

REDESIGN OF THE PACKAGING DESIGN OF TEMPE-SAGU CHIPS PRODUCTS BASED ON CUSTOMER PREFERENCES USING KANSEI ENGINEERING AND THE KANO MODEL

Mukhlisotul Mabrurotin¹

Universitas Pembangunan Nasional “Veteran” Jawa Timur, Surabaya, Indonesia
20032010164@student.upnjatim.ac.id

Akmal Suryadi²

Universitas Pembangunan Nasional “Veteran” Jawa Timur, Surabaya, Indonesia
akmal.suryadi65@gmail.com

Abstract

Neng Anis is a Small and Medium Enterprises located in Bojonegoro Regency which produces tempeh-sago chips which require improvements in product packaging so that they can compete for a wider market share with other tempeh-sago chips products. The aim of this research is to redesign the packaging design for tempeh-sago chips products based on customer preferences using Kansei Engineering and the Kano Model. This research used an interview method with the owner of the Neng Anis MSME and with 5 customers who had bought Neng Anis's tempe-sago chips. A 10 kansei word differential semantic questionnaire with 8 stimuli was distributed to 51 customers who had previously purchased Neng Anis tempe-sago chips products. The questionnaire results were processed using factor analysis, modified canoe diagram mapping and conjoint analysis. The packaging design for Neng Anis's sago tempeh chips that customers prefer is a packaging design that is Safe, Practical, Beautiful, Eye Catching, Unique, Informative, Elegant and Modern. The results of the packaging design use a box with a dark base color and use simple packaging decoration. Evaluation of the 3D design of Neng Anis sago tempeh chips packaging by 10 customers showed an average score of 86.5, indicating a positive response.

Keywords: Kansei Engineering, Factor Analysis, Kano Model, Konjoin Analysis

INTRODUCTION

In the midst of increasingly competitive market competition, Neng Anis wants to differentiate their products from competitors who offer similar products. Neng Anis is a Small and Medium Enterprises (UKM) located in Bojonegoro Regency which produces tempe-sago chips. According to him, the packaging of his tempeh-sago chips product looks ordinary so it is still not enough if the tempeh-sago chips product is distributed to large stores. Until now, tempeh-sago chips products have only been distributed at the nearest grocery store. Another goal is that the owner wants to distribute his products in large shops in Bojonegoro Regency and sell them to e-commerce, namely Facebook Marketplace and Shopee.

Table 1
Sales of Tempe-Sago Chips in March 2024

<u>Week 1</u>	<u>Week 2</u>	<u>Week 3</u>	<u>Week 4</u>
80	85	85	82

Source: Primary Research Data

It can be seen that the number of sales decreased in the 4th week. This is not in line with the target of the neng anis tempeh chips business to increase the sales every week. The decline in sales of tempeh chips has an impact on the profits obtained, therefore the owner of the neng anis tempeh chips business hopes that sales of neng anis tempeh chips can increase every week, to gain it's profit so that the business owned by the owner neng anis tempeh chips can be further developed.

After conducting an interview with Mrs. Anis as the owner of MSMEs, it was discovered that the problem faced by Neng Anis's MSMEs was that the packaging designs and models were still outdated. The packaging design for this tempeh-sago chips product only uses PP (Polypropylene) plastic and affixed with brand stickers. Packaging can encourage consumers to buy products, so the brand owner need to be as creatie as possible to create attractive and unique packaging designs according to their customer preferences. It is important to look at the problems from the customer's perspective gain a more holistic understanding (Amedia & Prayoga, 2024).

Based on existing problems, the customer's perspective can be analyzed to increase product sales through make an eye-catching packaging design so that it can attract customer

attention. An attractive packaging design can create a special attraction when consumers see it, so that it can encourage consumers to make spontaneous purchases (Prameswari, et al., 2021).

By combining Kansei Engineering and the Kano model, it is hoped that Neng Anis can provide input to MSMEs in creating packaging designs that suit customer preferences to increase the visual appeal and competitiveness of products in the midst of this competitive market. Therefore, this research will use the Kansei Engineering method and the Kano model to create a product packaging designs based on customer's perspective in order to increase product sales and attracting more customer attention.

