

Packaging Design of Roti Ganda Pematangsiantar Using Kansei Engineering Method and The Kano Model

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Abstrak

Toko Roti Ganda merupakan usaha makanan legendaris yang berdiri sejak tahun 1979 dan berlokasi di Jl. Kartini No. 21, Pematangsiantar, Sumatera Utara. Permasalahan utama terdapat pada salah satu produk unggulannya, yaitu roti jumbo isi srikaya yang hingga kini masih menggunakan kemasan sederhana berupa kertas dan karet gelang tanpa identitas merek maupun desain menarik. Kondisi ini menimbulkan keluhan dari konsumen, terutama wisatawan, karena kemasan dinilai kurang menarik, tidak fungsional, dan tidak praktis untuk dibawa sebagai oleh-oleh jarak jauh. Penelitian ini bertujuan untuk merancang kemasan baru yang sesuai dengan preferensi konsumen menggunakan pendekatan Kansei Engineering dan Model Kano. Kuesioner awal disebar kepada 96 responden, dan 77,1% di antaranya menyatakan kemasan saat ini tidak menarik dan kurang fungsional. Dari analisis, terkumpul 190 kata kansei yang diringkas menjadi 15 kata utama. Beberapa di antaranya adalah awet, eye catching, inovatif, identitas kuat, dan informatif. Kata-kata ini dianalisis menggunakan uji validitas, reliabilitas, dan analisis faktor. Hasil kuesioner Model Kano menunjukkan bahwa atribut seperti informatif, bahan berkualitas, bentuk sesuai isi, tulisan jelas, eye catching, awet, mudah digunakan, dan ilustratif termasuk dalam kategori One-Dimensional. Atribut seperti inovatif, identitas kuat, dan kemasan berwarna tergolong Attractive. Sementara itu, tulisan variatif dan keunikan desain termasuk dalam kategori Indifferent. Desain terbaik diperoleh dari alternatif dengan skor tertinggi sebesar 4,31. Desain tersebut berupa kemasan gable box berukuran 26 × 10 × 16 cm, ergonomis dan praktis, berbahan art carton tebal berlapis pelindung, dengan warna kuning cerah dan cokelat tua, serta informasi produk yang lengkap dan mudah dibaca.

Kata Kunci: Kano, Kansei Engineering, Kemasan, Oleh-oleh, Preferensi Konsumen

Abstract

Ganda Bakery is a legendary food business that has been operating since 1979, located at Jl. Kartini No. 21, Pematangsiantar, North Sumatra. The main issue lies in one of its flagship products, the jumbo bread filled with srikaya, which still uses basic packaging made of paper and rubber bands, without any brand identity or appealing design. This has led to consumer complaints, especially from tourists, as the packaging is considered unattractive, non-functional, and impractical for use as a long-distance food souvenir. This study aims to design new packaging that reflects consumer preferences using the Kansei Engineering approach and the Kano Model. An initial questionnaire was distributed to 96 respondents, with 77.1% stating that the current packaging is neither attractive nor functional. The analysis generated 190 Kansei words, which were refined into 15 core descriptors, including durable, eye-catching, innovative, strong identity, and informative. These were then analyzed through validity, reliability, and factor analysis. The Kano Model results indicated that attributes such as informative, high-quality materials, shape that matches the contents, clear text, visual appeal, durability, ease of use, and illustration belong to the One-Dimensional category. Meanwhile, attributes like innovative, strong identity, and colourful packaging fall under the Attractive category, while varied typography and unique design are categorized as Indifferent. The best design, scoring 4.31, features a gable box measuring 26 × 10 × 16 cm, which is ergonomic and practical, made from thick art carton with a protective layer, in bright yellow and dark brown, and includes complete, easy-to-read product information.

