colors| Cool Colors| White|      |
| X10  | Font Color               | Warm Colors| Cool Colors| White| Black |
| X11  | Font Type                | Serif| San Serif| Script|      |
| X12  | Figure                   | Original| Illustration|      |      |
| X13  | Label Type               | Plastic Film| Paper Laminating|      |      |
| X14  | Label Position           | Wrap Around Label| Wet Label|      |      |

3.1.6. Analysis of The Relationship Between Selected Kansei Concepts and Visual Design Elements

This analysis uses partial least square (PLS). Its main purpose is to identify design elements that strongly influence participants emotions. There are 2 variables involved. First, variable y (dependent), namely the average data of the selected Kansei words and the variable x (independent), namely data on dummy variable visual design elements. The following is Table 7 Coefficient Value Partial Least Square Output.
Table 7. Coefficient value partial least square output

| Element category        | Sub-element variant | Elegant Words | Range | Average Range |
|-------------------------|---------------------|---------------|-------|---------------|
| Barcode                 | Exist               |               |       |               |
|                         | Non-exist           |               |       |               |
| Nutrition Facts         | General             | 0.558         | 0.558 |               |
|                         | Specific            | 0.115         |       |               |
|                         | Non-exist           | 0.000         |       |               |
| Logo                    | Figure Mark         | 0.078         | 0.403 |               |
|                         | Word Mark           | 0.481         |       |               |
|                         | Combination Mark    | 0.115         |       |               |
| Brand Marks             | Top Front           |               | 0.429 |               |
|                         | Middle Front        |               |       |               |
|                         | Bottom Front        |               |       |               |
| Product Name            | Top Front           | 0.367         | 0.367 |               |
|                         | Middle Front        | 0.307         |       |               |
|                         | Bottom Front        | 0.000         |       |               |
| Product Composition     | Exist               |               |       |               |
|                         | Non-exist           |               |       |               |
| Expiration date         | Exist               |               |       |               |
|                         | Non-exist           |               |       |               |
| Net Weight Position     | Front               | 0.493         | 0.493 |               |
|                         | Side                | 0.000         |       |               |
|                         | Back                | 0.181         |       |               |
| Background Color        | Warm Colors         | 0.000         | 0.515 |               |
|                         | Cool Colors         | 0.515         |       |               |
|                         | White               | 0.158         |       |               |
| Font Color              | Warm Colors         | 0.199         | 0.394 |               |
|                         | Cool Colors         | 0.081         |       |               |
|                         | White               | 0.394         |       |               |
|                         | Black               | 0.000         |       |               |
| Font Type               | Serif               | 0.201         | 0.473 |               |
|                         | San Serif           | 0.473         |       |               |
|                         | Script              | 0.000         |       |               |
| Figure                  | Original            | 0.432         | 0.191 |               |
|                         | Illustration        | 0.241         |       |               |
| Label Type              | Plastic Film        | 0.527         | 0.381 |               |
|                         | Paper Lamination    | 0.146         |       |               |
| Label Position          | Wrap Around Label   | 0.593         | 0.512 |               |
|                         | Wet Label           | 0.081         |       |               |

The Partial Least Square output coefficient shows the magnitude of the relationship between the sub variants elements with the word Kansei selected.

3.2. Structural design concept
The concept of structural design is obtained by several stages of data processing, namely:

3.2.1. Product sample collection
The product sample used in this study consisted of 7 packaged product samples aloe vera bottle drinks, namely tropocal aloevera saft trinken, minute maid pulpy aloe vera, Vinut aloevera with pulp guava flavor, jugo aloevera saloe, aloe organic OKF, iberia aloevera drink, and neuherbs aloevera juice. Product samples obtained from the results of an open questionnaire containing respondents preferences for aloe vera bottled beverage products are the most preferred and often consumed.
Table 8. Conclusion of visual design concepts

| Element          | Sub element code | Sub elements       | Design Concept “Attractive” |
|------------------|------------------|--------------------|-----------------------------|
| Primary Element  |                  |                    |                             |
| X1               | Barcode          | Exist              |                             |
| X2               | Nutrition Facts  | General            |                             |
| X3               | Logo             | Word Mark          |                             |
| X4               | Brand Marks      | Top Front          |                             |
| X5               | Product Name     | Top Front          |                             |
| X6               | Product Composition | Exist            |                             |
| X7               | Expiration date  | Exist              |                             |
| X8               | Net Weight Position | Front             |                             |
| Secondary Element|                  |                    |                             |
| X9               | Background Color | Cool Colors        |                             |
| X10              | Font Color       | White              |                             |
| X11              | Font Type        | San Serif          |                             |
| X12              | Figure           | Original           |                             |
| X13              | Label Type       | Plastic Film       |                             |
| X14              | Label Position   | Wrap Around Label  |                             |

3.2.2. Determination of Item and Category of Beverage Bottle Packaging Items
The determination of items and categories is used to form later sample combinations will be used as the object of the third questionnaire. The sample is divided into five items, namely section stop of bottle, center of bottle, bottom of bottle, material, and size.

3.2.3. Determination of product sample stimuli (card design)
The stimulus is an experimental concept card that comes from a list of items (attributes) and category (level) of 7 product samples. In this study using a full-profile approach to reduce the amount of stimulus using the fractional factorial designs method. This process results in 49 combinations formed from the combination of attributes [11, 12].

3.2.4. Respondent assessment
Respondent assessment is the result of measurement of 100 respondents to 49 combinations of stimuli the sample offered through a closed questionnaire uses a rating scale. Respondents are required to rate 49 a combination of sample stimuli using a scale of 1 to 10 [13, 14].

3.2.5. Testing data
The validity test is used to determine the extent of accuracy and accuracy measuring instrument in performing its measuring function. Based on the validity test output, all the value of the Pearson correlation shows that it’s greater than the value of r table, namely 0.195 so the data is valid.
Reliability test is an index that shows the extent to which a measuring instrument can be trusted or reliable. Based on output reliability statistics, the data is reliable because of the alpha value obtained 0.833 is greater than the comparable alpha value, which is 0.6. The following is a table the results of validity test and reliability test closed questionnaire.

3.2.6. Conjoint analysis
Conjoint analysis is a method of analysis in multivariate analysis which is usually applied to marketing research to produce a new product or an old one and most preferred by consumers so that it can be seen consumer preferences for a product. The output of conjoint analysis consists of 3 analyzes, namely utilities, importance values, and the value of correlations to determine consumer preferences for design aloe vera beverage bottle packaging.

3.3. Visualization of Design Concepts
The visual design concept and structure are then visualized into 2D images. The following is Figure visualization of the visual design concept and structure.

4. Conclusion
Based on the discussion and analysis that has been done, conclusions can be made as follows:
1) The concept of visual design, the chosen word Kansei is elegant, commercial, fresh, modern, colorful, aesthetic, attractive, simple subjectively summarized as “attractive”.
2) The concept of structural design from the results of conjoint analysis on the respondent's assessment of 49 combination of structural design elements most preferred by consumers.

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