REVIEW OF LITERATURE

Kansei Engineering

Kansei Engineering was introduced by Professor Mitsuo Nagamachi in 1970. Kansei Engineering is a technology that combines Kansei (emotions and feelings) with engineering disciplines. Kansei Engineering is used in product development to obtain consumers and their satisfaction by analyzing human feelings and emotions and connecting these emotions and feelings with product design. Kansei Engineering aims to develop products based on consumer feelings (Yohanny, et al., 2023).

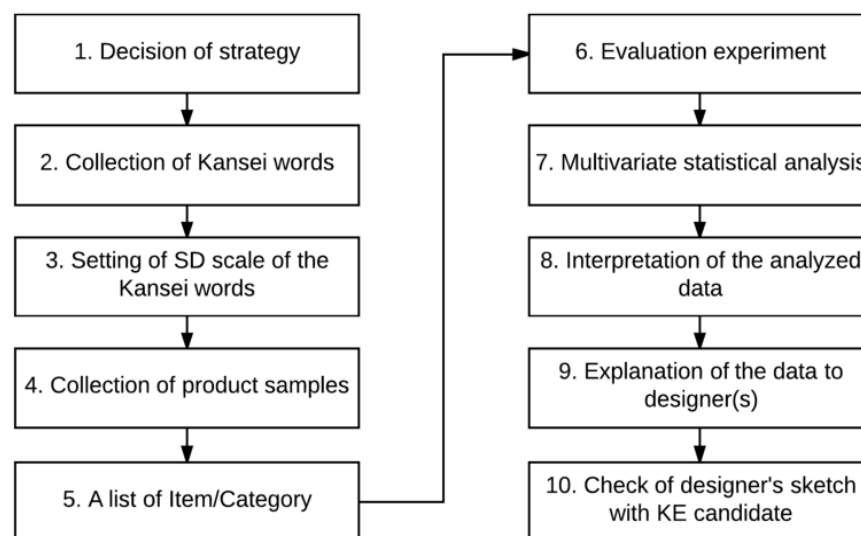


Figure 1
Stages of Kansei Engineering

Kansei Engineering, which includes an experiment or evaluation research by carrying out statistical analysis of the data that has been obtained, implementation is carried out in 3 steps, namely: 1) Select Kansei words, collect and select adjectives; 2) Evaluating Kansei which is a subjective evaluation of consumer perceptions of several products and product samples using a questionnaire containing the word Kansei; 3) Carry out data analysis based on evaluation experiments. If you know the combination of product properties that produces the highest score among descriptive words, you can produce guidelines for designing a new product's emotional interface (Fadly & Satori, 2021).

The Kano Model

This model was first developed by Noriaki Kano and his team in 1984. The Kano model is a method/technique used to determine which attributes have the most influence in order to meet customer (user) satisfaction when designing products and/or services. In the Kano diagram the horizontal axis shows the physical adequacy of certain quality attributes, then the vertical axis shows satisfaction with certain quality attributes.

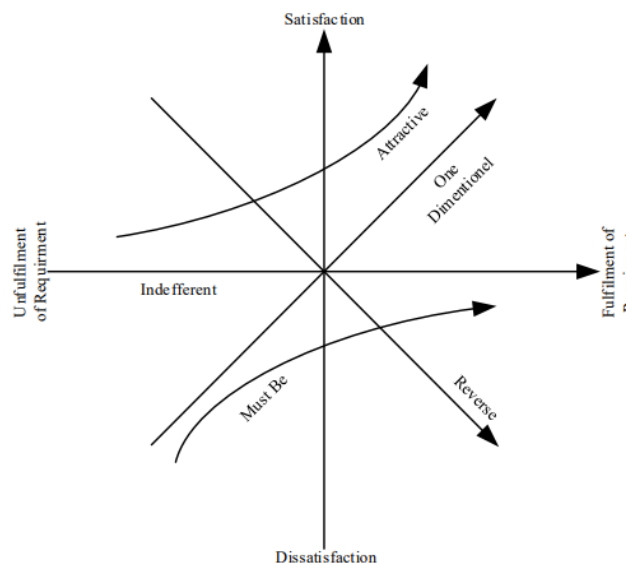


Figure 2
Six applicable Kanoe Model

1. Must-be (M), namely requirements that are not expressed by the customer and these requirements do not lead to customer satisfaction.
2. One-dimensional (O), to show a linear increase in satisfaction and is usually stated explicitly by the customer.