Keywords: Consumer Preference, Food Souvenir, Kano, Kansei Engineering, Packaging

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1. Introduction

The food and beverage (F&B) industry is a major contributor to the domestic economy, particularly in the non-oil and gas processing sector, which remains a vital pillar of national growth. In the second quarter of 2024, it held the largest share of the sector's GDP at 38.4 per cent. This strong position is supported by remarkable export achievements, with August 2024 figures reaching US\$3.78 billion, or 21.36 percent of total non-oil and gas manufacturing exports. The Ministry of Industry, via the Directorate General for Small, Medium, and Miscellaneous Industries, continually strives to strengthen F&B enterprises, particularly SMEs, to sustain competitiveness, encourage innovation, and promote long-term national economic growth.

Products are central to marketing and must maintain high quality to attract consumers and achieve company objectives. Products are anything that producers can offer to attract attention, demand, search, purchase, and utilization or consumption by the market to address the needs or preferences of the targeted market (Suryadi et al., 2023). Product innovation is key to maintaining business competitiveness in an ever-changing market. Four types of innovation, namely invention, extension, duplication, and synthesis, provide a strategic approach to product development that is more adaptive and tailored to consumer needs (Syarifudin et al., 2021).

Packaging is an essential component of finished products, serving functions of containment, protection, and preservation (Ahmad et al., 2022). In addition, packaging helps ensure safety, maintain food hygiene, and extend product shelf life (Afriani et al., 2023). Packaging is an important aspect of product marketing. Good and attractive packaging can influence consumers' purchasing decisions (Zetli et al., 2024).

Shifts in packaging design trends require attention not only to visual appearance but also to functionality, sustainability, and cost efficiency, ensuring alignment with consumer preferences and marketing objectives. Good packaging needs to consider several important factors such as safety, economy, distribution, media elements, ergonomics, aesthetics, identity, promotion, and the environment in order to be used optimally in the market (Amelia, 2020).

Roti Ganda is a local food business from Pematangsiantar, North Sumatra. As a legendary culinary icon of Pematangsiantar, Roti Ganda is widely known for its signature product, jumbo bread filled with srikaya jam, which has a distinctive taste and is the top choice for food souvenirs among tourists from various regions. However, packaging remains the main challenge. Currently, the product is only wrapped in paper and secured with rubber bands, lacking an attractive design or brand identity. Based on a survey conducted among 96 respondents who are consumers of the jumbo srikaya jam-filled bread, it was identified that 74 respondents (77.08%) stated that the current packaging is still

unattractive, simple, and boring. Additionally, many respondents complained that the packaging is easily damaged, not durable, and not suitable for long-distance travel. Therefore, to enhance competitiveness and maintain its status as a premium souvenir from Pematangsiantar, it is necessary to design the packaging for Pematangsiantar.

Kansei engineering is an approach that aims to ensure that products or services are able to generate the emotional response expected by consumers. This method allows the modelling of consumer feelings or emotions to be translated into appropriate design parameters (Faisal et al., 2021). Compared to other similar methods, kansei engineering has the advantage of being able to translate consumers' emotional needs into concrete design parameters through various techniques (Ratnasari et al., 2024). Furthermore, to design the packaging for jumbo bread filled with srikaya, the Kano model was also used to determine the packaging attributes desired by consumers. Kano is a model that aims to categorize product and service attributes based on how well they meet consumer needs. This method not only provides an overview of consumer preferences, but also serves as a foundation for developing quality services (Nurhadi et al., 2022).

Several previous studies have been conducted on design using the kansei engineering method and the Kano model. The study by Wulansari & Jakaria (2022) designed the packaging for Muntu coffee based on consumer preferences. Arini et al. (2023) designed the packaging for Tike chips, a speciality food of Indramayu. Khoiriah et al. (2023) designed a hardcase phone casing to enhance product appeal according to consumers' emotional preferences. Mujibulloh & Jakaria (2022) designed safety shoes based on user comfort and safety needs. Maburrotin & Suryadi (2024) redesigned tempe-sago chip packaging considering customer preferences to enhance the competitiveness of SMEs. Most packaging design studies address emotional or functional attributes separately. Therefore, this study focuses on integrating both aspects in the packaging design of jumbo srikaya-filled bread as a legendary souvenir from Pematangsiantar. Additionally, this study involves consumer preferences in determining the selection.