3. Attractive (A), Fulfillment of these requirements will cause a very high increase in customer satisfaction. However, if it is not fulfilled it will not cause a decrease in the level of satisfaction.
4. Indifferent (I), a condition where customers are indifferent to product features, the presence or absence of these attributes does not make a difference in satisfaction reactions to the product.
5. Reverse (R), a requirement that the customer does not want, and if what the customer wants for the product is met then customer satisfaction decreases.
6. Questionable (Q), requirements that customers may not understand (Ishak, et al., 2020).

Redesign

Redesign is an activity of carrying out innovative changes based on the form of an old design being changed to a new one, so that it can fulfill positive goals that result in progress (Yusuf & Mutalib, 2021). Meanwhile packaging design is a creative shapes, structures, materials, colors, images, typography and design elements with product information so that products can be marketed. Packaging design is also used to wrap, protect, send, release, store, identify and differentiate a product on the market. It acts as product marketing that uniquely communicates the personality or function of the consumer product (Nugraheni, 2019). Good packaging design will attract consumers' interest in a product. The higher the consumer interest, the higher the sales. The attractiveness of a product can be increased through the development of good packaging design. Packaging design development refers to meeting consumer needs (Rizqi, et al, 2021).

Consumer's Preferences

Consumer's preference is a person's decision to like or dislike the product (goods or services) consumed. Consumer preferences show consumers' preferences among various existing product choices. Preferences refers to the ability to prioritize options to make decisions. Consumer preferences are at least related to two attitudes, namely preferring and equally liking. Consumer preferences are closely related to determining basic attitudes that explain choices, as well as determining attitudes and behaviour in determining choices (Putra, et al, 2023).

Factor Analysis

Factor analysis is a technique used to look for factors that are able to explain the relationship or correlation between various independent indicators that are observed. Confirmatory factor analysis consists of several stages. The first is to formulate the problem. Before we carry out confirmatory factor analysis, it is necessary to re-evaluate the problem formulation that has been created.

The second is to construct a correlation matrix. There are several measures that can be used to meet data adequacy requirements as a rule of thumb and in this study the Kaiser-Meyer Olkin (KMO) measure method was used. This method is most widely used to see data adequacy requirements for factor analysis. The overall KMO size can be increased by removing incorrect variables whose MSA value is low or less than 0.50. Meanwhile, Bartlett's Test is a statistical test to see the significance value of all correlations in the correlation matrix where the correlation coefficient value is zero. MSA also has the same rules as KMO, the higher the MSA correlation coefficient value, the more reasonable it is to include individual indicators in factor analysis.

Third, determine the number of factors and factor rotation. After the variables are arranged based on the correlation pattern, the first step then determines the number of factors needed to represent the data (Kurniawati, et al., 2022).

Konjoin Analysis

Conjoint analysis is a technique used to understand how respondents develop preferences for a product or service. The main use of conjoint analysis is to find out product attributes that consumers like, help determine the composition of new product attributes, and analyze the attributes of products that have been launched on the market, so that companies can improve these products.

To test validity, conjoint analysis was carried out using Pearson's R and Kendal Tau correlation. The basis for the significance test is as follows:

H0: There is no strong correlation between Observed Variables and Estimated Preferences

H1: There is a strong correlation between Observed Variable and Estimated Critical Area

If the significance figure is ≥ 0.05 then H0 is accepted. Conversely, if the significance figure is < 0.05 then H0 is rejected (Faisal, et al., 2021).

RESEARCH METHOD

This research is quantitative because it narrows the customer's perspective become a number called relative proportion. This value will become a main aspect concept of developing tempe sago packaging. Besides that, it also shows the interpretation of the main component of several images so that we can see the distribution of Kansei words. The location for data collection in this research was at Neng Anis UMKM, whose address is Bojonegoro Regency. The dependent variable in this research is customer preference for the Neng Anis Tempe-Sago Chips product.

The independent variables in this research include various attributes or features contained in the product packaging. Independent variables include: 1) Packaging form; 2) Color packaging design; 3) Packaging design decoration.

Table 2
Packaging Design Categories

Category	Items
Shape	1. Jar Shape
	2. Standing Pouch
	3. Box
	4. Cylinder Tube
Color	1. Dark
	2. Bright
Decoration	1. Simple
	2. Crowded

Source: Primary Research Data

Categorizing packaging designs can be used to search for packaging design stimuli. Selecting a packaging design category based on shape, color and decoration can be based on various reasons related to functionality, aesthetics and marketing strategy. Kansei's words were collected by conducting interviews with customers who had purchased Tempe-Sago Chips Neng Anis. Interviews will be conducted using the Zoom Meeting application.

The first step in conducting the interview was to describe the UMKM Neng Anis Tempe-Sago Chips product and what kind of packaging they wanted for the UMKM Neng Anis Tempe-Sago Chips product. Next, interviews will be conducted by researchers and

customers/respondents with 5 questions about first impressions when purchasing Neng Anis UMKM Tempe-Sago Chips products.

Table 3
List of Questions for Interviewers

Question
When buying Tempe-Sago Chips products at the store, is there anything you prioritize when buying them at the store?
What do you expect when you see the packaging for Tempeh-Sago Chips?
What made you choose these Tempe-Sago Chips compared to other competing Tempe-Sago Chips?
How do you feel when you buy Tempe-Sago Chips?
What are your expectations when consuming Tempe-Sago Chips?

Source: Primary Research Data

The list of interview questions to elicit Kansei Word from customers is created based on several important steps that ensure that the questions can effectively probe customer feelings, emotions and perceptions. Developing questions for the interviewer helps ensure that the questions are appropriate to the research objectives and can provide relevant and useful information. From collecting Kansei Words from packaging design stimuli and interviews with 5 customers/respondents, a total of 26 Kansei Words were obtained. The number of kansei words obtained is quite large and has many words that are similar to each other. That is why the word kansei will be grouped/structured based on the definition of the word in the Indonesian Dictionary.

RESULTS AND DISCUSSION

Validity Test Results

The data was tested using the Pearson Validity test by correlating the score of each questionnaire item with the total score of each question. With a total of 51 respondents (n) and a significance level (alpha) applied of 5% and checking the r-table value of 0.2759.

Table 4
Questionnaire Data Validity Test Results

Kansei Word	Pearson Correlation	r-table	Information
Cheap	0.556	0.2759	Valid
Unique	0.910	0.2759	Valid
Informative	0.813	0.2759	Valid
Elegant	0.875	0.2759	Valid

Safe	0.834	0.2759	Valid
<i>Eyes Catching</i>	0.922	0.2759	Valid
Clear	0.870	0.2759	Valid
Practical	0.805	0.2759	Valid

Source: SPSS 25 output

The validity test results above show that the r-table value is 0.2759, which is greater than the calculated r-value, meaning the data is valid and will continue to the next test.

Reliability Test Results

The reliability test used the *Cronbach technique Alpha* where an instrument can be said to be reliable or reliable if it has a reliability coefficient of >0.6 (Mardiana, et al., 2021). *Cronbach's results alpha* is 0.952, which means the data is reliable on a very good scale, meaning very reliable.

Table 5
Questionnaire Data Reliability Test Results
Reliability Statistics

Cronbach's Alpha	N of items
,952	10

Source: SPSS 25 Output

Factor Analysis

In the Kansei method engineering, factor analysis is used to reduce data using statistics using correlation between variables to create new variables that have fewer variables than the original variables.