The goal of this research is to identify the packaging design attributes for jumbo srikaya-filled bread that best match consumer needs and preferences. The findings are expected to contribute to a more satisfying user experience, especially for travellers on long journeys, and to position Roti Ganda as a premier food souvenir from Pematangsiantar.

2. Research Methods

The research methods used in this study to design the packaging for jumbo srikaya-filled bread are the Kansei Engineering method and the Kano model. Kansei Engineering was chosen because it is an approach that

aims to ensure that products are able to generate the emotional responses expected by consumers by translating consumer feelings and emotions into concrete design parameters (Pertiwi et al., 2023). Meanwhile, the Kano Model was used to classify packaging design attributes based on their level of importance and influence on consumer satisfaction, so that the resulting design could meet consumer desires and expectations (Nurhadi et al., 2022). The research flowchart is presented in the following Figure 1.

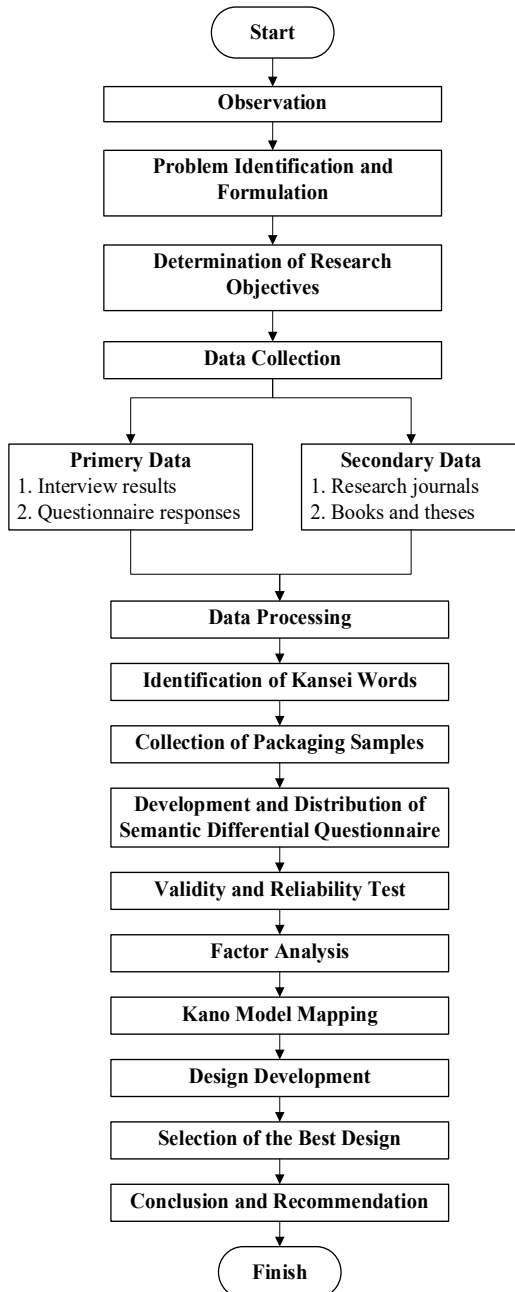


Figure 1: Research Flowchart

Kansei Engineering is used to understand the psychological aspects related to consumer emotions when interacting with a product, allowing for the development of packaging solutions that align with consumer feelings. The Kano model is applied to deeply map the attributes obtained from Kansei Engineering, so that consumer needs and preferences can be identified

more systematically. This approach is expected to produce a packaging design that meets consumer expectations in the market. Consequently, this packaging innovation can enhance the competitiveness of Roti Ganda and strengthen its position as a leading local food souvenir from Pematangsiantar. The two methods are then integrated to generate packaging attributes that align with consumer needs and preferences.

3. Results and Discussion

3.1. Sample Determination

In this study, the sample size was determined using the Lemeshow formula, which is appropriate for studies in which the population size is unknown or cannot be determined with certainty (Istikomah et al., 2024).

$$\begin{aligned}
 N &= \frac{Z^2 \times P(1-P)}{e^2} \\
 &= \frac{1.96^2 \times 0.50(1-0.50)}{0.10^2} \\
 &= \frac{3.8416 (0.25)}{0.01} \\
 &= \frac{0.96}{0.01} \\
 &= 96.04 \text{ Respondents}
 \end{aligned}$$

In this study, 100 questionnaires were distributed, and 96 valid responses were obtained and included in the analysis based on the sample size determined using the Lemeshow formula.

3.2. Identification of Kansei Words

The collection of kansei words was carried out using a questionnaire distribution method to find kansei words in more detail and depth. A total of 190 kansei words were successfully collected. This study collected more kansei words than the studies (Arini et al., 2023), which only collected 114 kansei words. Next, kansei words were identified by grouping words with the same meaning. This grouping aimed to narrow down the kansei words while still covering all kansei words with the same meaning. The grouping of words with the same meaning resulted in 15 kansei words, which can be seen in Table 1 below:

Table 1: Kansei Words

No	Kansei Words
1	Durable
2	Shape matches the contents
3	Eye-catching
4	Innovative
5	High-quality materials
6	Colorful packaging
7	Strong brand identity
8	Easy-to-read text
9	Clear text
10	Varied typography
11	Informative
12	Includes illustrations
13	Safe to use
14	Unique
15	Easy to use

3.3. Collection of Packaging Samples

The product samples collected were jam bread packaging from various brands available on the market. The purpose of collecting these samples was to determine the criteria for filled bread packaging with srikaya jam. These samples can be used to compare the packaging criteria in the market with consumer preferences. A total of 5 samples were collected. The specifications of the packaging samples are presented in Figure 2:



Figure 2: Packaging Samples

3.4. Distribution of Semantic Differential Questionnaires

Semantic Differential is widely used in the early stage of product design to capture and interpret user expectations (Jatmiko et al., 2023). In this study, the kansei words obtained were further evaluated through a Semantic Differential questionnaire consisting of 15 kansei attributes assessed across 5 packaging design samples. The scale ranges from 1 to 5, where the smaller the number chosen by respondents, the more negative their assessment of the packaging design, and conversely, the higher the number chosen, the more positive their assessment. The results of the Semantic Differential Questionnaire are shown in Appendix 5.

3.5. Testing the Results of the Semantic Differential Questionnaire

The semantic differential questionnaire results were tested for validity, reliability, and analyzed by factor analysis.

a. Validity Test

The results of the semantic differential questionnaire distribution in this study were then tested for validity. The testing was conducted using the average kansei word scores from 5 assessments by 96 respondents. The validity test results were processed using IBM SPSS Statistics 25 software. A summary of the validity test results is shown in Table 2 below:

Table 2: Validity Test

Kansei Words	r Calculate	r Table	Description
Durable	0.702	0.201	Valid
Shape matches the tents	0.776	0.201	Valid
Eye-catching	0.704	0.201	Valid
Innovative	0.735	0.201	Valid
High quality materials	0.807	0.201	Valid
Colorful packaging	0.770	0.201	Valid
Strong brand identity	0.761	0.201	Valid
Easy-to-read text	0.833	0.201	Valid
Clear text	0.767	0.201	Valid
Varied typography	0.788	0.201	Valid
Informative	0.784	0.201	Valid
Includes illustrations	0.750	0.201	Valid
Safe to use	0.805	0.201	Valid
Unique	0.773	0.201	Valid
Easy to use	0.829	0.201	Valid

b. Reliability Test

The next step is to conduct a reliability test. This test aims to determine the extent to which the results of the selected variables can be trusted or considered reliable. Reliability is measured by examining the Cronbach's Alpha value. Kansei words are considered reliable if the Cronbach's Alpha value is > 0.6 . The reliability test results were processed using IBM SPSS Statistics 25 software. A summary of the reliability test results can be seen in Table 3 below:

Table 3: Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
0.951	15

c. Analysis Factor

Factor analysis is a method used to reduce the amount of data in statistical techniques involving several variables. In factor analysis, the variables under consideration are grouped according to the degree of relationship between them. Variables that are closely related are grouped to form a factor (Sakinah et al., 2024).