Table 6
Results of the Kaiser-Meyer-Oikin (KMO) phase I KMO and Bartlett's Test
KMO and Bartlett's Test

Kaiser -Meyer -Olkin Measure of Sampling Adequacy .	,914
Bartlett's Test of Sphericity	Approx . Chi- Square
	482,772
	df
	45
	Sig .
	,000

Source: SPSS 25 Output

The KMO value is 0.914 with a significance of 0.000 (sig < 0.05), which can be interpreted as if the value is in the satisfactory category for factor analysis. Based on Bartlett's Test with a chi-square value of 482.772 with degree of freedom (df) has a value of 45 and a significance value of 0.000 (sig < 0.05) indicating that the correlation matrix is not an identity

matrix (which means there is a correlation between variables) so it can be analyzed by kansei the word. Measure method of Sampling Adequacy (MSA) can be seen through the anti-image matrix. From table 7, it can be seen that the MSA values (marked " a ") are all more than 0.5 ($MSA > 0.5$), which means that the variable can be predicted without error from other variables and can be analyzed further.

Table 7
Anti-Image Correlation Matrices

Kansei Word	Anti-Image Correlation
Cheap	,788 ^a
Unique	,938 ^a
Informative	,942 ^a
Elegant	,915 ^a
Safe	,925 ^a
Eye Catching	,925 ^a
Clear	,892 ^a
Practical	,938 ^a
Beautiful	,886 ^a
Modern	,930 ^a

Source: SPSS 25 Output

Table 8
Output Component Matrix
Components Matrix^a

	Components
	1
Cheap	,521
Unique	,913
Informative	,824
Elegant	,884
Safe	,832
<i>Eyes Catching</i>	,923
Clear	,873
Practical	,802
Beautiful	,926
Modern	,876

Source: SPSS 25 Output

Based on table 8, it can be seen that all items have *factor values* *The loading* is quite high (more than 0.3), indicating that each item has a significant contribution to the main factor. *Kansei* *The word* Beautiful has the highest loading , namely 0.926, indicating that this

item is highly correlated with the main factor extracted. Considering that only one main factor was extracted and all items had high *loadings on this factor*, it can be concluded that all *kansei word* is used to measure the same concept effectively. If factor analysis shows that only one component is significant, factor rotation is not necessary.

Kano Model Mapping

In this research, we apply a modification of the Kano model by using factor scores to indirectly identify when customers consider an attribute to be raised (positive score) or removed (negative score). This is done by grouping factors or attributes into two parts. Existing attributes or positive attributes (PA) relate to parts whose attribute scores are above average. On the other hand, attributes that are not applied or negative attributes (NA) have a score lower than the average. Thus, the presence or absence of these attributes is a relative value to the population average. Spearman's correlation coefficient rho is then calculated between these factor scores. In this research, the same thing was done, namely identifying indirectly when consumers consider a *kansei words* to appear (positive value) or omitted (negative value) in the packaging design for *tempe-sago chips*.

The data used in calculating the correlation value is the average Kansei questionnaire calculation data word . This factor correlation calculation was carried out using the questionnaire evaluation scores by respondents which were divided into two categories, namely positive and negative answers. The assessment criteria are as follows: 1) Positive Answer = 3 – 4 – 5; 2) Negative Answer = 1 – 2.

A score of 3 is included in a positive answer with the consideration that a neutral answer (a score of 3) can still be accepted by the respondent. The following is table 9 which shows the respective correlation results each *kansei word* with Y (packaging design quality).

By using negative answer data and negative answers as an axis, it can be used to describe and map customer satisfaction using a canoe diagram. The kano diagram will be processed using SPSS 25. Figure 3 is a mapping of each *kansei word* in modified Kano matrix.