The initial stage of factor analysis testing is the assumption test, which is a validity test with the following criteria: KMO value > 0.5 ; Bartlett's test significance value < 0.5 ; and MSA > 0.5 . The KMO value obtained was 0.937, meaning that factor analysis is feasible and the kansei words are suitable for further analysis. The significance value of Bartlett's Test obtained was 0.000 and MSA > 0.5 , so all kansei words are suitable for the factoring process.

The next step is to perform the factorization process. Factor analysis is performed using the Principal Component Analysis (PCA) method. The results of the factorization process test show that all extraction values are above 0.5. Therefore, all Kansei words are suitable for use because they

contribute significantly to the formation of new factors.

The next process is factor rotation. The purpose of this rotation is to obtain a factor structure that is easier to understand and has a clearer and simpler pattern. In this study, the rotation method used is orthogonal rotation with the Varimax technique, which aims to maximize the clarity of factor loadings on each variable. Based on the results of the rotation process, it was found that 15 Kansei words were successfully reduced to two main components. The first factor, named design functionality, consists of eight Kansei words: form follows function, colourful packaging, strong identity, easy-to-read text, clear text, illustrative, safe, and easy to use. Meanwhile, the second factor, named innovative aesthetics, consists of seven Kansei words: durable, eye-catching, innovative, high-quality materials, varied text, informative, and unique.

3.6. Kano Model Mapping

After processing the data using the Kansei Engineering method to identify consumers' emotional perceptions of packaging design, the next step is to classify these design attributes based on the Kano model. The Kano model identifies consumer satisfaction and expectations for each attribute derived from Kansei words. Each attribute derived from Kansei words is formulated into two statements: a functional statement (if the feature is available) and a dysfunctional statement (if the feature is not available), which respondents then answer using a rating scale from 1 to 5 according to the Kano model standard.

The results of the Kano questionnaire distribution in this study were then used to determine the categories of each attribute by matching the respondents' answers to functional questions with their answers to dysfunctional questions. To determine the final value more accurately, the category with the highest frequency of occurrence for each attribute is identified using the following Baulth Formula:

1. If the total of (One Dimensional + Attractive + Must Be) is greater than the total of (Indifferent + Reverse + Questionable), the grade is determined by the highest value among One Dimensional, Attractive, or Must Be.
2. If the total of (One Dimensional + Attractive + Must Be) is less than the total of (Indifferent + Reverse + Questionable), the grade is determined by the highest value among Indifferent, Reverse, or Questionable.
3. If the total of (One Dimensional + Attractive + Must Be) = (Indifferent + Reverse + Questionable), the grade is determined by the highest value across all categories.

The results of the final grade determination are shown in Table 4 below:

Table 4: Final Grade

Packaging Attributes	O+A+M	Q+I+R	Grade
Durable	93	3	O
Shape matches the contents	94	2	O
Eye-catching	93	3	O
Innovative	94	2	O
High quality materials	94	2	O
Colorful packaging	94	2	O
Strong brand identity	94	2	O
Easy-to-read text	94	2	O
Clear text	94	2	O
Varied typography	48	48	I
Informative	96	0	O
Includes illustrations	90	6	O
Safe to use	91	5	O
Unique	58	38	O
Easy to use	86	10	O

After the final value is obtained, the next step in the Kano Model is to calculate the better and worse values using customer satisfaction coefficients with the following formulas:

1. Better $= \frac{A+O}{A+O+M+I}$
2. Worse $= -\frac{M+O}{A+O+M+I}$

The better value reflects the extent to which consumer satisfaction will increase if the features in the Attractive (A) and One-Dimensional (O) categories are available in the product design. These features are considered capable of having a significant positive impact on consumer perception, both in terms of functionality and emotional experience. Conversely, the worst value indicates the level of decrease in consumer satisfaction if features in the One Dimensional (O) and Must be (M) categories are not provided. The absence of these features can lead to serious dissatisfaction, as features in this category are considered basic requirements that must be met by a product. The better and worse values for each attribute are shown in Table 5.

Table 5: Better and Worse Values

Packaging Attributes	Better	Worse
Durable	0.917	-0.740
Shape matches the contents	0.927	-0.813
Eye-catching	0.938	-0.813
Innovative	0.927	-0.708
High quality materials	0.979	-0.750
Colorful packaging	0.958	-0.688
Strong brand identity	0.938	-0.708
Easy-to-read text	0.896	-0.719
Clear text	0.927	-0.823
Varied typography	0.281	-0.406
Informative	0.948	-0.781
Includes illustrations	0.885	-0.729
Safe to use	0.885	-0.823
Unique	0.521	-0.458
Easy to use	0.854	-0.729

Mapping the better and worse values of each design attribute into the Kano quadrant is done to identify the level of consumer satisfaction and dissatisfaction with that attribute. The better value shows the consumer response when the feature is available, while the worse value shows the response when the feature is not available. Based on the combination of these two values, each attribute is categorized into one of the four Kano quadrants: Must-be, One-dimensional, Attractive, and Indifferent. The Must-be category reflects attributes that

must be present. One-dimensional indicates attributes that directly affect satisfaction, Attractive refers to attributes that provide a positive surprise when present, and Indifferent are attributes that do not significantly impact consumer satisfaction. The mapping results are presented in diagram form to provide a clear visual representation of each attribute's position, making it easier to determine design development priorities. The mapping results are presented in the following Figure 3