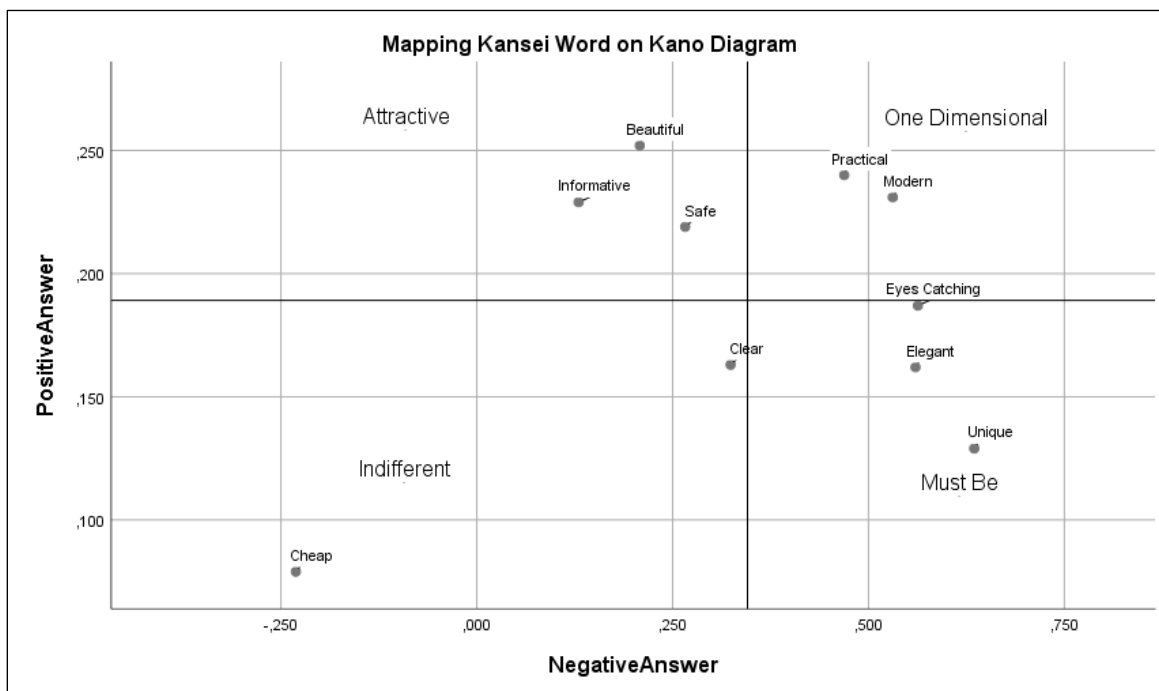


Figure 3
Mapping *Kansei* Word on Kano Diagram

So, it can be concluded that the packaging design for tempeh-sago chips that customers prefer is a packaging design that uses kansei word, such as Safe, Practical, Beautiful, Eye Catching, Unique, Informative, Elegant and Modern.

Conjoint Analysis

Arrangement of cards design before conjoint analysis is a crucial step to obtain accurate and structured consumer preference data. Card concept card design used to combine packaging design categories for each different design item for each sample. Items and design categories are used as a reference for packaging design combinations based on customer preferences.

Table 9
Summary Combination of Packaging Design Stimulus Samples Tempe -Sago Chips

Card Design	Form	Color	Decor
1	<i>Jar</i>	Bright	Crowded
2	<i>Box</i>	Bright	Simple
3	<i>Box</i>	Dark	Crowded
4	<i>Jar</i>	Dark	Simple
5	Standing Pouches	Dark	Simple
6	Standing Pouches	Bright	Crowded

Card Design	Form	Color	Decor
7	Cylindrical Tube	Dark	Crowded
8	Cylindrical Tube	Bright	Simple

Source: SPSS 25 Output

Conjoint analysis was used to determine the relationship between design elements and kansei words according to the results of the questionnaire on the level of importance of kansei words on Neng Anis' tempe-sago chips packaging. The following is a recapitulation of the overall utility value in each design category within the specified factors.

Table 10
Summary of Greatest Utility Value in Kansei Word

Kansei Word	Design Elements		
	Form	Color	Decor
Unique	Box	Dark	Simple
Informative	Jar	Dark	Crowded
Elegant	Box	Dark	Crowded
Safe	Box	Bright	Simple
Eye Catching	Jar	Dark	Simple
Practical	Jar	Bright	Simple
Beautiful	Box	Dark	Crowded
Modern	Box	Dark	Crowded
Overall Statistics	Box	Dark	Simple

Source: SPSS 25 Output

Conjoint analysis on utility value, for example, in Unique Kansei, consumers prefer box packaging with dark packaging colors and simple decoration. Overall statistics is the average utility value of 8 kansei words. Based on overall value statistics, the combination that has the highest value desired by customers overall is packaging that has a box shape, with dark packaging colors and has a simple packaging design. Simple and busy decoration elements have the same amount, but based on the values in Appendix 11, simple decoration shows a greater value than busy decoration.

3D Prototype Design

The resulting packaging design is a combination of design elements obtained in conjoint analysis, namely box- shaped packaging, dark colors with simple decoration. This design element must give the impression of being safe, practical, beautiful, eye-catching

Catching, Unique, Informative, Elegant and Modern. The results of the tempeh-sago chips packaging prototype can be seen in the image below:



Figure 4
Packaging Design Networks Tempe-Sago Chips

The election category form that is use box with dimensions 20x7x7 cm are based on results data processing shows that consumer more like packaging shaped box. In the category of decoration, consumer more choose simple decoration however still interesting. Therefore, decoration on the packaging This use patterns in colors base box and a little decoration on brand product. Election color dark with color base blue jacker based on results data processing shows that consumer more like color dark. Yellow used as color accent for give touch bright on the packaging and attractive attention consumer. Pink and white colors used for brand writing products with objective increase visibility and modern impression.

Evaluation of Packaging Design

A new prototype design for tempeh-sago chips product packaging will be presented which will be evaluated by 10 respondents. The ten respondents were adults aged ≥ 15 years, male and female, who had purchased Neng Anis's tempe-sago chips and had been respondents to the previous questionnaire distribution. Respondents will be given a form to fill out. The form contains a semantic differential scale with kansei words to be rated based

on feelings when looking at the prototype. Then respondents were asked to fill out a design evaluation questionnaire.

Table 9
Average Evaluation Results Of 3D Prototype Designs

Kansei Word	Poins	Score
Unique	4,2	10,5
Informative	4,2	10,5
Elegant	4	10
Safe	4,4	11
Eye Catching	4,4	11
Practical	4,5	11,25
Beautiful	4,5	11,25
Modern	4,4	11
Score		86,5

Source: Primary Research Data

Based on design evaluations carried out by customers (see Table 9), the average score for the 3D prototype packaging design for tempeh sago chips was 86,5. This value can indicate that the new packaging design is approved by the customer. Therefore, Kansei Engineering and Kano Model can be used to create packaging designs according to the customer's perspective precisely. This value was obtained based on the results of the assessment of 10 respondents who had bought Neng Anis tempe sago chips. The decision to use a subset of 10 people is because it can represent the diversity of a larger group and provides an accurate picture of overall preferences and needs.

CONCLUSION

The packaging design for Neng Anis's tempe-sago chips that customers prefer is a packaging design that is Safe, Practical, Beautiful, Eye-Catching, Unique, Informative, Elegant and Modern. The desired packaging design is to use box shaped packaging using dark packaging design colors and having simple packaging decoration. Packaging designs are created using software Corel Draw. The results of the prototype design use a pattern on the base color of the box and a little decoration on the product brand. The dark color selection uses a dark blue base color. Yellow is used as an accent color to give a bright touch to the packaging and attract consumers' attention. Pink and white are used for product branding with the aim of increasing visibility and a modern impression. Evaluation of the 3D design

of Neng Anis sago tempoh chips packaging by 10 customers showed an average score of 86.5, indicating a positive response. The use of 10 respondents is sufficient to represent the diversity of the group and provides an accurate picture of overall preferences and needs. For further research, research methods such as Eye-Tracking can be added Analysis to understand what most attracts users' attention to a display.

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