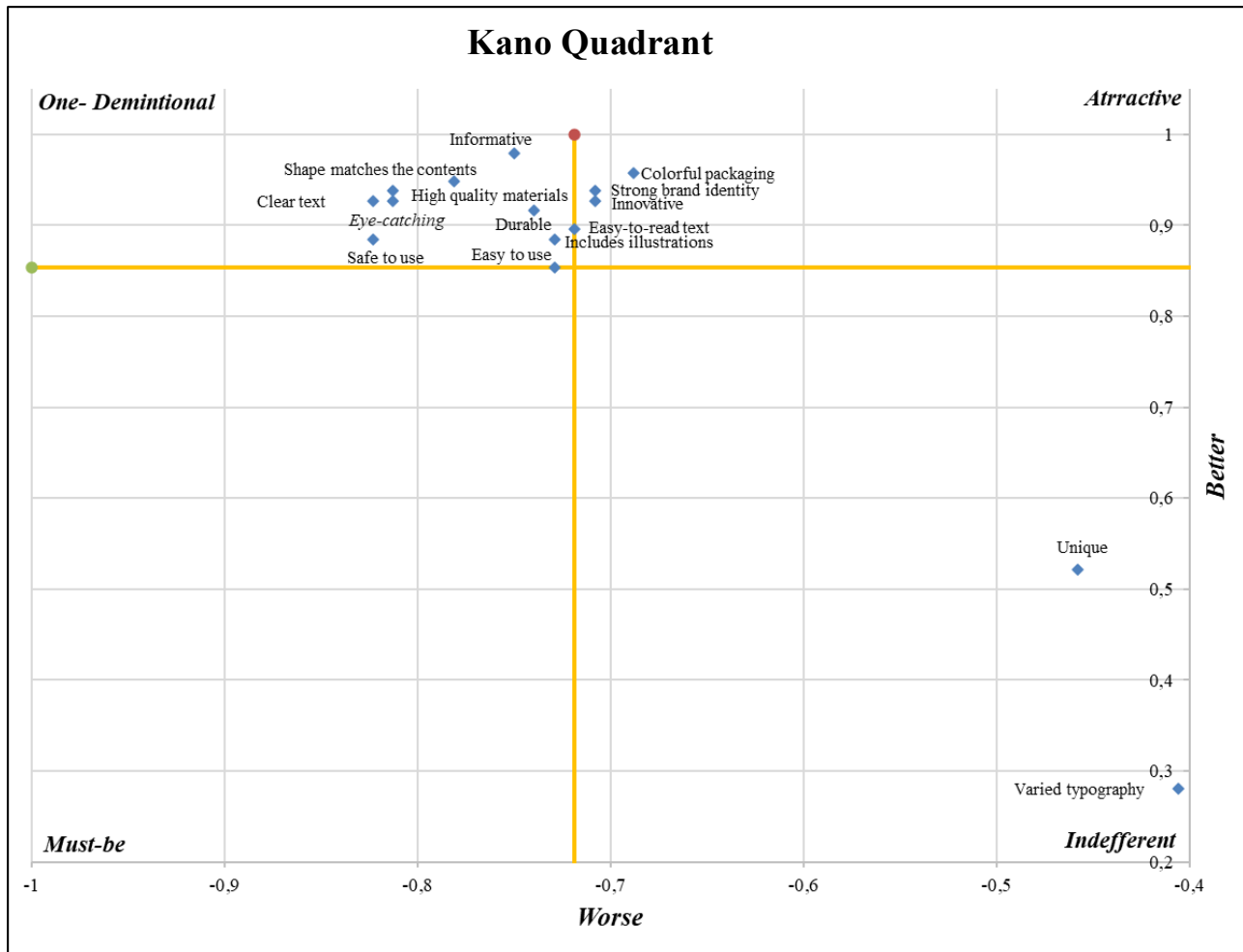


Figure 3: Kano Diagram

Based on the Kano diagram mapping in Figure 3, it shows that most packaging design attributes, such as informative, high-quality materials, shape matching the contents, eye-catching, clear text, durable, easy-to-read text, illustrative, safe, and easy to use, are in the One-Dimensional quadrant. This means that these attributes significantly influence consumer satisfaction or dissatisfaction levels and should therefore be the primary focus in design development. Some attributes, such as colored packaging, innovative, and strong identity, also function as Attractive attributes that can add value and enhance satisfaction, although they are not mandatory. There are no dominant attributes in the Must-be quadrant. Meanwhile, attributes such as varied text and unique design are in the Indifferent quadrant, which do not

significantly influence consumer perception, so their usefulness in the final design can be reevaluated.

3.7. Packaging Design

The packaging design in this study is the result of integrating the kansei engineering method and the Kano model. The kansei method is used to capture and interpret consumers' emotional perceptions through kansei words, while the Kano model is used to group packaging attributes based on their influence on consumer satisfaction.

The packaging design is based on the main priority attributes in the One-Dimensional quadrant, namely attributes that greatly influence satisfaction when fulfilled and have the potential to cause dissatisfaction when ignored. These attributes include: informative,

high-quality materials, a shape that matches the contents, eye-catching, clear writing, durable, easy-to-read writing, illustrative, safe, and easy to use. Additionally, supplementary attributes in the Attractive quadrant, such as colourful packaging, innovative design, and a strong brand identity, are also considered as added value in the design, as they can enhance the positive perception of the product.

The packaging design revisits the initial kansei words (Appendix 2) to ensure alignment with consumers' visual and emotional expectations. The designs were developed using Adobe Photoshop and Canva, resulting in two packaging concepts presented in Figures 4 and 5.



Figure 4: First Packaging Concept



Figure 5: Second Packaging Concept

3.8. Selection of the Best Packaging

The packaging concepts that have been created are then presented back to consumers for further evaluation and validation. This step is crucial to ensure that the final design aligns with consumer preferences and expectations. Consumers are asked to assess each design based on the main priority attributes that were previously identified during the analysis phase.

To determine which concept is most preferred, respondents are required to complete a structured product design questionnaire that includes rating scales for each attribute. The data collected from this questionnaire is then processed in the concept selection stage, where percentage weights and packaging scores are calculated using a weighted scoring method. The results of the concept selection are shown in Table 6 below:

Table 6: Packaging Concept Selection Results

No	Attributes	Weight (%)	Design Selection Concept			
			A		B	
			Rating	Weighted Score	Rating	Weighted Score
1	Durable	6.54	4.20	0.27	4.10	0.27
2	Shape matches the contents	6.76	4.40	0.30	4.13	0.28
3	Eye-catching	6.46	4.20	0.27	4.02	0.26
4	Innovative	6.48	4.10	0.27	4.07	0.26
5	High-quality materials	6.52	4.30	0.28	4.11	0.27
6	Colorful packaging	6.74	4.20	0.28	3.99	0.27
7	Strong brand identity	6.85	4.20	0.29	4.07	0.28
8	Easy-to-read text	6.93	4.30	0.30	4.05	0.28
9	Clear text	6.95	4.30	0.30	4.07	0.28
10	Varied typography	6.65	4.40	0.29	4.01	0.27
11	Informative	6.51	4.30	0.28	3.99	0.26
12	Includes illustrations	6.52	4.30	0.28	4.07	0.27
13	Safe to use	6.70	4.40	0.29	3.90	0.26
14	Unique	6.52	4.30	0.28	3.8	0.25
15	Easy to use	6.82	4.80	0.33	3.94	0.27
Total Score			4.31		4.02	
Ranking			1		2	

Previous studies have focused solely on final packaging designs, whereas this study created multiple concepts and involved consumers in the evaluation process, resulting in a more user-centered selection. Based on Table 6, the percentage weight (%) of each Kansei word attribute was calculated according to its relative importance as evaluated by respondents through the Semantic Differential questionnaire by dividing the total importance score of each attribute by the cumulative importance score of all 15 Kansei words and multiplying the result by 100%. Subsequently, concept selection was conducted by identifying the highest total weighted score. The total score was obtained from the rating results

multiplied by the weighted score for each design concept. The first design had a total score of 4.31, and the second design had a total score of 4.02. Therefore, based on the results, the selected total score was the first design concept with a total score of 4.31.

4. Conclusion

This study successfully identified 190 Kansei words through an initial questionnaire, which were systematically grouped into 15 main attributes to comprehensively map consumer emotions towards packaging design. Analysis using the Kano Model revealed that attributes such as informative, high-quality

materials, shape-matching content, eye-catching, clear text, durable, easy-to-read text, illustrative, safe, and easy to use fall under the One-Dimensional category, which significantly influences consumer satisfaction and dissatisfaction. Packaging attributes such as colored, innovative, and strong identity fall under the Attractive category, which adds substantial value, while varied text and unique design are categorized as Indifferent. All attributes were deemed valid and reliable after testing and were used to design two packaging concepts. The selected design is the first packaging concept with the highest score of 4.31, using an ergonomic and practical gable box measuring $26 \times 10 \times 16$ cm. Thick art carton material protects the product and maintains durability during both distribution and storage, complete with a wrapper to prevent spills. The bright yellow colour combined with dark brown accents gives a cheerful and premium impression, reinforced by illustrations of melting bread for greater visual appeal. Product information is neatly displayed with bold and easy-to-read typography. Overall, this packaging is functional, attractive, and effectively reinforces the brand identity.

The packaging operational cost increased by approximately IDR 1,992 per unit due to thicker materials, full-color printing, and additional inner wrapping. This increase is justified by the functional and emotional benefits, including product protection, ease of handling, and enhanced consumer satisfaction. Although a detailed cost analysis has not yet been conducted, future research could apply Value Engineering to optimize cost efficiency while maintaining functional and aesthetic quality. Additionally, future research could expand the exploration and identification of kansei words with a greater variety and number, resulting in a richer analysis and enabling the creation of packaging designs that are increasingly aligned with consumer preferences.

Acknowledgment

The author sincerely expresses his deepest gratitude to his beloved parents for their unconditional love, constant prayers, and unwavering moral support, which have been the greatest source of strength and motivation throughout this academic journey. Deep gratitude is also extended to the supervisor for their invaluable guidance, constructive feedback, and encouragement, which have played a crucial role in shaping the quality of this research. The author also thanks the faculty members and staff of the Industrial Engineering Program at Malikussaleh University for their academic assistance and efforts in creating a supportive, inspiring, and conducive learning environment. Special thanks are also extended to fellow students and all individuals who have contributed directly or indirectly through encouragement, collaboration, and in-depth discussions, as well as to the respondents who voluntarily participated and provided valuable input for this research. May all the

kindness, support, and contributions received be abundantly rewarded.

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